Countywide Bike Plan

Douglas County, Kansas

Adopted by:

Lawrence-Douglas County MPO Policy Board	July 15, 2021
Eudora City Commission	August 9, 2021
Lecompton City Council	August 16, 2021
Douglas County Commission	August 25, 2021
Resolution 21-30	
Baldwin City Council	September 7, 2021

Received by:

Lawrence City Commission	August 17, 2021
(Due to the connection with the Lawrence Bikes Plan)	

LAWRENCE - DOUGLAS COUNTY

MPO

METROPOLITAN PLANNING ORGANIZATION

Funding Note: This report was funded in part through grant[s] from the Federal Highway Administration [and Federal Transit Administration], U.S. Department of Transportation. The views and opinions of the authors [or agency] expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

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Executive Summary

This Douglas Countywide Bicycle Plan provides guidance to develop a countywide bicycle system which is accessible and comfortable for all while bicycling in Eudora, Baldwin City, Lecompton, or the unincorporated portion of Douglas County (as shown in Figure ES.1). The Lawrence specific bike plan is called Lawrence Bikes and can be found at https://lawrenceks.org/mpo/bicycle_planning. The Countywide Bicycle Plan and Lawrence Bikes plan are coordinated. This plan was approved by the MPO Policy Board on July 15, 2021.

Vision

A bikeway network that supports safe and comfortable riding for all

Goals & Metrics

Improve Comfort and Safety

- Reduce the number of bicycle rider fatalities/serious injuries through 2030. (Since 2015, three bicycle rider serious injuries and zero bicycle rider fatalities have occurred in Unincorporated Douglas County, Eudora, Baldwin City, and Lecompton.)
- Douglas County – Improve separation distance and roadside safety 100% of the time during road improvements on roadways identified as a future bikeway.
- Baldwin City – Increase the miles of the bikeway network by 3.25 miles by 2030. Prioritize extending the Maple Leaf Trail to Franklin County by 2030.
- Eudora – Increase the miles of the bikeway network by 4 miles by 2030. Improve the K-10 crossing as a critical connection to increase safety of non-motorized users by 2025.
- Install signage and implement the American Discovery Trail and US Bike Network 55 by 2025.

Figure ES.1: Plan Area

Click on the map to view an interactive map.

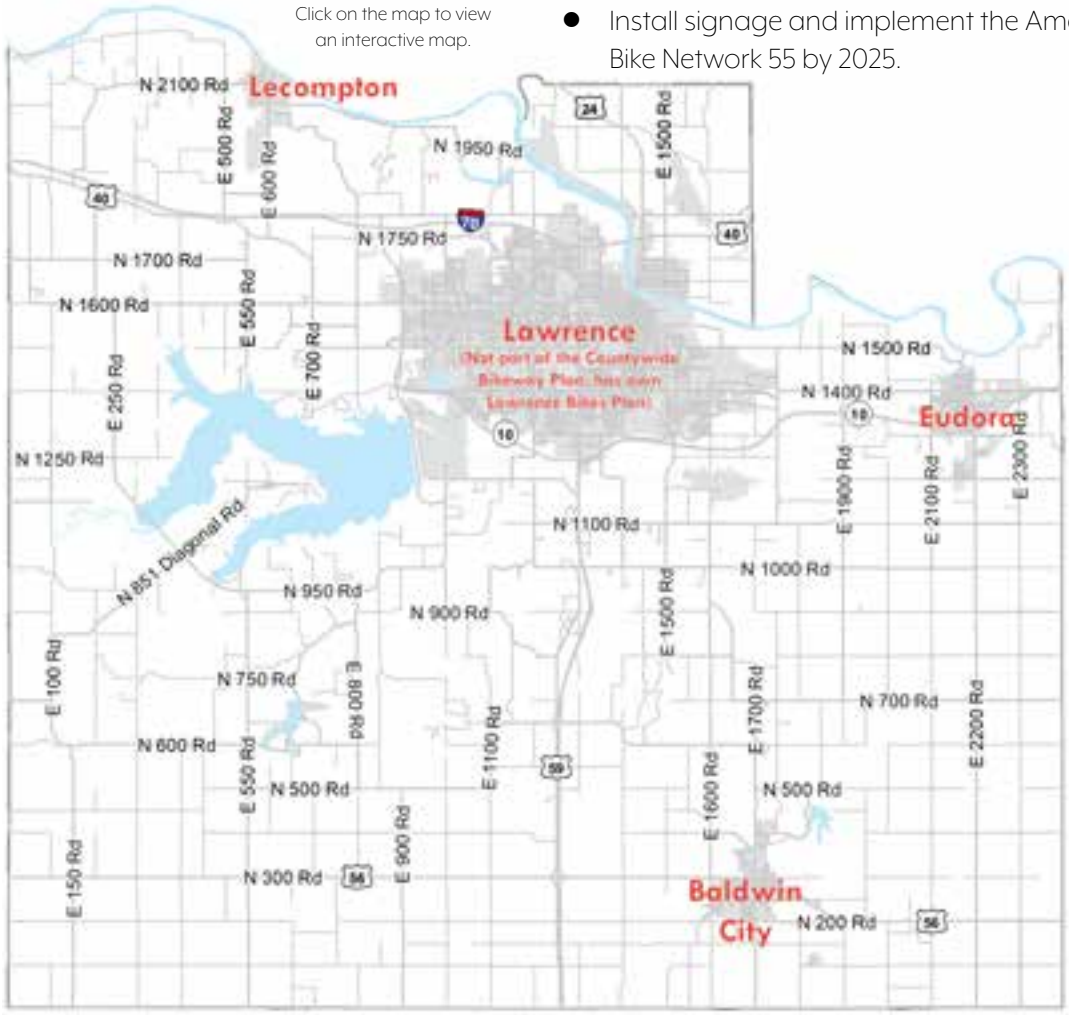

Table ES.1: Action Plan Summary

	Unincorporated Douglas County	Baldwin City	Eudora	Lecompton
Education and Enforcement				
Implement the Safe Routes to School Programs which include biking to school through bike events and supporting a bicycling culture				
Enforce the rules of the road for bicycle riders and drivers to improve the safety for all road users				
Promote the Countywide Bicycle Rideability Map to assist bicycle riders in choosing routes				
Engineering				
Implement the Bikeway Network thru street reconstruction, stand alone projects, street maintenance, and develop a plan for maintaining bikeways				
Evaluate locations for bicycle signal detection devices, bicycle counters, and improved crossings				
Consider adopting a Complete Streets Policy				
Consider modifying development code to require developers to build bikeways and install bike parking as part of their development				
Consider lowering the local speed limit or installing traffic calming to improve safety				
Continue to pursue state and grant funding to implement the bikeway plan				
Plan and install 3 feet passing law education signs.				
Evaluation				
Track progress through performance measures				

 Indicates the item applies to the jurisdiction

Regional Overview

This Douglas Countywide Bicycle Plan provides guidance to develop a countywide bicycle system which is accessible and comfortable for all while bicycling in Eudora, Baldwin City, Lecompton, or the unincorporated portion of Douglas County. The following vision and goals were developed through evaluating best practices and available datasets and are applicable to the entire plan.

Vision

A bikeway network that supports safe and comfortable riding for all

Goals & Metrics

Improve Comfort and Safety

- Reduce the number of bicycle rider fatalities/serious injuries through 2030. (Since 2015, three bicycle rider serious injuries and zero bicycle rider fatalities have occurred in Unincorporated Douglas County, Eudora, Baldwin City, and Lecompton.)
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The Case for Bicycling

According to a study by Ralph Buehler and John Pucher "cities with a greater supply of bike paths and lanes have significantly higher bike commute rates". They also found the supply of bikeways per capita is a statistically significant predictor of bike commuting. By including separate variables for paths and lanes ... our analysis is able to examine each type of facility separately and finds that they do not have significantly different associations with levels of bike commuting among cities. Buehler and Pucher report that bike commuting in cities with the most bike lanes per 100,000 residents was three to four times higher than in cities with the fewest, and twice as high in cities with the most bike paths. They also found three to four times more bike commuting in cities with the most combined path and lane mileage compared to those with the least. In other words, when the opportunity is there - whether on an off-street beaten path or a freshly painted road lane - city residents ride their bikes more often. That isn't causation, of course, but it is "consistent with the hypothesis that bike lanes and paths encourage cycling," the researchers conclude.[1] Moreover bicycling benefits individuals and the entire community by improving personal health, the environment, mobility, safety, and the economy.

The Douglas County Community Health Plan also identifies accessing healthy food sites by foot, bike, or transit as a strategy to address food security and a healthy built environment.[2]

BALDWIN CITY PUBLIC LIBRARY

EUDORA CITY HALL

1 Buehler, R. & Pucher, J. Transportation. (2012) 39: 409. https://doi.org/10.1007/s11116-011-9355-8 Retrieved April 5, 2019 from https://www.citylab.com/transportation/2012/02/do-bike-paths-promote-bike-riding/1318

2 Lawrence-Douglas County Public Health. (2-6-2019) Douglas County Community Health Plan. Retrieved November 9, 2020 from https://ldchealth.org/DocumentCenter/View/2440/2018-2023-Douglas-County-Community-Health-Plan-262019-update?bidId=

Health

The most obvious component of bicycling for transportation is the health aspect. By bicycling rather than sitting in a motor vehicle, individuals are exerting physical effort, which helps with combating heart disease, adult-onset diabetes, obesity, high-blood pressure, and lowers stress levels. People who are physically active tend to live longer.[2] Making even short trips by bicycle the benefits are outstanding.

- Exercise boosts brainpower and helps to stave off Alzheimer's in the elderly.[1]
- People who are active on a daily basis are 31% less likely to develop high blood pressure.[2]
- About 1 in 5 (21%) adults meet the 2008 Physical Activity Guidelines (at least 2.5 hours of physical activity a week).[3]

Environment

When people make trips on a bicycle rather than personal motor vehicles the environment is improved due to the reduced air pollution and emissions of greenhouse gases.

- 60% of pollution created by automobile emissions happens in the first few minutes of operation.[4]
- In 2016, transportation accounted for approximately 28% of total U.S. greenhouse gas emissions.[5]

Mobility

Bicycling expands the distance people who cannot or do not drive can travel, thereby expanding their mobility. This includes children, seniors, people with disabilities, and low income people.

- 1 in 16 (6.3%) Douglas County residents do not have access to a vehicle.[6]
- Safe non-motorized transportation options, combined with access to public transportation, are critical components of a transportation network that connects people - especially low-income households - with jobs, education, and essential services, providing "ladders of opportunity." [7]
- Seniors who do not drive make 65% fewer trips to visit family, see friends or go to church.[8]

Safety

High quality bike facilities increase ridership and make biking safer, not only in terms of traffic safety, but also reduces crime level. When more people are not in motor vehicles, they interact more with their neighbors. This helps to reduce crime as more "eyes are on the street".

- The risk of a bicycle rider being struck by a driver declines as the number of people biking increases.[9]

Economy

Individuals benefit from bicycling because vehicle ownership is expensive and property values increase in areas that are more inviting to bicycling. Cities benefit because there is less wear and tear on streets and less demand for parking lots.

- In 2017, driving a newer medium sized sedan costs an average of $8,171 per year and driving a newer medium sized SUV costs $9,451 per year. [10]
- Transportation costs are typically the second highest household expense behind housing. Factoring in both housing and transportation costs provides a more comprehensive way to think about housing costs and true affordability. Housing + transportation costs are: Eudora = 53% of total income, Baldwin City = 52%, Lecompton = 61%.[11]

1 Buehler, R. & Pucher, J. Transportation (2012) 39: 409. https://doi.org/10.1007/s11116-011-9355-8 Retrieved April 5, 2019 from https://www.citylab.com/transportation/2012/02/do-bike-paths-promote-bike-riding/1318

2 Hurford, M. (2018, November 08). 8 Health Benefits of Cycling That Aren't Just Physical. Retrieved November 12, 2018, from https://www.bicycling.com/training/a20029633/8-ways-cycling-will-make-you-healthier

3 Center for Disease Control and Prevention. (2018, September 12). Physical Activity. Retrieved November 12, 2018, from https://www.cdc.gov/physicalactivity/data/facts.htm

4 Pedestrian and Bicycle Information Center. Environmental Benefits of Bicycling and Walking. Retrieved November 12, 2018, from http://www.pedbikeinfo.org/data/factsheet_environmental.cfm

5 United States Environmental Protection Agency. (2018, August 27). Fast Facts on Transportation Greenhouse Gas Emissions. Retrieved November 12, 2018, from https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

6 United States Census Bureau. (2010, October 05). 2016 American Community Survey 5-Yr Estimates. Retrieved November 12, 2018, from https://factfinder.census.gov

7 United States Department of Transportation. (2015, January 05). Pedestrian and Bicycle Safety. Retrieved November 12, 2018, from http://www.transportation.gov/safer-people-safer-streets

8 Bailey, L. (2004, April). Aging Americans: Stranded Without Options. Surface Transportation Policy Project Retrieved November 12, 2018, from https://www.apta.com/resources/reportsandpublications/Documents/aging_stranded.pdf

9 National Association of City Transportation Officials. (2016, July 20). High-Quality Bike Facilities Increase Ridership and Make Biking Safer. Retrieved November 12, 2018, from https://nacto.org/2016/07/20/high-quality-bike-facilities-increase-ridership-make-biking-safer

10 AAA. (2017, August 23). AAA Reveals True Cost Of Vehicle Ownership. Retrieved November 12, 2018, from https://newsroom.aaa.com/tag/driving-cost-per-mile

11 The Center for Neighborhood Technology. (n.d.). H+T® Index. Retrieved November 12, 2018, from https://htaindex.cnt.org/

The Planning Process

The MPO Bicycle Advisory Committee (BAC) served as the steering committee for this planning process. The BAC is comprised of representatives from each of the governing bodies in Douglas County and included an ex-officio liaison from the Lawrence Multimodal Transportation Commission.

Existing plans including the existing Countywide Bikeway System Plan[1], the Eudora Parks and Recreation Master Plan[2], the Baldwin City Parks and Recreation Master Plan[3], and Douglas County Community Health Plan[4] were reviewed and are included in Appendix D: Plan & Policy Review.

The public engagement during the plan process included a survey, two guided bicycle ride, three mobile meetings, and three open houses held on June 12, June 15, and June 19 which were focused on how comfortable people feel bicycling in Eudora/Baldwin City/Lecompton/Unincorporated Douglas County. The survey was available May 18, 2018 to August 31, 2018. People indicated their level of comfort bicycling on various facility types. 49 survey responses were collected for people who self-reported they either live or work in Eudora, Baldwin City, and Lecompton. Additionally a stakeholder meeting was held in Eudora and Baldwin City to gain input on the planning process and how to make the communities more bicycle friendly.

Staff and BAC members reviewed public input to make recommendations on final network alignments and prioritizing the E's of bicycle planning. The final plan was reviewed by the Technical Advisory Committee (TAC) on July 6, 2021 and was approved by the MPO Policy Board on July 15, 2021. The plan was adopted by the Eudora City Commission on August 9, 2021, the Baldwin City Council on [insert date], the Lecompton City Council on [insert date], and the Douglas County Commission on [insert date].

1 https://assets.lawrenceks.org/assets/mpo/study/reports/bike.pdf
2 https://www.cityofeudoraks.gov/DocumentCenter/View/221/Eudora-Parks-and-Recreation-Master-Plan?bidId=
3 https://www.baldwincity.org/DocumentCenter/View/80/Parks-and-Recreation-Master-Plan-PDF?bidId=
4 https://ldchealth.org/221/Community-Health-Plan

VARIOUS LOCATIONS IN
BALDWIN CITY & EUDORA, KS

Public Input: What We Heard

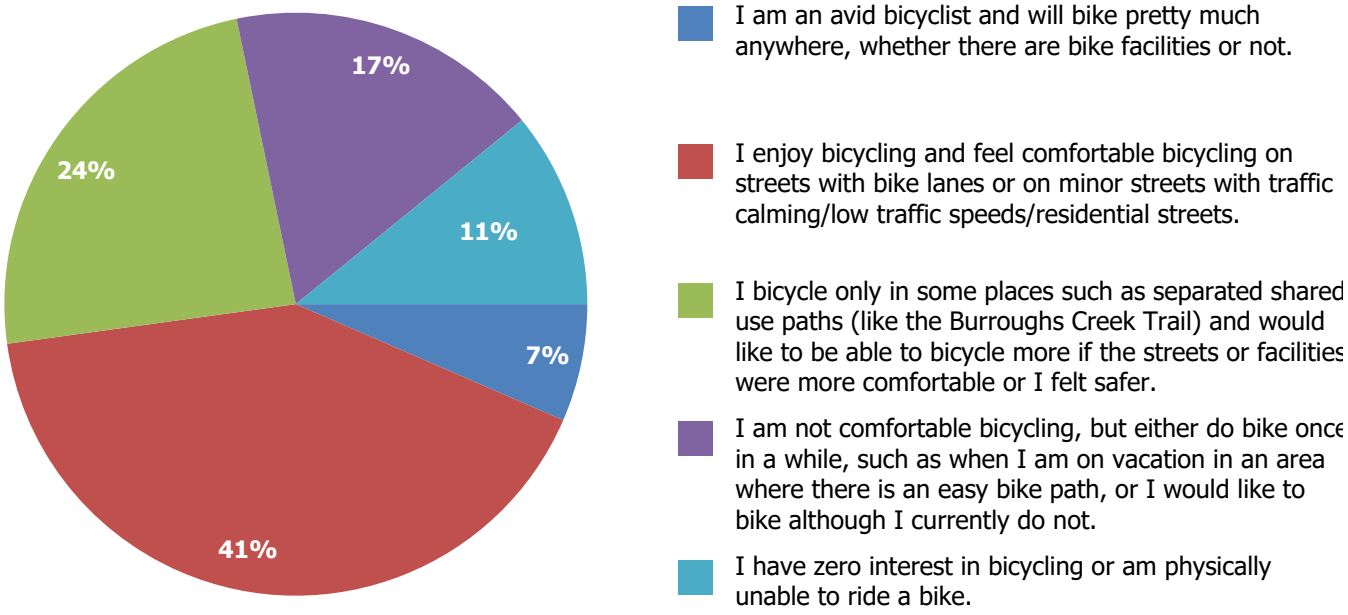
The first survey asked respondents about their level of comfort bicycling. For a complete report on survey responses see Appendix B: Public Input.

Concerned Cyclists self-identify as bicycling only on separated shared use paths, and would like to bike more if streets or facilities were more comfortable/safer, or are not comfortable bicycling, but would like to bicycle. As shown in Figure 1.1, this accounts for 41% of the total survey respondents as shown with the blue and orange colors in the pie chart. Responses were compiled for all respondents and for Concerned Cyclists for bicycling on commercial and residential/neighborhood streets (Figure 1.2 and Figure 1.3).

Survey results were also divided by gender because women are typically more risk adverse than men, which rings true in our survey data. Men were more comfortable on various types of bicycle facilities on residential/neighborhood streets than women (Figure 1.4).

The results of the survey affirmed the public's desire for low-stress, comfortable, protected, and connected bikeways. MPO Bicycle Advisory Committee (BAC) members reviewed the surveys to assist in determining priorities for bikeway network and the Action Plan elements from the E toolbox found in Appendix C: Policy and Program Toolbox.

Figure 1.1: Type of Bicycle Rider



Number of Responses – 46

We asked kids to draw a picture of the coolest bike they could imagine. The drawings are included throughout the plan.

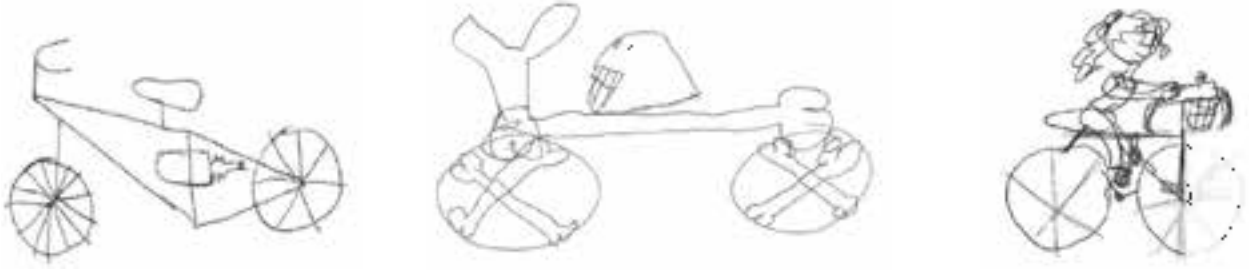
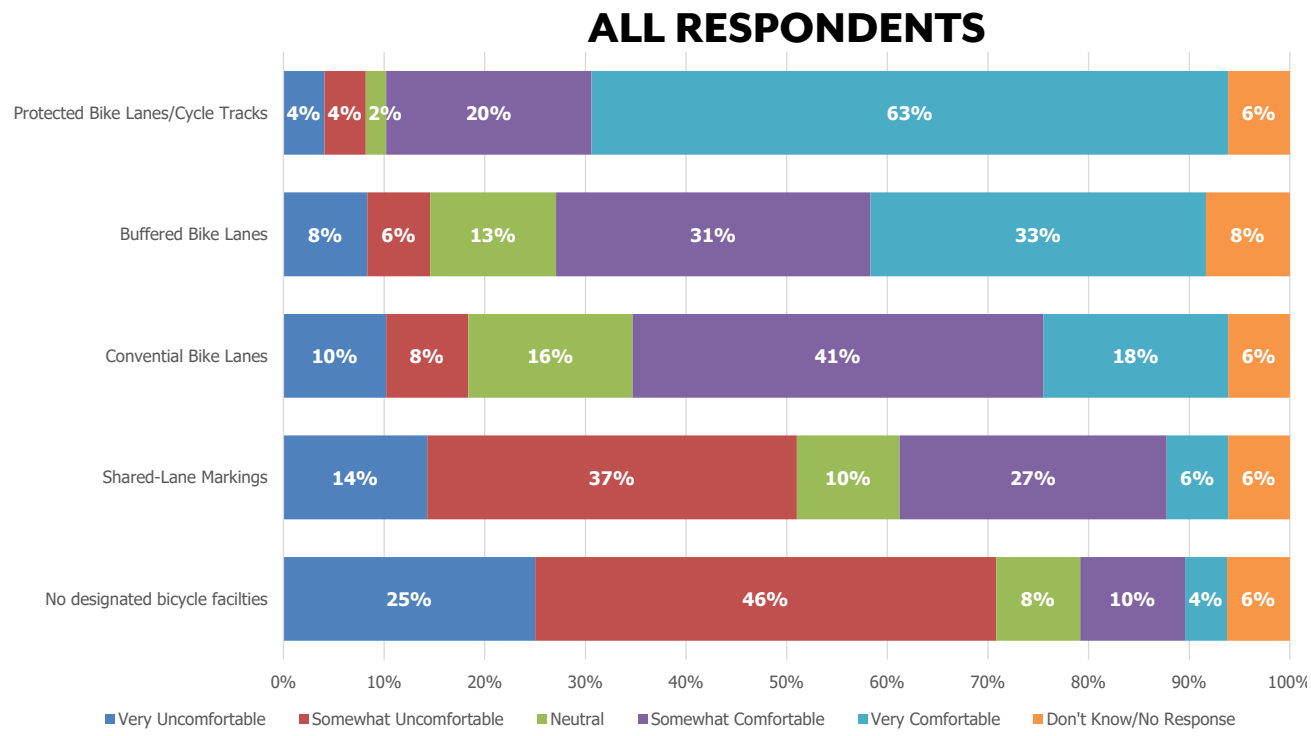
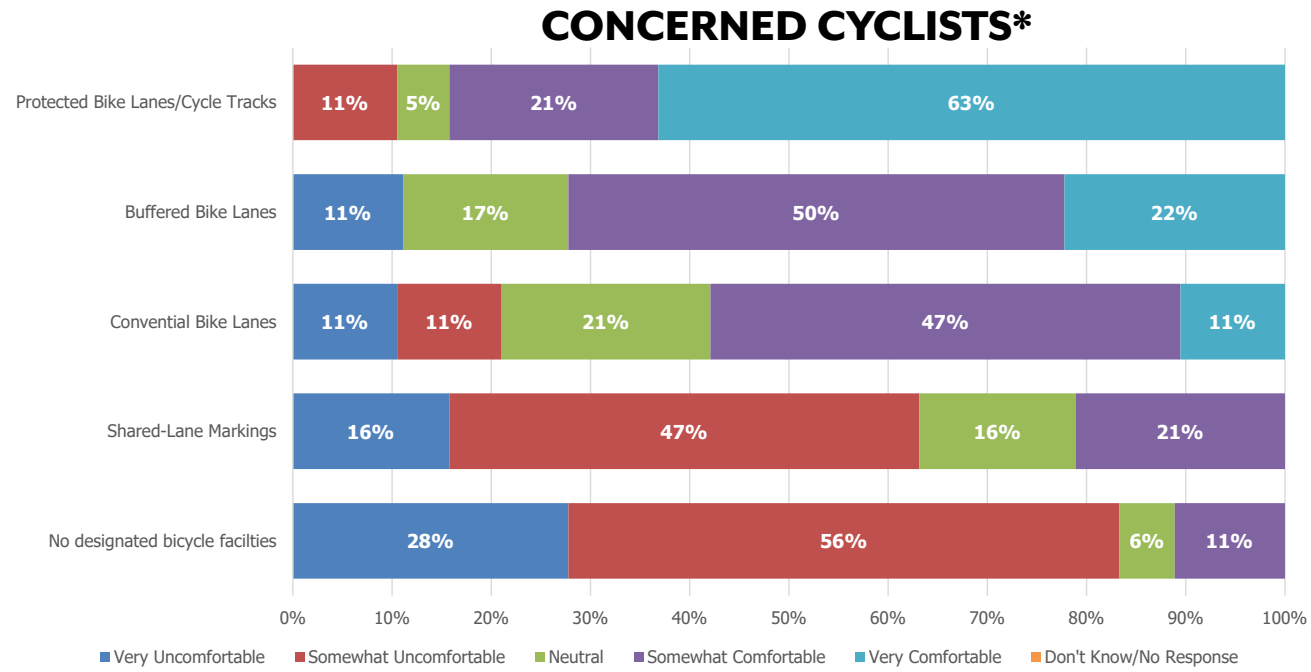


Figure 1.2: Comfort Bicycling On Different Forms of Bicycle Facilities on Commercial Streets



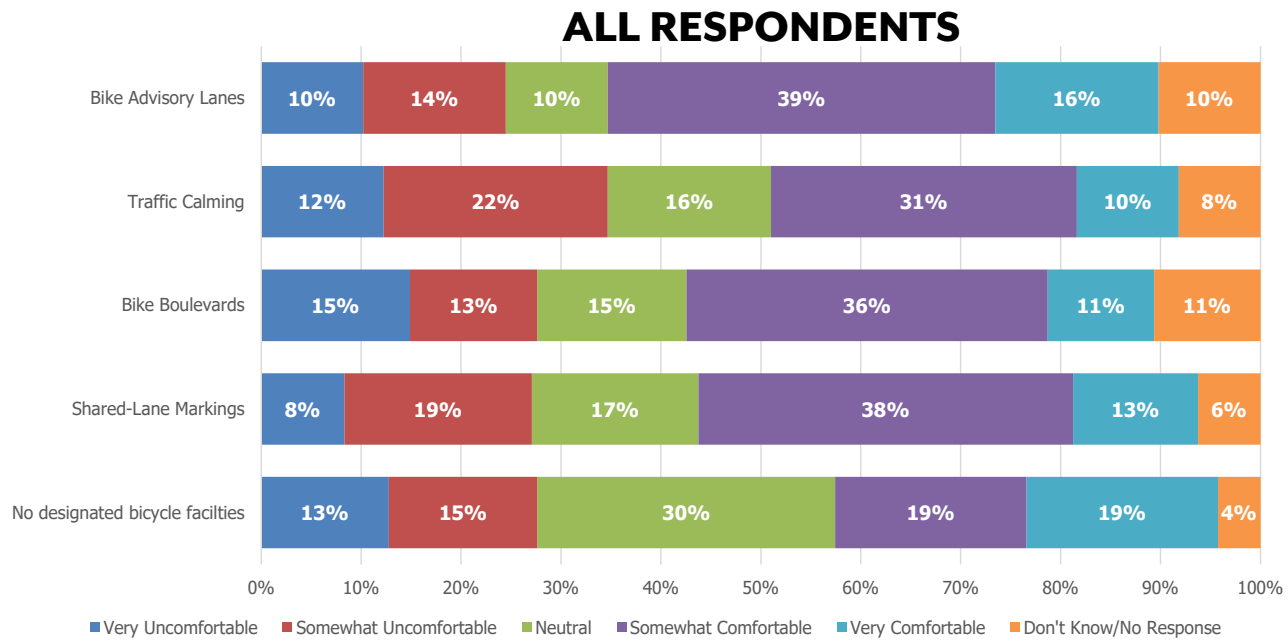
Number of Responses – 48-49 per facility type



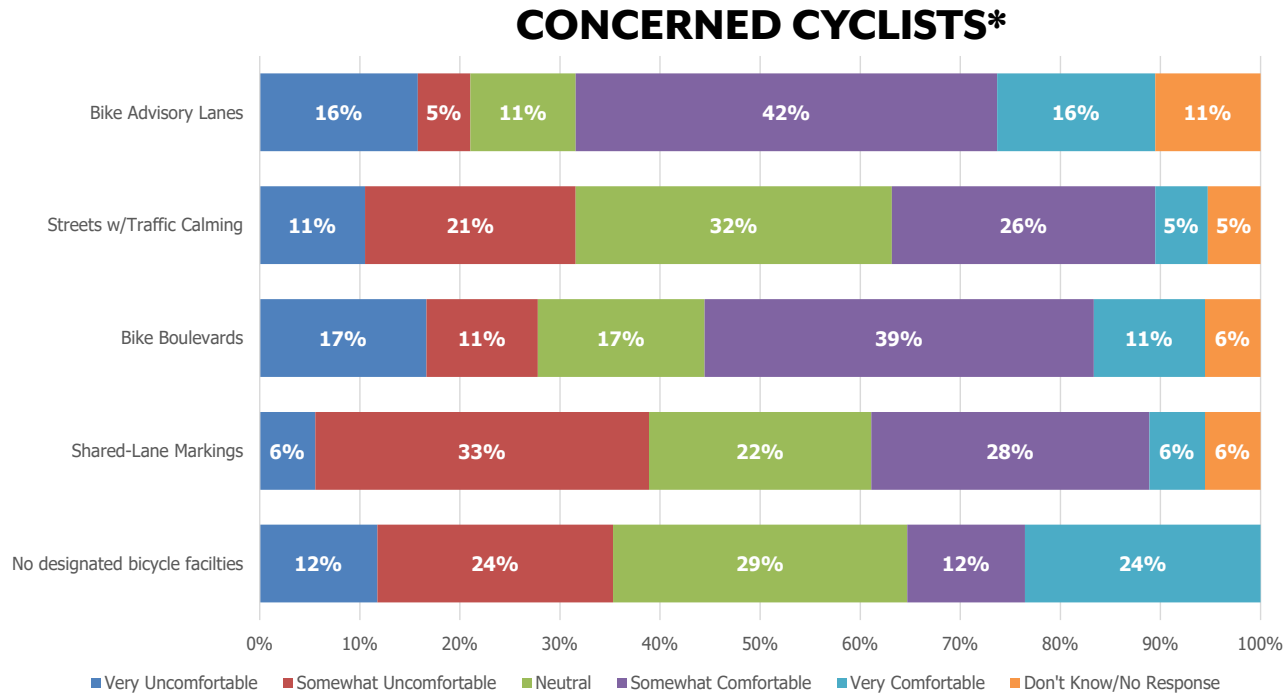
Number of Responses – 18-19 per facility type

* Concerned Cyclists self-identify as bicycling only on separated shared use paths, and would like to bike more if streets or facilities were more comfortable/safer, or are not comfortable bicycling, but would like to bicycle.

Figure 1.3: Comfort Bicycling On Different Forms of Bicycle Facilities on Residential/ Neighborhood Streets



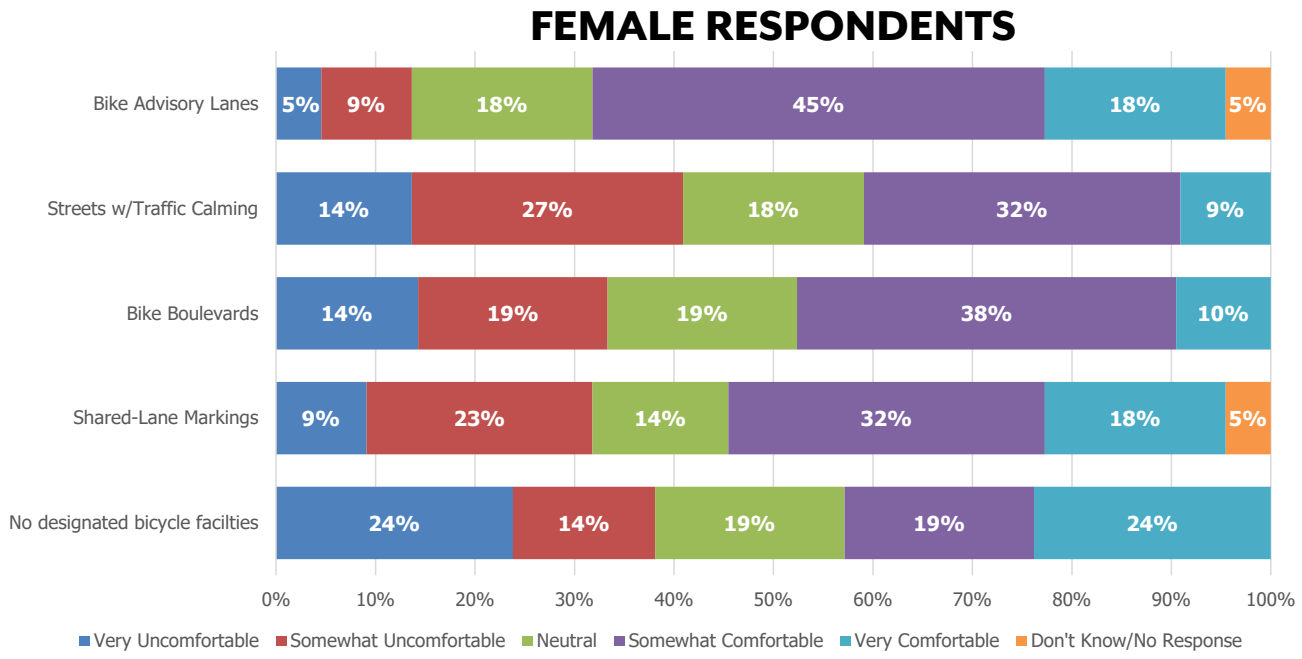
Number of Responses – 47-49 per facility type



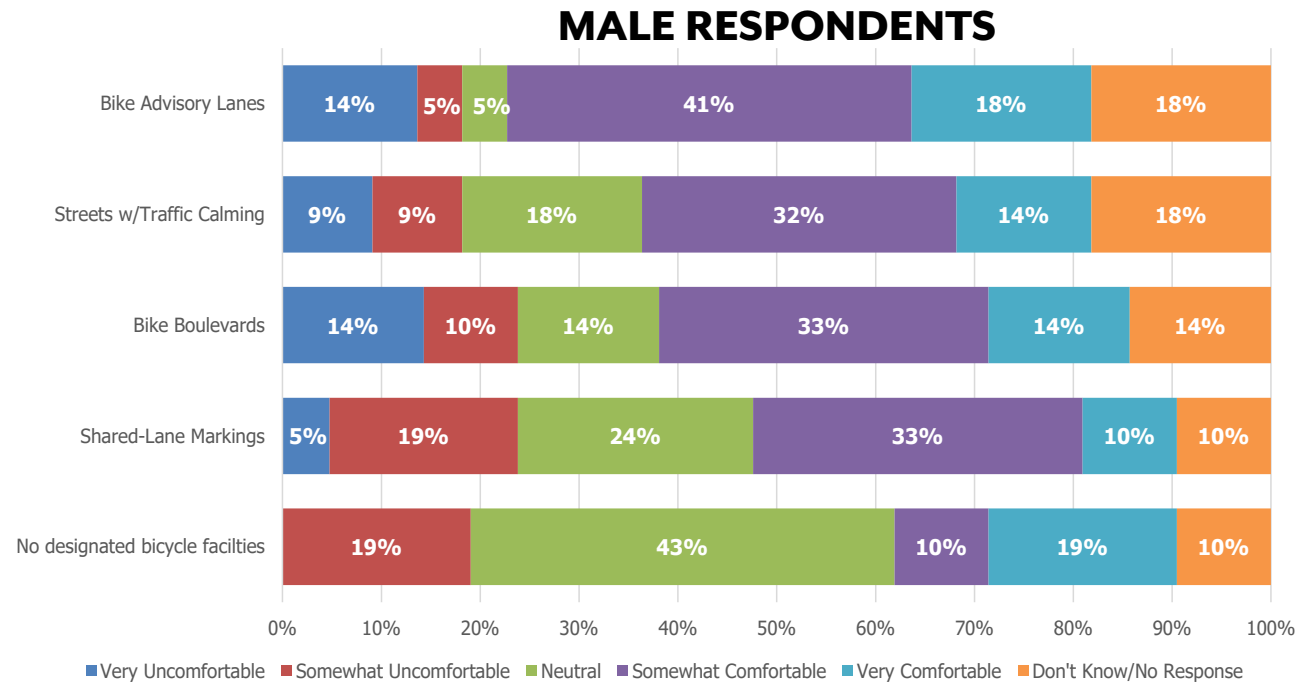
Number of Responses – 17-19 per facility type

* Concerned Cyclists self-identify as bicycling only on separated shared use paths, and would like to bike more if streets or facilities were more comfortable/safer, or are not comfortable bicycling, but would like to bicycle.

Figure 1.4: Female vs. Male Comfort Bicycling On Different Forms of Bicycle Facilities on Residential/ Neighborhood Streets



Number of Responses – 21-22 per facility type



Number of Responses – 21-22 per facility type

Regional Bicycle Crashes

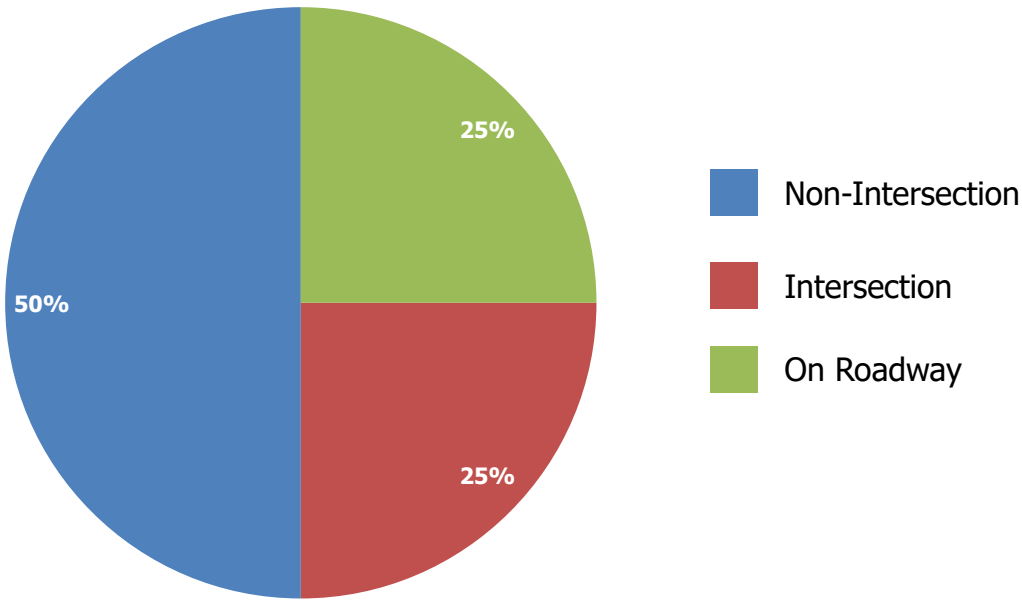
An overview of bicycle crashes is provided below. For a more in depth review see Appendix E: Crash Analysis. Safety, or a perceived lack of safety, is a concern of current and potential bicycle riders in Douglas County. Crashes are a visible indication of safety. The Kansas Department of Transportation (KDOT) collects traffic crashes that occur on public roadways involving property damage of at least $1,000 or an injury or fatality on the Kansas Motor Vehicle Accident Report Form. This includes crashes between motor vehicles and bicycle riders. The Cities of Eudora, Baldwin City, Douglas County, and Kansas Highway Patrol reports crashes to KDOT. Four bicycle related crashes occurred in Douglas County (excluding Lawrence) between 2015 and 2019. This equates to 0.1% of all crashes occurring in Douglas County during 2015 to 2019. While this number is extremely low providing for safe bicycling conditions is important as bicycle riders are more vulnerable roads users and have a higher chance of being injured if there is a collision. Further bicycle related crashes are underreported. See the pull out box on the next page for types of crashes historically not reported.

There were no bicycle fatalities between 2015 and 2019. There were two possible injuries, one minor injury, and another injury not classified as possible, minor, or major.

The word "crash" may be new to some people as a way to describe the event in which a bicycle rider collides with a motor vehicle, in a way that can result in bodily harm and/or property damage. Historically, these events were called accidents. The term accident implies heavy doses of chance, unknown causes, and the connotation that nothing can be done to prevent them. Crashes are preventable. Bicycle rider crashes are not random events. They fall into a pattern of recurring crash types and occur because the parties involved make mistakes. The mistakes can be identified and counteracted through a combination of education, skill development, engineering, and enforcement measures that can substantially reduce crash occurrences. There is a continuing need to inform drivers that bicycle riders also have the right to use our public roadways.

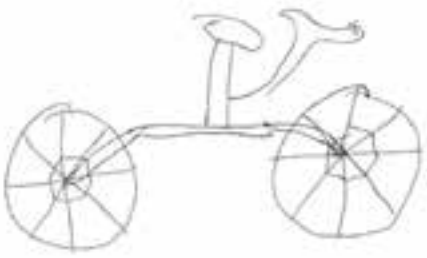
KDOT reported bicycle-motor vehicle crashes were evaluated to determine the location of the crashes (Figure 1.5). Two crashes occurred at a non-intersection, one at an intersection, and one on the roadway.

Figure 1.5: Location of Bicycle Rider Crashes (2015-2019)

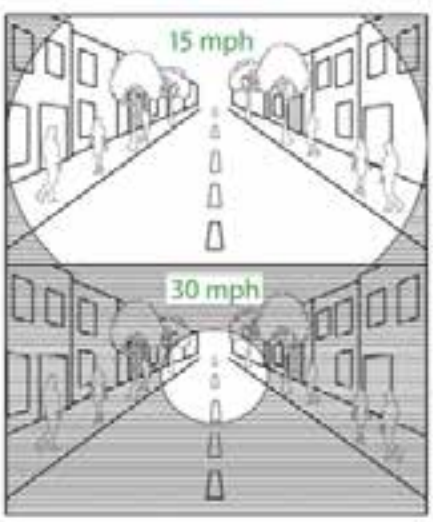


Several types of crashes according to BikeLaw.com are generally not reported.

- **"No contact" crashes** – Crashes where a car runs a bicycle rider off the road, turns in front of or next to a bicycle rider and the bicycle rider takes an evasive action and crashes
- **"Minor" bodily injury crashes** – Crashes were a bicycle rider is not transported to the hospital from the scene; crashes where the cyclist or officer does not immediately identify a significant head injury; crashes where bicycle rider goes into "superman" or "superwoman" mode and reports being okay, when s/he is not and needs to be checked out
- **"Stationary" motor vehicle crashes** – "Dooring" crashes and crashes where bicycle rider hits parked—or allegedly parked—motor vehicle
- **Animal-related crashes** – Unleashed dog runs in front of bicycle rider or attacks bicycle rider; deer, squirrel and other wild animal crashes
- **Work zone crashes** – Crashes caused by unmarked hazards in a work zone and/or failure to warn of upcoming work zone hazards
- **Surface condition crashes** – Crashes caused by potholes, sand, gravel, etc.
- **"Criminal" or "intentional" crashes** – Bicycle rider harassment that results in a crash
- **"Hit" and run crashes** – Both contact and no contact "hit" and runs, meaning sometimes the motor vehicle actually hits the bicycle rider and leaves and sometimes the motor vehicle causes the bicycle rider to be run off the roadway without actually colliding with the bicycle rider and then leaves
- **"Mechanical" and/or user error crashes** – Brakes don't work; bicycle rider loses control of bike

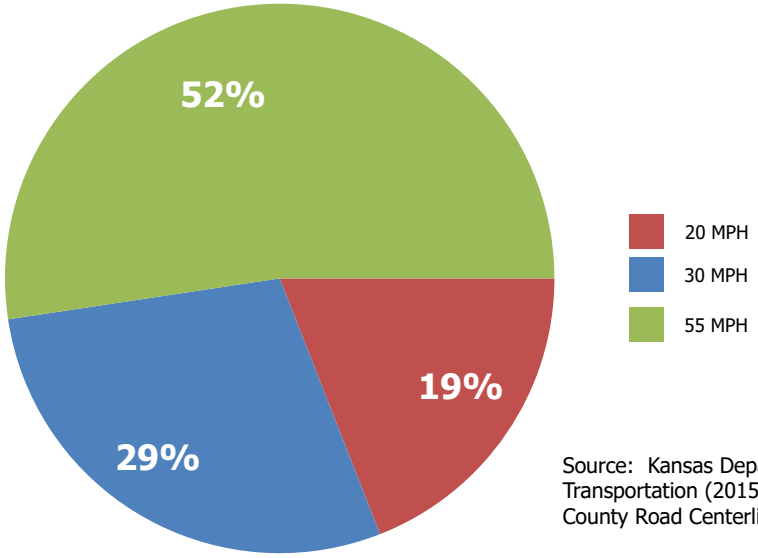


Crashes were located near roadways with a posted speed limit of 20, 30 or 55 mph (Figure 1.6). An important consideration about this data is there is some level of discrepancy within the mapped data. The crash may not have been recorded in the exact location the crash occurred. Thus the crash may not have occurred on the higher speed road, rather it may have been on a slower speed road which intersects the higher speed one. However, in general crashes occurring on higher speed roads is not surprising because the speed of a roadway limits the driver's field of vision. The field of vision is the amount of space a person can view while driving down the road. The faster you drive the less you can view. Thus faster speeds lead to more crashes as drivers are not able to view bicycle riders (and pedestrians) soon enough to avoid a crash. According to the AAA Foundation for Traffic Safety the average risk for death of a pedestrian increases as the speed of the vehicle increases (Table 1.1). Although the AAA Foundation for Traffic Safety evaluated pedestrians, it can be extrapolated the data is also applicable to bicycle riders since bicycle riders are vulnerable users like pedestrians.[1]



Source: Institute of Transportation Engineers. (n.d.) Speed as a Safety Problem. Accessed on March 27, 2019 from https://www.ite.org/technical-resources/topics/speed-management-for-safety/speed-as-a-safety-problem/ Original Source: Walkable City Rules, https://islandpress.org/book/walkable-city-rules

Figure 1.6: Road Speed of Bicycle Rider Crashes (2015-2019)



Source: Kansas Department of Transportation (2015-2019) & Douglas County Road Centerline (2020)

Table 1.1: Average Risk of Pedestrian Severe Injury or Death Based on Vehicle Miles per Hour Speed

	Severe Injury	Death
10%	16 mph	23 mph
25%	23 mph	32 mph
50%	31 mph	42 mph
75%	39 mph	50 mph
90%	46 mph	58 mph

Source: AAA Foundation for Traffic Safety. Impact Speed and a Pedestrian's Risk of Severe Injury or Death.

*Note: Risks vary significantly by age. For example, the average risk of severe injury or death for a 70-year-old pedestrian struck by a car traveling at 25 mph is similar to the risk for a 30-year-old pedestrian struck at 35 mph.

Unfortunately the current data provided by KDOT does not include user behavior, so we are unable to evaluate the human contributing factor to the crashes (e.g. was there a failure to yield or stop by either the bicycle rider or driver).

Improving shoulders to meet the minimum shoulder width should improve safety for recovery of all users. The Unincorporated Douglas County chapter of this plan discusses this concept. Further analysis is needed. This review of bicycle crashes only provides a baseline of crash information. This data should be reviewed and evaluated in future years.

1 Tefft, B.C. (2011). Impact Speed and a Pedestrian's Risk of Severe Injury or Death. AAA Foundation for Traffic Safety. Accessed on March 26, 2019 from https://aaafoundation.org/impact-speed-pedestrians-risk-severe-injury-death/

Bikeway Types

The Federal Highway Administration developed a Small Town and Rural Multimodal Networks guide in 2016.[1] This guide defines the various bikeway types. Different bikeways (shared use path, bike lane, etc.) may have varying levels of comfort for bicycle riders based on several factors: the number of motor vehicles, the speed of the motor vehicles, and the width of the travel lanes and presence of a shoulder. Individual bicycle rider level of comfort is also influenced by their riding experience and may change over time.

Separation from traffic is another key factor to bicycling level of comfort. The most comfortable bikeway type is separated with a physical barrier between motor vehicles and bicycle riders. This is called Major Separation. Shared use paths, cycle tracks, and protected bike lanes are considered major separation. The first survey asked participants their level of comfort on various facility types. Eighty-four percent (84%) said they would feel at least somewhat comfortable bicycling on facilities with major separation on commercial streets.

Major Separation

Shared Use Path/Sidepath
(PATH LEADING TO THE ELEMENTARY SCHOOL INTERMEDIATE CENTER, BALDWIN CITY, KS)

Cycle Track/Protected Lane
(INDIANAPOLIS, IN)

A stripe of paint provides less physical separation, but still provides a designated space for bicycle riders, this type of facility is called Minor Separation. Bike lanes and buffered bike lanes are considered minor separation. Sixty-five percent (65%) of respondents said they would feel at least somewhat comfortable bicycling on facilities with buffered bike lanes on commercial streets, while 59% said they would feel at least somewhat comfortable bicycling on facilities with bike lanes on commercial streets. The lowest level separation are called Shared Streets. On these facilities motor vehicles and

Minor Separation

Buffered Bike Lane
MASSACHUSETTS ST. AND E. 13TH ST., LAWRENCE, KS

Bike Lane
(MONTEREY WAY AND PETERSON RD., LAWRENCE, KS)

1 https://ruraldesignguide.com

bicycle riders commingle and share the street. There is not dedicated, exclusive space for bicycle riders. Bicycle Boulevards, streets with Sharrows, Bike Advisory Lanes, Paved Shoulders, and recreational gravel roads are shared streets. Forty-seven percent (47%) of respondents said they would feel at least somewhat comfortable bicycling on bicycle boulevards on neighborhood/residential streets. Fifty percent (50%) of respondents said they would feel at least somewhat comfortable bicycling on facilities with shared-lane markings (sharrow) on neighborhood/residential streets. And 55% of respondents said they would feel at least somewhat comfortable bicycling on facilities with a bike advisory lane on neighborhood/residential streets. The survey asked about riding on streets with shared lane markings or Sharrows, but the Bike Plan calls these facilities Marked Shared Lanes.

Shared Street

Bike Boulevard
(21ST ST. AND OUSDAHL RD., LAWRENCE, KS)

Marked Shared Lane (Sharrow)
(LAWRENCE, KS)

Bike Advisory Lane
(HANOVER, NH)

Roadway with Paved Shoulder
E 600 RD., DOUGLAS COUNTY, KS

Recreational Gravel Road
(PAT DONNELLY RIDING IN RURAL DOUGLAS COUNTY)

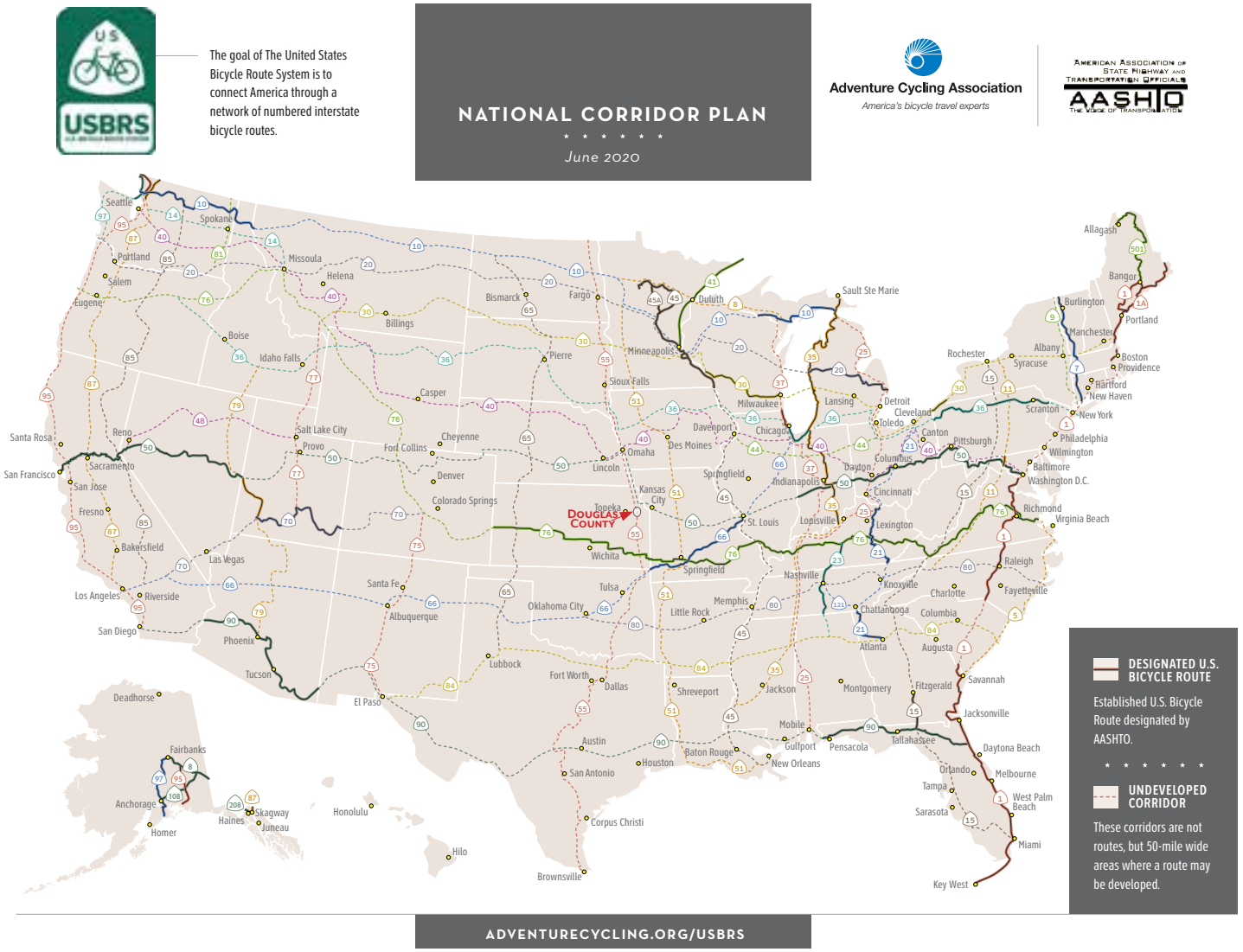
Recreational gravel roads are exclusively in rural areas and are part of the bikeway system. Recreational gravel roads are considered a shared street.

U.S. Bike Network

The goal of the U.S. Bicycle Route System (USBRS) is to connect America through a network of numbered interstate bicycle routes. Currently Route 76 runs east/west through south/central Kansas. Planned Route 55 goes north through Kansas from Brownsville, TX to Fargo, ND (Figure 1.7). Planned routes are designated as Corridors. Corridors are 50-mile wide areas that are used as templates to show planners where a U.S. Bicycle Route could be developed. Douglas County is roughly 24 miles wide; however, the case could be made to utilize the Southwind Rail Trail and Prairie Spirit Trail which goes from Humboldt, KS to Ottawa, KS. There is a planned Maple Leaf Trail along the Midland Railway connecting Ottawa to Baldwin City. A 2021 KDOT Transportation Alternatives grant will install a 0.58 mile 10 foot shared use path from Highway 56 to the Santa Fe Depot south of High Street, which is the beginning of the Maple Leaf Trail. In the meantime before the shared use path connection is made from Franklin County to Baldwin City, the route should go along E 1250 Rd./E 1300 Rd. (also known as old US-59 highway) and continue north through Lawrence and Lecompton.

To designate the route through Douglas County the Kansas Department of Transportation (KDOT) would need to submit an application to the American Association of State Highway and Transportation Officials (AASHTO) Special Committee on Route Numbering utilizing the specific procedures. The proposed route is shown in blue in Figure 1.8.

Figure 1.7: National Corridor Plan



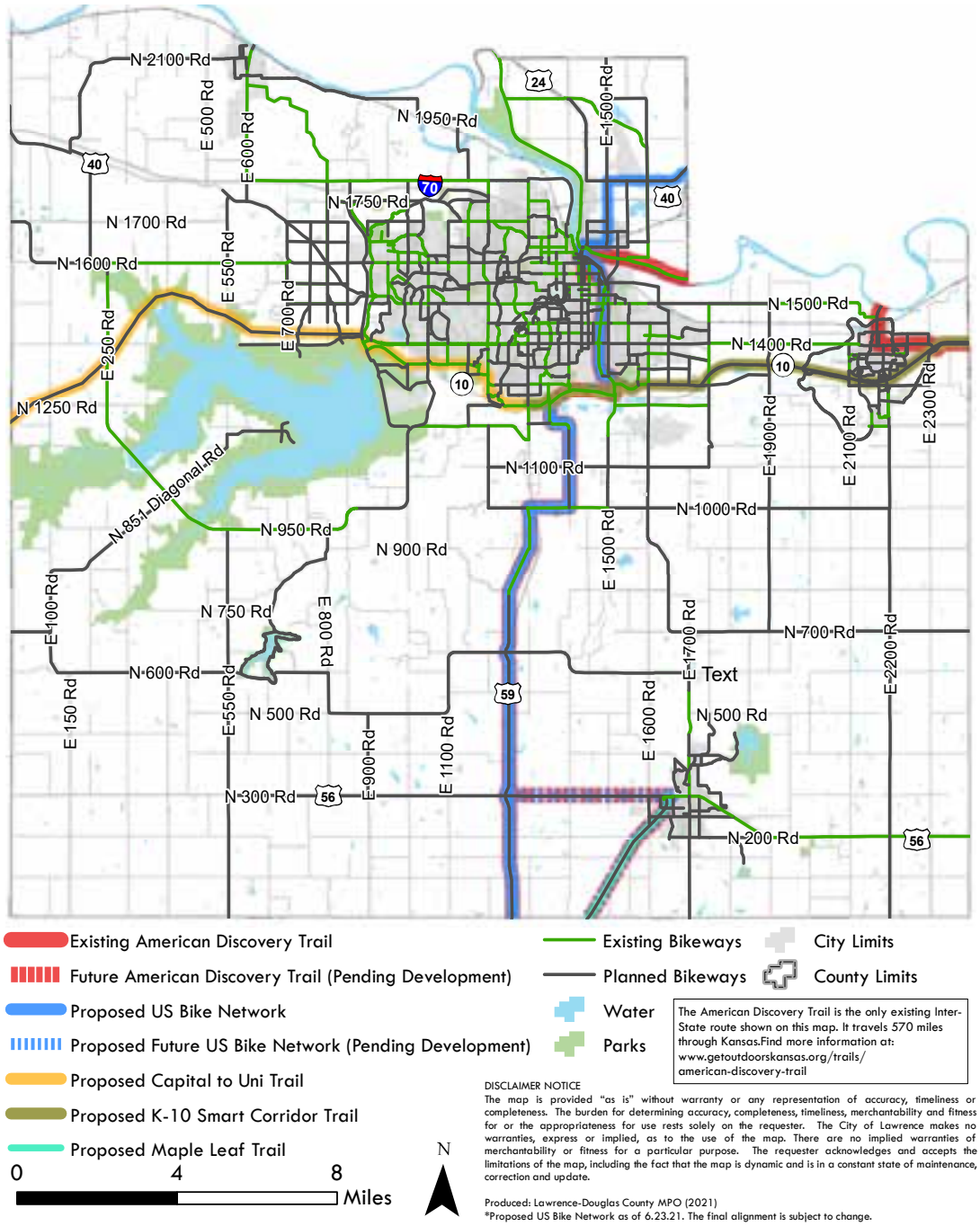
Source: Adventure Cycling Association. Accessed on September 14, 2020 from https://www.adventurecycling.org/routes-and-maps/us-bicycle-route-system/national-corridor-plan. Modified to show Douglas County as a potential route for Undeveloped Corridor 55.

Inter-State and Inter-County Routes

The American Discovery Trail travels 570 miles in Kansas. The Trail follows the footsteps of the pioneers, the Great Plains Indian Tribes and many western heroes and bandits. While in Douglas County if follows portions of the Lawrence Loop shared use path and E 1250 Rd./E 1300 Rd. (also known as old US-59 highway, which is immediately west of US-59). Once the Maple Leaf Trail connects to Franklin County, the American Discovery Trail is recommended to go through Baldwin City. It is currently shown as a proposed future alignment once development occurs.

The Kansas Department of Transportation (KDOT) has identified future Rail Trail Projects in Douglas County, including the Capital to Uni Trail (shown in orange), the K-10 Smart Corridor Trail (shown in brown), and the Maple Leaf Trail (shown in green).The US Bike Network alignment discussed on the prior page is shown in blue in Figure 1.8. As future separated bikeways are developed the route is proposed to shift to more desirable bikeways (like the American Discovery Trail, shown with the dashed lines).

Figure 1.8: Inter-State and Inter-County Routes



Click above to view an interactive map.

Unincorporated Douglas County

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Douglas County maintains portions of shared use paths that are outside of the City of Lawrence (Louisiana St. and Haskell Ave. along the Baker Wetlands), but does not have any other specific bikeways in the unincorporated portion of Douglas County besides paved shoulders which are for all vehicles, not specifically bicycles. The roads in the unincorporated portion of Douglas County are maintained by jurisdictions based on the roadway type. County Routes and a few neighborhood subdivisions which were built in the 1970s and 1980s in the county are maintained by the County. The other non-state roads are maintained by the applicable township. The townships do not have appropriate funding to develop bikeway networks. The Kansas Department of Transportation (KDOT) maintains the highways through the County (except for Interstate 70, which is maintained by the Kansas Turnpike Authority).

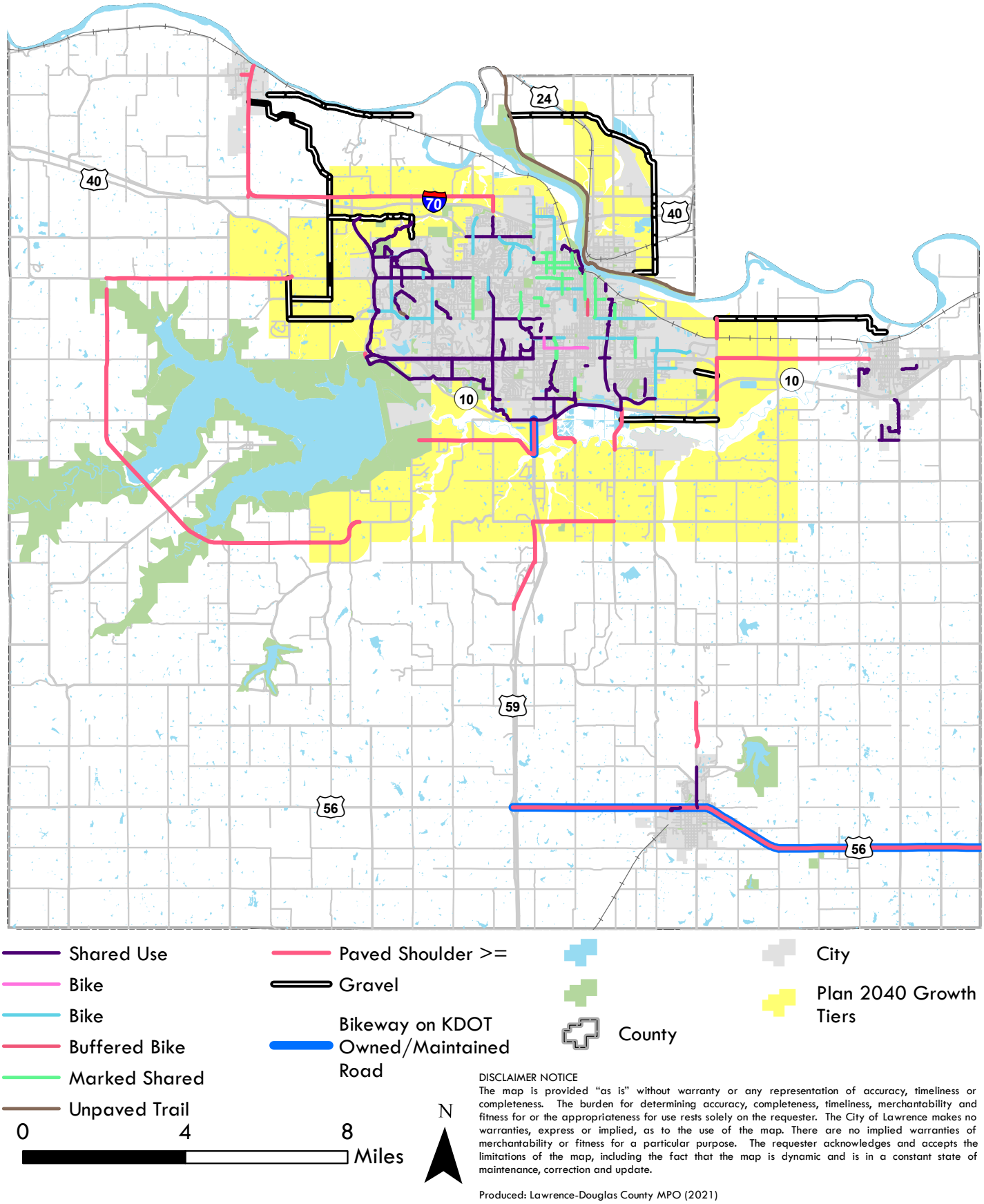
As the County completes roadway projects their goal is to deploy roadside safety improvements on County maintained roads including on County maintained roads. Paved shoulders and flatter ditch slopes have been constructed on higher volume routes such as Routes 438, 442, 458, 460, 1029 and 1055. Route 1061 is also planned for these improvements in the future. Paved shoulders increase safety for all vehicles, including bicycles.

The Small Town and Rural Multimodal Networks Guide by the Federal Highway Administration published in 2016, states the minimum paved shoulder to accommodate bicycles is 4 feet. The guide suggests wider shoulders should be constructed for busier and faster roads. Douglas County has found the most cost effective shoulder width is 6 feet. This provides adequate space for disabled vehicles, but does not require excessive right-of-way purchases to widen the road. However, if a roadway has less than 750 vehicles per day the County is exploring installing 4 feet shoulders. Douglas County maintains 41 miles of roadways with a minimum of 4 feet of shoulder. This equates to 31% of the future Douglas County maintained roads identified for widened shoulders. Figure 2.1 displays the existing bikeways in Douglas County. The paved shoulders highlighted in blue are on KDOT maintained roads (not Douglas County).

Gravel roadways are identified because some bicycle riders enjoy the challenge of biking on gravel. However, the gravel routes are not identified for transportation. In some cases they will never be improved to a paved road.

ROADWAY WITH PAVED SHOULDER
E. 900 RD, CLINTON STATE PARK

Figure 2.1: Existing Bikeways in Unincorporated Douglas County



DISCLAIMER NOTICE
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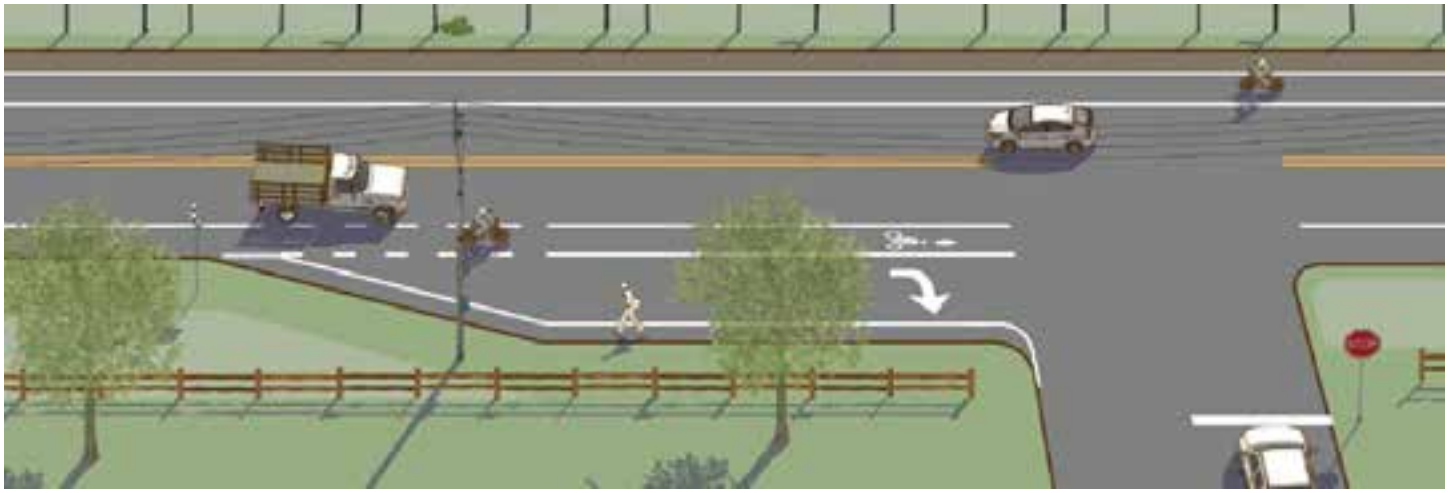
Produced: Lawrence-Douglas County MPO (2021)

Click above to view an interactive map.

Shoulders are typically used for turning, receiving, or bypass lanes at intersections. Space must be maintained for bicycle riders to safely ride. While the preference is for at least six feet of shoulder space be maintained for bicycle riders; a minimum of four feet should be provided.

Paved shoulders are typically located immediately to the right of right turn lanes. This may lead to right-hook conflicts between through bicycle riders and turning vehicles. At intersections with right turn only lanes, bicycle accessible shoulders should be classified as bike lanes (Figure 2.2) or separated bike lanes/shared use paths (Figure 2.3), and appropriate intersection designs should be used to encourage safe interactions.[1]

Figure 2.2: Shoulder Bikeway Crossing Transition to Bike Lane



The shoulder is designated as a bike lane and a right turn lane is introduced to the right of the bike lane. Drivers must yield to through bicycle riders before entering the turn lane.
Source: Small Town and Rural Multimodal Networks, page 3-8, https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Figure 2.3: Shoulder Bikeway Crossing Transition to Separated Bike Lane or Shared Use Path

The shoulder is designated as a separated bike lane or shared use path. Bicycle riders are shifted laterally away from the roadway and separated from the travel or turn lanes by an unpaved buffer space.
Source: Small Town and Rural Multimodal Networks, page 3-8, https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

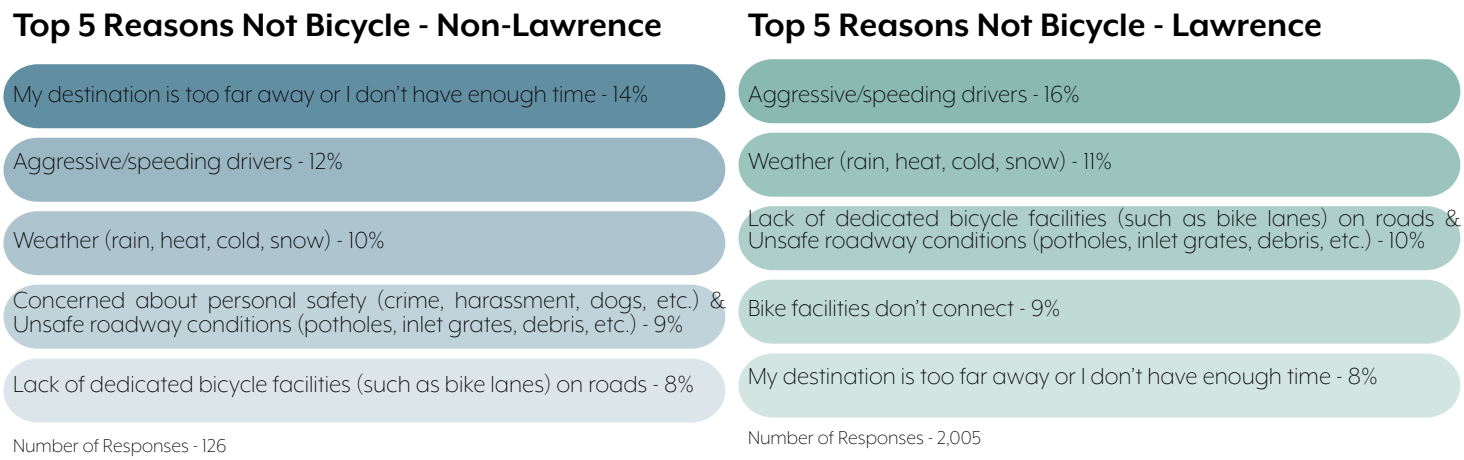
1 Federal Highway Administration. (2016) Small Town and Rural Multimodal Networks. Page 3-8. Accessed on October 21, 2020 from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Barriers to Bicycling

Nationally the barriers to bicycling include concerns about traffic safety, lack of routes, weather, distance, and the absence of shower and parking facilities.[1] The national data corresponds to what we heard locally from the survey conducted over the summer of 2018 (Figure 2.4). For the responses that were not from people who lived or worked in Lawrence, the number one reason people selected for what prevents them from bicycling more was – "my destination is too far away or I don't have enough time." The second reason why people don't bicycle more is aggressive/speeding drivers, followed by weather. While this chapter is about the unincorporated Douglas County area people from Lawrence bicycle in the unincorporated areas. Therefore the Lawrence answers are included as well. Several of the top five reasons are similar: aggressive/speeding drivers, weather, (rain, heat, cold, snow), Lack of dedicated bicycle facilities (such as bike lanes) on roads, Unsafe roadway conditions, and my destination is too far away or I don't have enough time.

All reasons respondents could have selected included: ability to afford a bicycle, aggressive/speeding drivers, bicycle facilities don't connect, concerned about personal hygiene/nowhere to shower after riding, concerned about personal safety (crime, harassment, dogs, etc.), i don't know the best route, intersections are too wide/busy, lack of bike racks at my destination, lack of dedicated bicycle facilities (such as bike lanes) on roads, my destination is too far away or i don't have enough time, other, personal ability (physical limitation or don't know how to ride a bicycle), physical barriers (railroads, rivers, hills, highways), poor street lighting at night, there is not enough rack space on the bus for my bike, unsafe roadway conditions (potholes, inlet grates, debris, etc.), weather (rain, heat, cold, snow). Respondents were asked to select all of the reasons that applied to them.

Figure 2.4: Reasons not to Bicycle from Survey Responses



Distance of destinations, time, or weather cannot be addressed, but aggressive/speeding drivers can be addressed in the recommendations section of this chapter.

1 Reasons Why Bicycling And Walking Are And Are Not Being Used More Extensively As Travel Modes. (n.d.). National Bicycling And Walking Study, FHWA-PD-92-041. Retrieved November 12, 2018, from https://safety.fhwa.dot.gov/ped_bike/docs/casel.pdf.

Funding

No specific funding is identified to construct the bikeway network in the unincorporated portions of Douglas County. However, Douglas County typically includes full width shoulders (approximately six feet wide) on reconstruction projects. This practice improves the safety of the road by providing space for agricultural equipment and other slow moving vehicles; while also providing more separation between bicycle riders and motor vehicles. Roadway projects that include paved shoulders are programmed through the Douglas County Capital Improvement Plan (CIP) process. More information can be found online at: https://www.douglascountyks.org/depts/administration/douglas-county-capital-improvement-plan

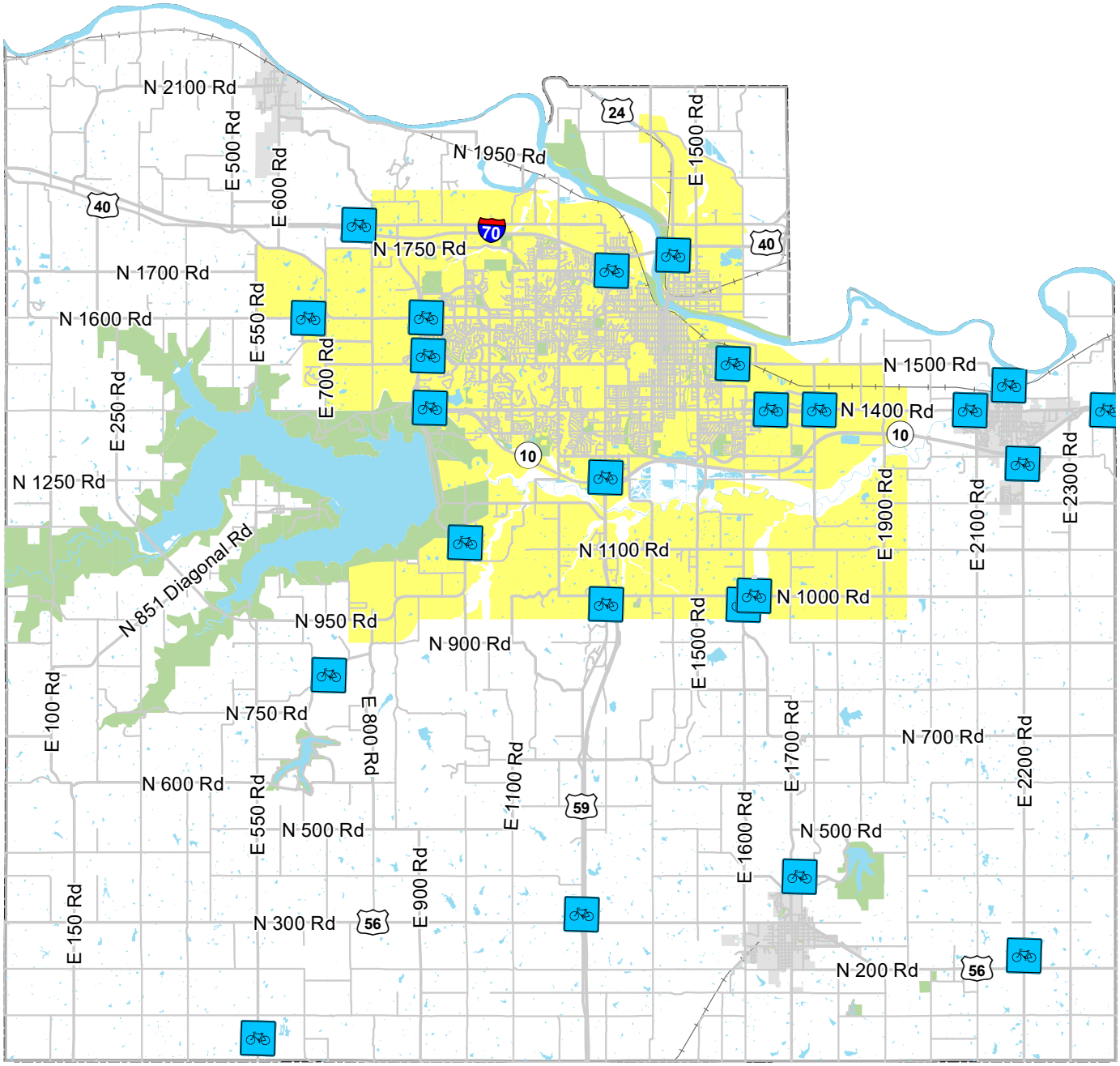
Signage

Figure 2.5: KDOT Approved Sign

Kansas law says drivers must maintain a minimum of 3-foot distance when passing a bicycle rider (House Bill 2192, 2011). Although this law was enacted in 2011, many people do not realize at least 3-foot must be provided between a passing vehicle and a bicycle rider. Thus, 3-feet passing signs should be installed along identified bikeways in the unincorporated County shown in Figure 2.6. This signage is eligible under general Highway Safety Improvement Program (HSIP) funding through KDOT. According to estimates calculated by Douglas County each sign costs approximately $145 to produce and install. There are 16 signs identified for placement in the Unincorporated portion of Douglas County. The 16 signs would cost $2,320 to produce and install.

The 3 feet passing sign reminds drivers to give at least 3 feet when passing and also indicates bicycle riders may be on the route. The KDOT approved 3-ft passing sign shown in Figure 2.5.

Figure 2.6: Recommended 3ft Pass Sign Locations



Source: Lawrence-Douglas County Bicycle Advisory Committee Recommended Sign Locations 7/18/16
Produced: Lawrence-Douglas County MPO (2021)

N
0 2 4 Miles

Open Space Planning

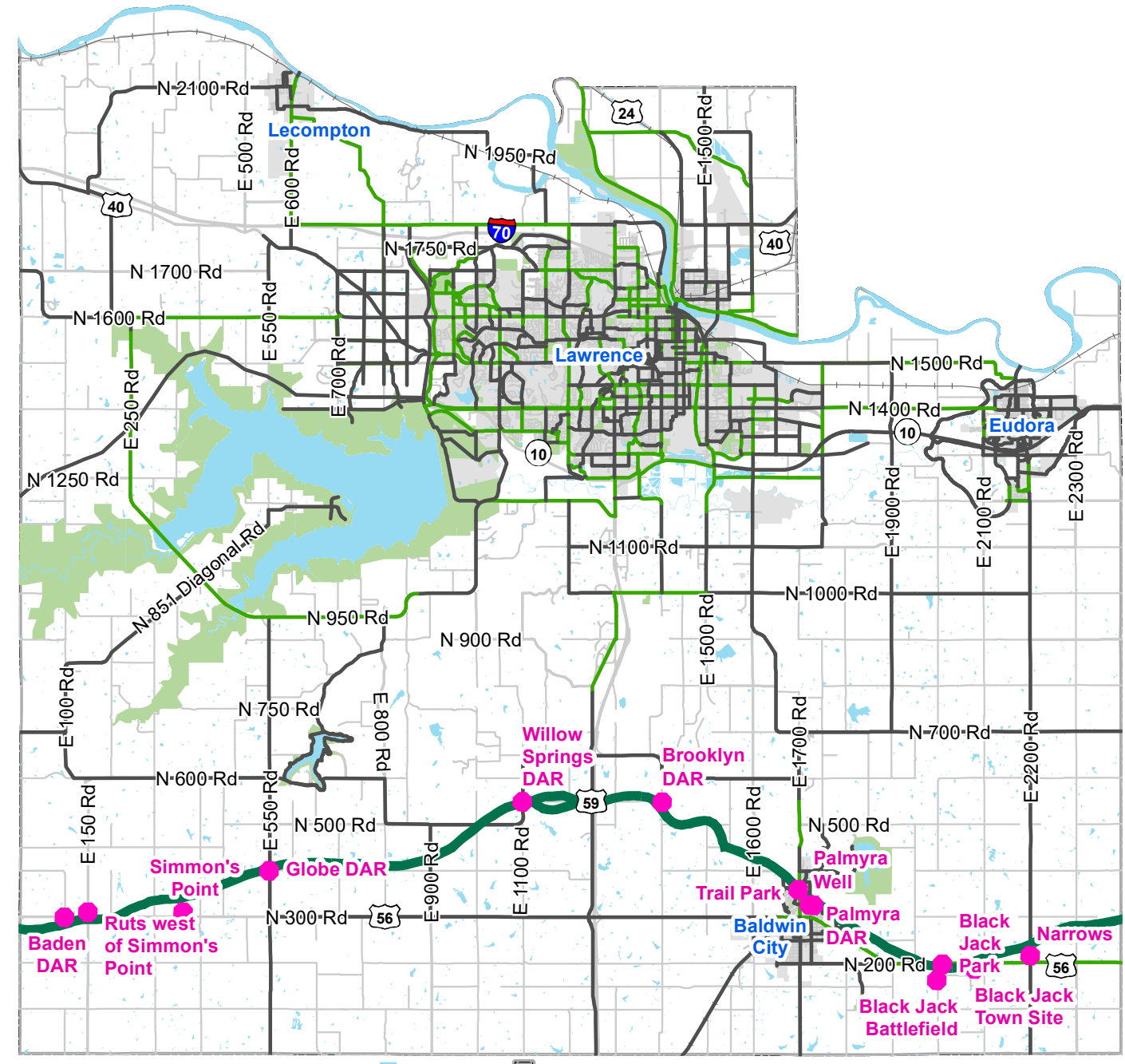
In May 2020, the Douglas County Government and the Douglas County Community Foundation received a $26,000 matching grant from Partners for Places to complete Phase I of a three-phase Open Space Plan development and implementation process. The match was provided through local donations to the Douglas County Community Foundation. All together $52,000 will be utilized in this first phase of planning.

- Phase I – Study existing data and polices, build relationships with key stakeholders, and identify community values and shared vision related to open space. Phase 1 was scheduled to begin in the summer of 2020 and be completed in Spring 2021.
- Phase II – Identify actions the community can take to fulfill its values and vision. This could include designating target conservation areas, policy changes, changes in organizational structure, and identifying ongoing funding for implementation.
- Phase III – Host demonstration projects and implement the plan.

While this Countywide Bicycle Plan will be completed before the Lawrence-Douglas County Sustainability Office lead Open Space Plan is developed there is an intrinsic tie between the two planning processes, especially in concerns to biking in the unincorporated portions of the county. The Open Space Plan should recognize the value of providing adequate facilities for bicycle riders in the countryside. Riding along open spaces is one of the draws for riding in the unincorporated portion of the County.

The Heritage Conservation Council is developing Landmark Tours throughout Douglas County, which would be wonderful opportunities for biking in the unincorporated portion of the County. The first Landmark Tour is of the Santa Fe Trail. A Smartphone App is being developed. The tour will include badges that are captured on your smartphone at each site, photos, text and audio recordings about the site recorded by Baker University students with the assistance of the Santa Fe Trail Historical Society, and a chance to win prizes. The 13 sites are shown in Figure 2.7. More information about the existing and any future Landmark Tours can be found at: https://ffnha.oncell.com/en/santa-fe-trail-landmark-tour-287822.html.

Figure 2.7: Santa Fe Trail Landmark Tour



The Douglas County Heritage Conservation Council is developing Landmark Tours in Douglas County. Find more information at: https://ffnha.oncell.com/en/santa-fe-trail-landmark-tour-287822.html

Source: Santa Fe Trail Alignment – National Park Service, 2017
Landmark Tour – Douglas County Heritage Conservation Council, 2021

Produced: Lawrence-Douglas County MPO (2021)

UNINCORPORATED DOUGLAS COUNTY BIKEWAY SYSTEM MAP

Douglas County has found the most cost effective shoulder width is 6 feet. This provides adequate space for disabled vehicles, but does not require excessive right-of-way purchases to widen the road. However, if a roadway has less than 750 vehicles per day the County is exploring installing 4 feet shoulders. Therefore, if roadways have a minimum of a 4 feet wide shoulder they are considered a Paved Shoulder, which is a Shared Street Bikeway Type because bicycle riders share the roadway with motor vehicles and there is not a dedicated bikeway facility.

Figure 2.8 displays the bikeways in Unincorporated Douglas County. The Lawrence Bikes Plan does not recommend future bikeway separation types, thus future bikeways within the Plan 2040 Growth Tiers (shown in yellow) do not have separation categories assigned. As the City of Lawrence grows within the Growth Tiers, the type of bikeaway will be determined by the Lawrence Bicycle Level of Comfort model.

Currently there are 41 miles of roadways maintained by Douglas County with a minimum paved shoulder of 4 feet. This equates to 31% of the planned network. The total planned network of paved shoulders maintained by Douglas County is 91 miles. For context, Douglas County maintains 227 miles of roadways.

The roadways highlighted in blue are State maintained roadways which are identified for a bikeway, which KDOT will need to develop and maintain the paved shoulders.

Bikeway Types

Major Separation

Shared Use Path

Cycle Track/ Protected Lane

Minor Separation

Buffered Bike Lane

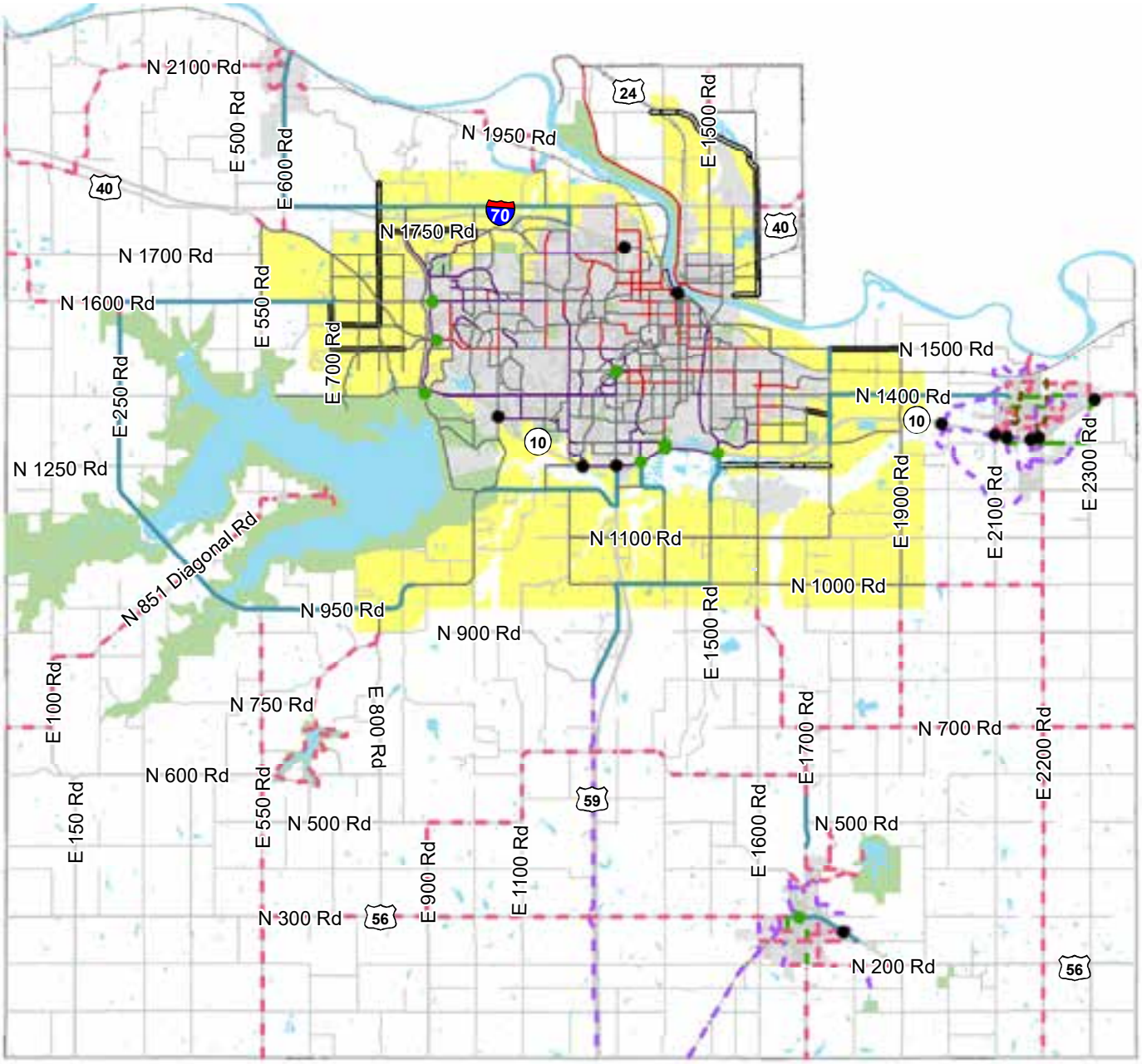
Conventional Bike Lane

Shared Street

Marked Shared Lane (Sharrow), Bike Advisory Lane, Bicycle Boulevard, & Roadway with Paved Shoulder

*The heading color matches the future bikeway type in the map.

Figure 2.8: Unincorporated Douglas County Bikeway System Map



Future Bikeway - Major Separation
Future Bikeway - Minor Separation
Future Bikeway - Shared Street
Future Bikeway - Riparian (Eudora)
Shared Use Path
Existing Bikeway in Lawrence
Future Bikeway Within Lawrence Growth Tier
Gravel Roadway
Paved Shoulder >= 4'

0 4 8 Miles

Grade Separated Crossings
Existing
Future
Water
Parks

City Limits
County Limits
Plan 2040 Growth Tiers

The Lawrence Bikes Plan does not recommend future bikeway separation types, thus future bikeways within the Plan 2040 Growth Tiers (shown in yellow) do not have separation categories assigned. As the City of Lawrence grows within the Growth Tiers, the type o bikeaway will be determined by the Lawrence Bicycle Level of Comfort model.

N

Produced: Lawrence-Douglas County MPO (2021)

Click above to view an interactive map.

A wide range of policies and programs are listed in Appendix C: Bikeway Toolbox, but the following items are specifically identified as appropriate for the unincorporated Douglas County.

Education and Enforcement

- Enforce the rules of the road for bicycle riders and drivers to improve the safety for all road users. Utilize all technology available including the 3 ft passing enforcement device and speed monitoring devices to enforce regulations consistently.
- Promote the Countywide Bicycle Rideability Map to assist bicycle riders in choosing routes.

Engineering

- When roads are reconstructed or resurfaced the bikeway plan should be consulted to determine if the roadway is a bikeway or future bikeway. If the roadway is slated for a bikeway the shoulder widths should be expanded to provide width that is adequate for the total number of motor vehicles per day.
- Douglas County should request KDOT install devices on traffic signals that detect bicycles to provide green lights when necessary as well as bicycle counting devices on the State maintained roadways and evaluate if installation would make sense elsewhere in the County.
- Install 3 feet passing signs.
- Develop a plan to maintain bikeways. Bikeway maintenance includes: the general upkeep of pavement markings, concrete or asphalt condition, flex posts replacement, signage, and other maintenance elements; and maintaining operable bikeways cleared of debris and leaves, sand, snow, and ice.

Evaluation

- Track plan performance through plan specific performance measures and measures from Transportation 2040.

The 3 ft passing enforcement device currently costs $1,480 and works by bouncing ultrasonic waves off of passing vehicles to measure the distance the passing vehicle is from the bicycle. Chattanooga, Tennessee and Austin, Texas are some of the jurisdictions using this device to educate and enforce the 3 ft passing law.

https://arstechnica.com/tech-policy/2015/06/police-use-ultrasonic-device-to-make-sure-drivers-stay-3-feet-from-cyclists

Baldwin City

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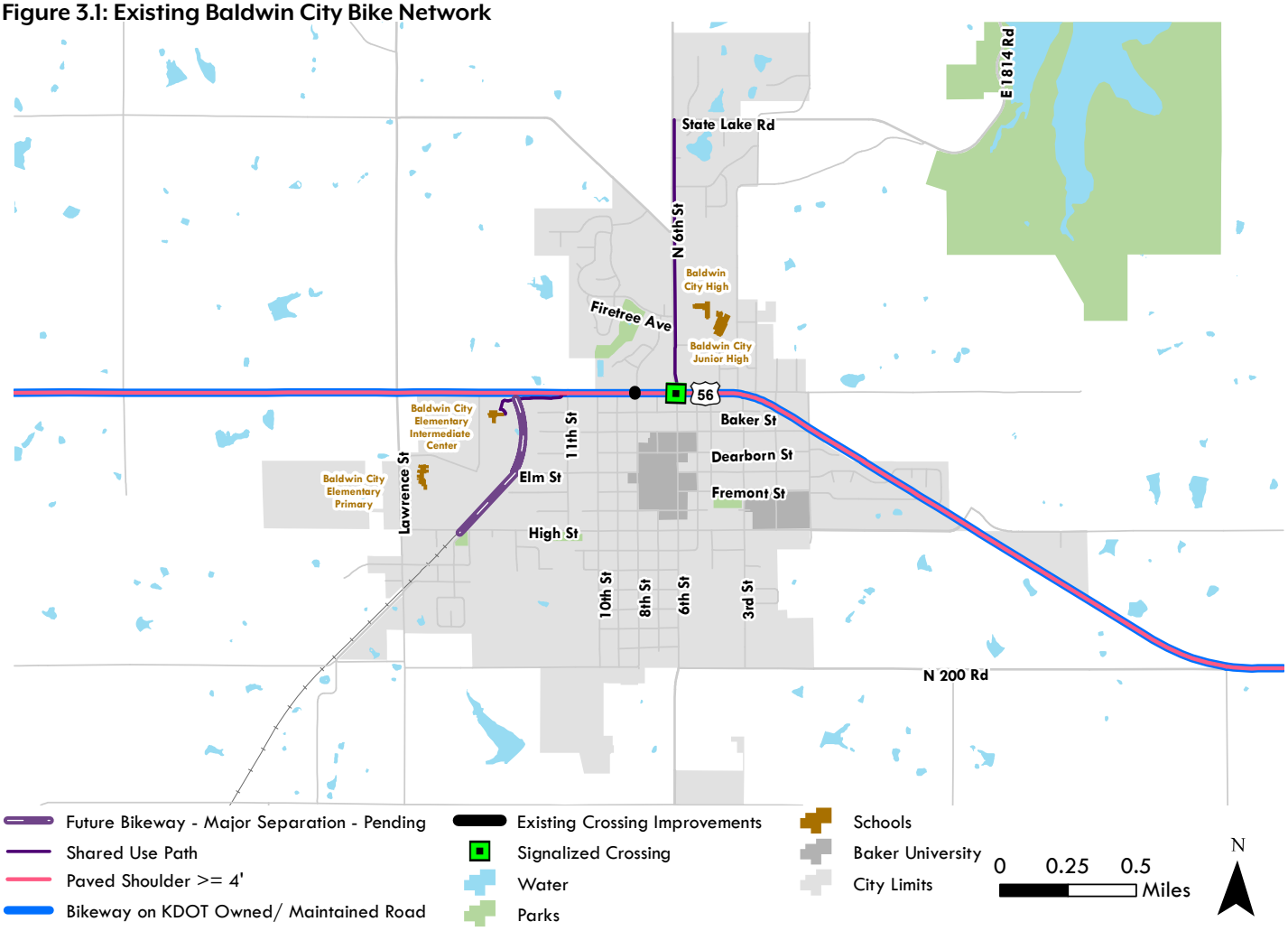
STREET NETWORK

Baldwin City is a city of approximately 4,700 people located in southeastern Douglas County. The city covers approximately two and a half square miles, and has largely developed around a grid-based street network. This network of grid streets provides good bicycling and walking access throughout much of Baldwin City, although a number of barriers exist. U.S. Highway 56, known as Ames Street within the city, runs east to west across the Baldwin City and is a significant barrier to walking and bicycling. Traffic volumes and speeds on Ames Street are relatively high for the area, which can make crossing the street difficult.

EXISTING BICYCLE FACILITIES

There are no specific on-street bicycle facilities in Baldwin City. Two shared use paths are located along 6th Street and Ames Street (US-56) leading to the Intermediate School (Figure 3.1). Further, the shoulder on US-56 which travels through Baldwin City has a paved shoulder greater than 4 feet. A 2020 KDOT Transportation Alternatives grant was funded to install sidewalk along Elm Street from the existing Midland Railway crossing to 8th Street. A 2021 KDOT Transportation Alternatives grant will install a .58 mile 10' shared use path from Highway 56 to the Santa Fe Depot south of High Street, which will begin the construction of the Maple Leaf Trail extending from Baldwin City to Ottawa. Currently 1.30 miles exist in Baldwin City, once the first phase of the Maple Trail is constructed 1.88 miles of shared use path will exist in Baldwin City.

Figure 3.1: Existing Baldwin City Bike Network

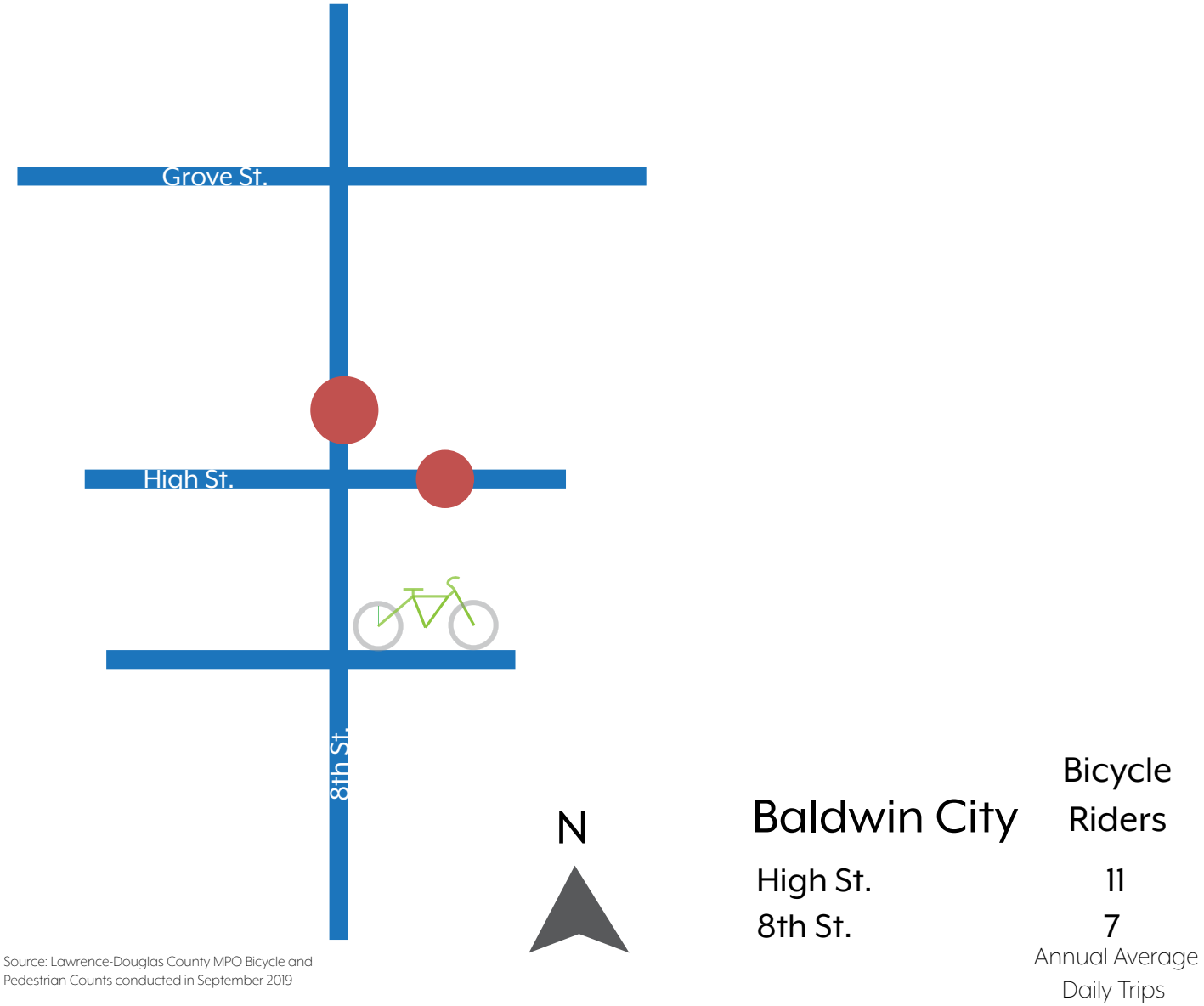


Click above to view an interactive map.

Bike Count

Bicycle rider counts are collected to calculate an average annual daily number of bicycle trips for each location. This data can be viewed in an interactive map at: www.lawrenceks.org/mpo/bikepedcount. Figure 3.2 displays the annual average daily trips (AADT) bicycle riders take based on counts conducted by the MPO.

Figure 3.2: Annual Average Daily Trips of Bicycle Riders in Baldwin City



Source: Lawrence-Douglas County MPO Bicycle and Pedestrian Counts conducted in September 2019

As part of the Safe Routes to School program, students self-identify how they arrive at school. In the Spring of 2019, 24 students in the Baldwin City School District said they biked to school and in the Fall of 2019, 54 students said they biked to school.

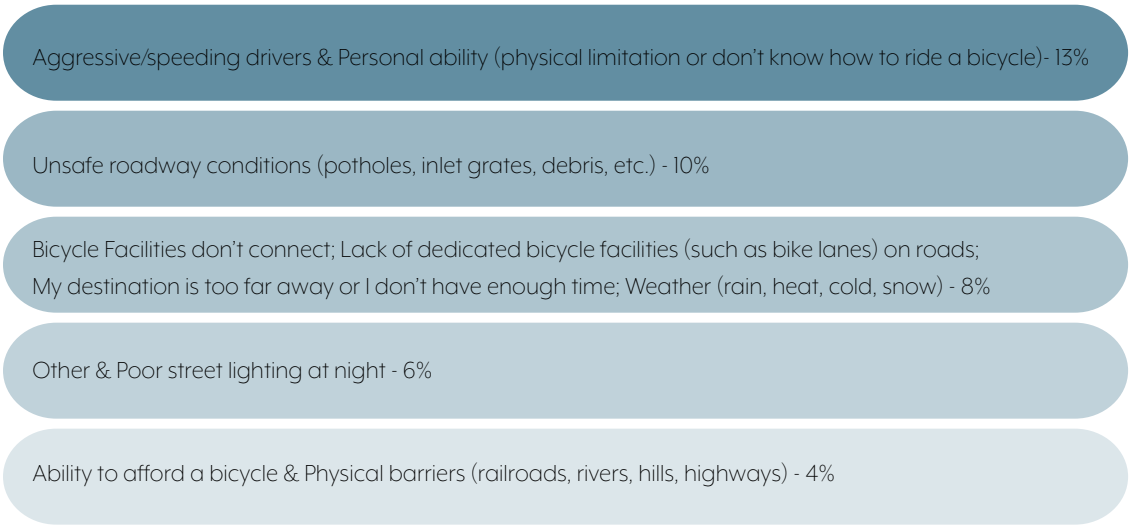
According to the U.S. Census 5-Year American Community Survey around 0.3% of workers commute by bicycle (per year between 2014-2018). This number has a margin of error of plus or minus 0.5% associated with it since the data is from a survey.

Barriers to Bicycling

Nationally the barriers to bicycling include concerns about traffic safety, lack of routes, weather, distance, and the absence of shower and parking facilities.[1] The national data corresponds to what we heard locally from the survey conducted over the summer of 2018, shown in Figure 3.3. The number one reason people selected for what prevents them from bicycling more was a tie between "Aggressive/speeding drivers & Personal ability (physcal limitation or don't know who to ride a bicycle." The second reason why people don't bicycle more is "unsafe roadway conditions (potholes, inlet grates, debris, etc.)". The recommendations section of this chapter provides strategies to address many of the reasons not to bicycle.

All reasons respondents could have selected included: ability to afford a bicycle, aggressive/speeding drivers, bicycle facilities don't connect, concerned about personal hygiene/nowhere to shower after riding, concerned about personal safety (crime, harassment, dogs, etc.), i don't know the best route, intersections are too wide/busy, lack of bike racks at my destination, lack of dedicated bicycle facilities (such as bike lanes) on roads, my destination is too far away or i don't have enough time, other, personal ability (physical limitation or don't know how to ride a bicycle), physical barriers (railroads, rivers, hills, highways), poor street lighting at night, there is not enough rack space on the bus for my bike, unsafe roadway conditions (potholes, inlet grates, debris, etc.), weather (rain, heat, cold, snow). Respondents were asked to select all of the reasons that applied to them.

Figure 3.3:Top 5 Reasons not to Bicycle from Survey Responses for Baldwin City



Number of Responses - 48

Two bicycle crashes were reported in Baldwin City in 2018. However, obtaining the detailed records of the crashes was not possible. Future planning work should include more detailed safety evaluations.

Public comment indicated there is a perceived safety issue as evidenced by people not riding their bicycle due to aggressive/speeding drivers.

1 Reasons Why Bicycling And Walking Are And Are Not Being Used More Extensively As Travel Modes. (n.d.). National Bicycling And Walking Study, FHWA-PD-92-041. Retrieved November 12, 2018, from https://safety.fhwa.dot.gov/ped_bike/docs/casel.pdf.

Opportunities to Build the Bikeway Network

GRANTS AND PRIVATE FUNDING

In Baldwin City, currently bicycle specific projects are contingent upon grants. Baldwin City has been fortunate to be awarded KDOT Transportation Alternative (TA) grants in the past including the portion of the Maple Leaf Trail planned for construction in 2021. Private grants should be pursued. Baldwin City should seek government and private funded grants to fund the bikeway network.

BONDS

In 2018, the City authorized $1.000,000 bonds to improve sidewalks and the public park and recreation facility. This influx of funding for sidewalk projects will improve the walkability of Baldwin City. Future sidewalk locations should be evaluated in coordination with the bikeway network and sidewalks should be upgraded to shared use path (sidewalk wider than eight foot) where appropriate.

PRIVATE DEVELOPMENT

Currently when developers are proposing projects they do not consult the Baldwin City Bikeways Map (Figure 3.9) or install bicycle parking. It is a plan recommendation to require developers to review the Bikeways Map and install bike parking (like they do for vehicles). If a project is identified it should be completed as part of the development. The exact type of bikeway within major or minor separation or shared street will be determined by project engineers. The Facility Selection Criteria Chart in the Bikeway Design Guidelines (Appendix A) can be used as reference.

SAFE ROUTES TO SCHOOLS AND BIKEWAYS

Historically, Safe Routes to School (SRTS) infrastructure projects have focused on walking routes and sidewalk routes for kids bicycling. However, older students could bike to school on appropriate bikeways. When SRTS infrastructure projects are considered the Baldwin City Bikeways Map (Figure 3.9) should be consulted to determine if bikeway network improvements can be coordinated with SRTS projects. Future sidewalk locations should be evaluated in coordination with the bikeway network and sidewalks should be upgraded to shared use path where appropriate.

BAKER UNIVERSITY

Baker University is located in the heart of Baldwin City and has approximately 900 students on campus. Students are required to live in on campus housing. Vehicle parking is free; however, 8th Street becomes congested with parked cars. Bicycle related programing should be created in partnership with various community organizations, Baker University, and the City to promote bicycling as a form of transportation.

MAINTENANCE OF BIKEWAYS

Two types of maintenance apply to bikeways. First, is clearing of debris, leaves, sand, snow, and ice. Baldwin City Public Works clears sidewalk and the 6th St. shared use path. Public Works will clear future shared use paths not on school property. Private property owners are required to clear their sidewalks. The School District clears the shared use path along Highway 56 on school property.

The second type of maintenance is general upkeep and maintenance of projects. Concrete, asphalt, pavement markings, or flex posts are not built to last forever. Potholes, general wear and tear, and surface defects happen over time and with weather events. The City doesn't currently have a plan for maintaining streets or bikeways. It is a plan recommendation to develop a systematic approach maintaining streets and bikeways.

Bicycle Parking

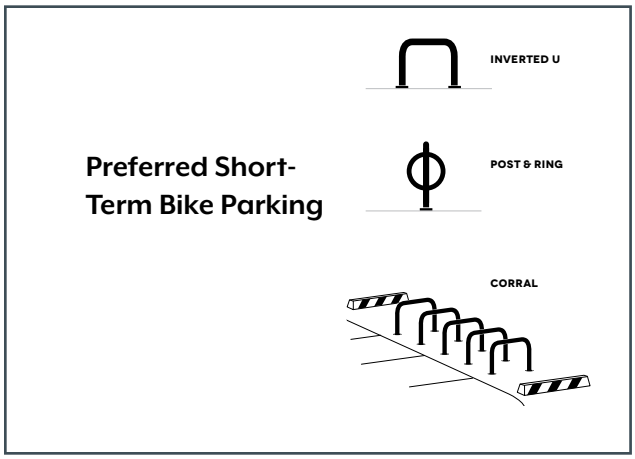
Bikeways are only one component in creating a bicycle friendly community. Bike parking encourages people to commute by bicycle.[1] Currently Baldwin City does not have any requirements for bike parking. Imagine riding your bike somewhere, but you do not have a good place to lock it up. That leads to nervousness to let the bike out of view and makes you not want to ride to any destinations. As mentioned previously, it is a plan recommendation to require developers to install bike parking. The recommended short-term and long-term bike parking is described below.

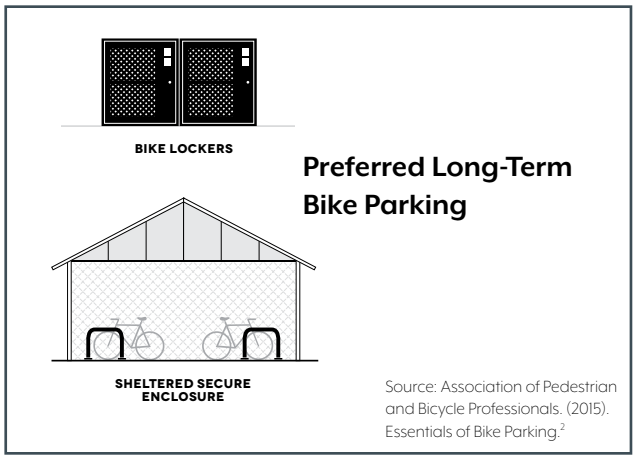
Short-term bicycle parking – Short-term parking is designed to meet the needs of people making quick stops typically lasting up to two hours. Short-term parking needs to be located in highly-visible locations and have two anchor points where bicycles can be secured using U-shaped locks. Inverted U's, post and ring, and corrals are good short-term bicycle parking types.

Best Practices Guide
Association of Pedestrian and Bicycle Professionals has several guides:
https://www.apbp.org/bicycle-parking-solutions

Temporary bike parking at special events should be encouraged. Some special event attendees would prefer to ride their bicycle to the event. Bike parking needs to be provided in designated locations. Preferably, bike parking or bike valets should be located in highly visible places near main entrances. Bike parking should be placed within temporary barriers to direct bicycle riders to a single entrance and exit; this prevents theft and pedestrian traffic interference.

Long-term bicycle parking – Long-term parking is designed to meet the needs of people (commuters, residents, and others) needing to lock their bike for longer than two hours. Long-term parking provides security and protection from weather. Long-term parking can take a variety of forms, including a room within a residential building or workplace, a secure enclosure within a parking garage, or a cluster of bike lockers at a transit center. Some long-term parking is open to the public and some of it is on private property with access limited to employees, residents, or other defined user groups.[2]





Source: Association of Pedestrian and Bicycle Professionals. (2015). Essentials of Bike Parking.[2]

1 Cycle Note, Queensland Transport. (2006, June). End-of-trip facilities for bicycle riders. Retrieved November 12, 2018, from https://www.bikeleague.org/sites/default/files/BFB_Queensland_End_of_trip_facilities_for_bicycle_riders.pdf

2 Association of Pedestrian and Bicycle Professionals. (2015). Essentials of Bike Parking. Retrieved November 12, 2018, from https://www.apbp.org/assets/docs/EssentialsofBikeParking_FINA.pdf

Bikeway Types

Refer to the regional overview for more detailed information about each bikeway type and the results of the countywide survey providing level of comfort for each type.

Major Separation

Shared Use Path/Sidepath
(PATH LEADING TO THE ELEMENTARY SCHOOL INTERMEDIATE CENTER, BALDWIN CITY, KS)

Cycle Track/Protected Lane
(INDIANAPOLIS, IN)

Minor Separation

Buffered Bike Lane
MASSACHUSETTS ST. AND E. 13TH ST., LAWRENCE, KS

Bike Lane
(MONTEREY WAY AND PETERSON RD., LAWRENCE, KS)

Shared Street

Bike Boulevard
(21ST ST. AND OUSDAHL RD., LAWRENCE, KS)

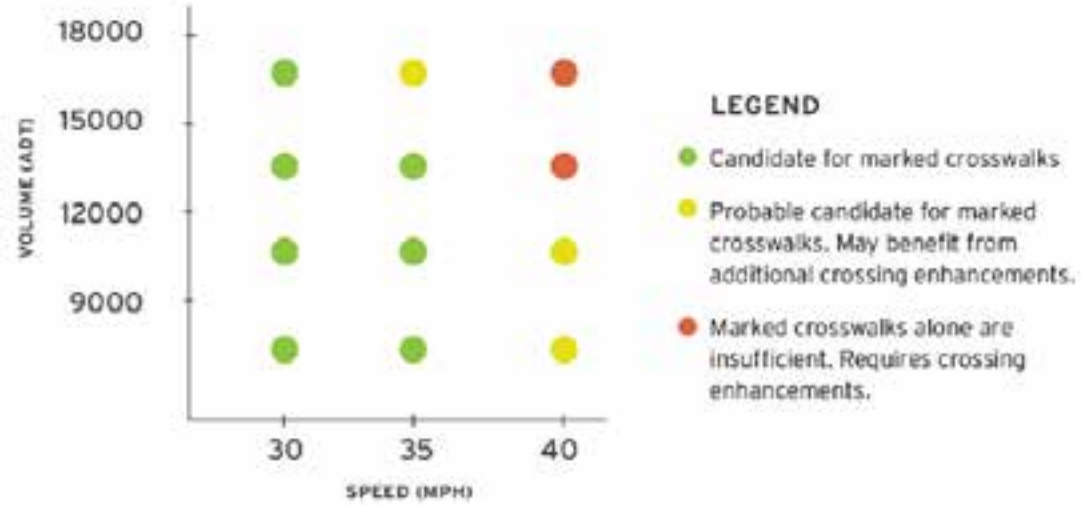
Bike Advisory Lane
(HANOVER, NH)

Marked Shared Lane (Sharrow)
(LAWRENCE, KS)

Roadway with Paved Shoulder
E 600 RD., DOUGLAS COUNTY, KS

Crossings are some of the most dangerous locations for a bike rider because of the potential conflict with motor vehicles. The Federal Highway Administration developed an informative guide called Small Town and Rural Multimodal Networks. It illustrates different bikeway types and ways to improve safety when bikeways have crossings. A major component of safety is the speed of vehicles and the number (or volume) of vehicles. Essentially the higher the speed and number of vehicles need more infrastructure to support safety; Figure 3.4 shows this relationship. Intersection enhancements include: Marked Crosswalks, Median Safety Islands, Rectangular Rapid Flash Beacons (RRFB), Pedestrian Hybrid Beacons (or HAWK).[1]

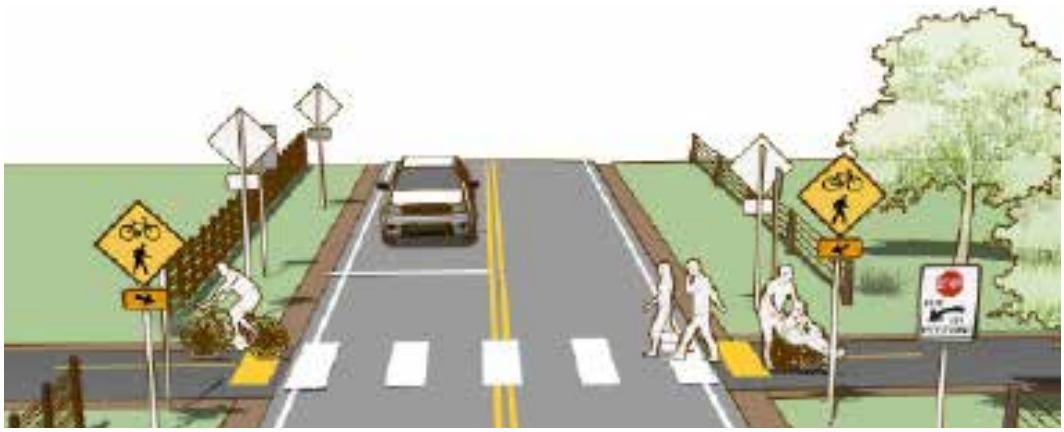
Figure 3.4: Type of Intersection Enhancements by Speed and Volume of Vehicles



Source: Small Town and Rural Multimodal Networks, page 4-7 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf Chart adapted from FHWA Safety Effects of Marked Crosswalks at Uncontrolled Locations 2005 Table 2-11 (data for two-lane roadway at non school crossings).

A Marked Crosswalk may be appropriate at crossings with low motor vehicle speeds and volumes (Figure 3.5).

Figure 3.5: Marked Crosswalk



Source: Small Town and Rural Multimodal Networks, page 4-7 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

A median safety island allows space for bicycle riders and pedestrians to wait in the middle of the road in case they are not able to cross all at once. This is intented for roads with higher speeds or numbers of vehicles or three or more travel lanes. Figure 3.6 shows an example of a Median Safety Island.

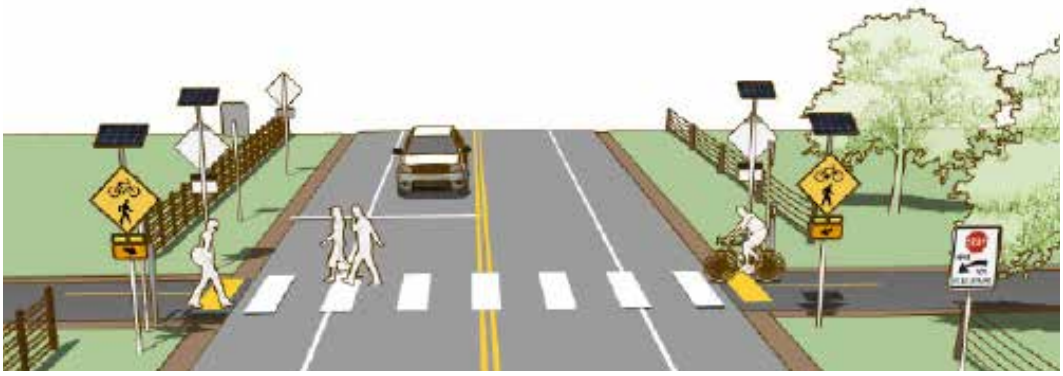
1 Federal Highway Administration. (2016) Small Town and Rural Multimodal Networks. Pages 4-7 and 4-8. Accessed on October 21, 2020 from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Figure 3.6: Median Safety Island

Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

For greater visibility, a Rectangular Rapid Flash Beacon (RRFB) or Pedestrian Hybrid Beacon (also known as a HAWK signal) can be used to actively indicate to drivers someone desires to cross the street. RRFBs are typically used on lower volume streets, while Pedestrian Hybrid Beacons are used in locations with mulitiple lanes or higher volume streets with few gaps for crossing bicycle riders or pedestrians. A RRFB is shown in Figure 3.7, while a Pedestrian Hybrid Beacon is shown in Figure 3.8.

Figure 3.7: Rectangular Rapid Flash Beacon (RRFB)



Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Figure 3.8:Pedestrian Hybrid Beacon (HAWK)

Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

BALDWIN CITY BIKEWAY SYSTEM MAP

The Baldwin City Bikeway System Map was created by incorporating the City's Parks and Recreation Master Plan (2010)[1], coordinating with the Safe Routes to School plan, evaluating the previous Countywide Bikeway Plan, and reviewing best practices.

While acknowledging Baldwin City does not have dedicated funding for bicycle projects, many bikeway projects have been achieved through KDOT Transportation Alternative funding. Baldwin City should continue to pursue state and grant funding to build the bikeway network, but relatively low cost projects can help build out a low stress network.

Shared streets can be signed and marked as shared streets either — bike boulevards, bike advisory lanes, or have Shared-Lane Markings. This can be accomplished by simply painting the appropriate line/symbol on the road, which has adequate width, and placing signs. The type of bikeway is determined by the number of motor vehicles. See the Bikeway Design Guide in Appendix A for specific installation conditions.

As in the Safe Routes to School Plan, the highest priority needs are those that serve the school campuses. A potential crossing along US-56 is identified on the Bikeway Map.

Figure 3.9 displays the Baldwin City Bikeway System Map. Future Bikeways are identified as either major or minor separation, shared streets. The exact type of bikeway will be determined when projects are designed and built. (View examples of each separation type on the proceeding page.)

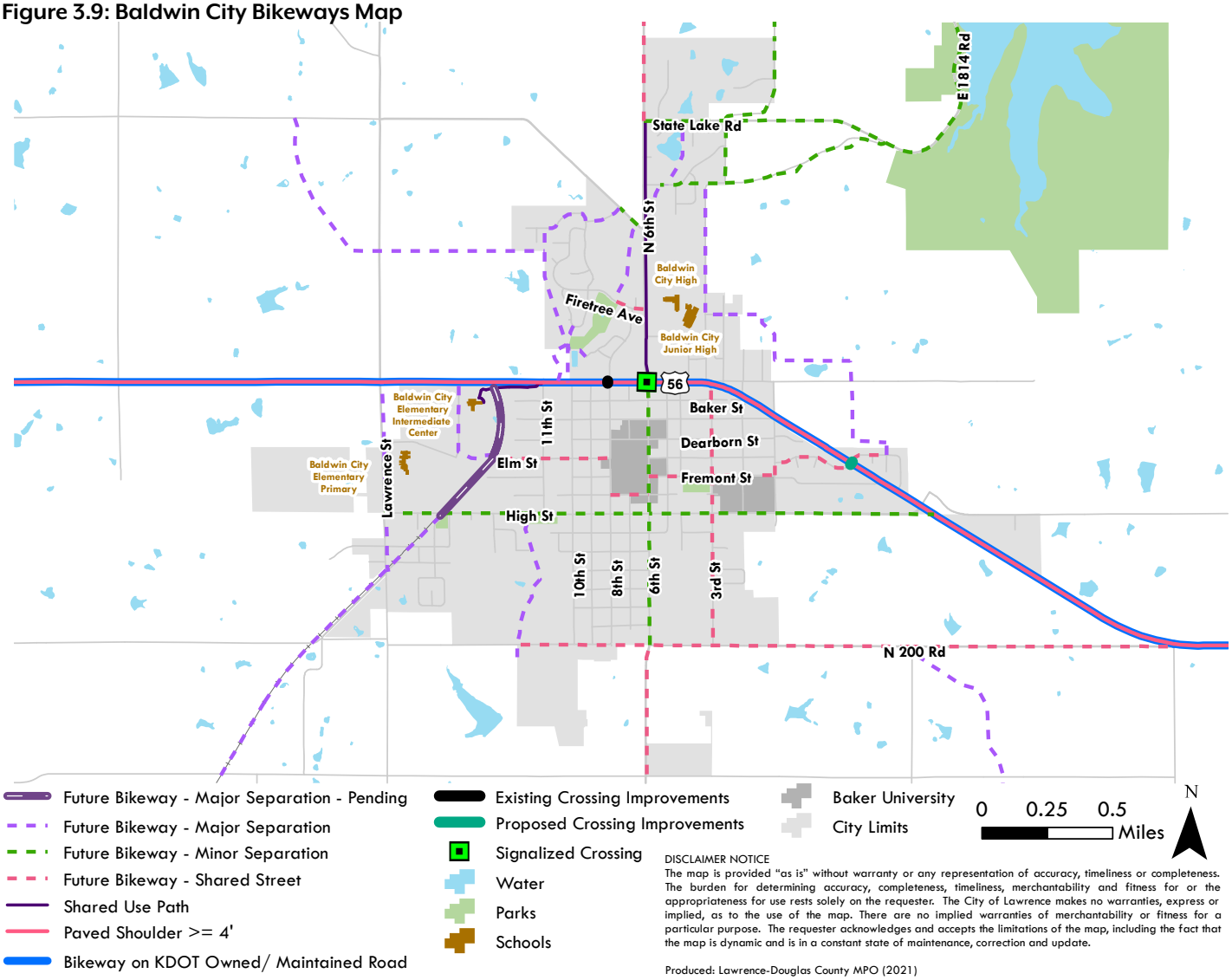
There are 26.7 miles of planned future bikeway in Baldwin City. Of the planned mileage 8.7 miles are identified as future shared streets (bike boulevards, bike advisory lanes, and shared-lane markings). The City should evaluate the streets to identify the appropriate type of shared street and install the necessary infrastructure necessary to improve the comfort of bicycle riders on the street. Depending on the necessary infrastructure these could be implemented with fairly low cost materials (paint, signs, etc).

This Bikeway Plan sets a goal to increase the mileage of bikeway from 1.8 miles to 5.1 miles by 2030. (The 1.8 miles includes the planned first phase of the Maple Leaf Trail, which was awarded 2021 KDOT Transportation Alternatives funding to install a .58 mile 10' shared use path.) Extending the Maple Leaf Trail to the Franklin County line requires 3.1 miles of new shared use path. The 5.1 mileage goal includes extending the Maple Leaf Trail to Franklin County.

BALDWIN CITY PUBLIC LIBRARY,
BALDWIN CITY, KS

1 https://www.baldwincity.org/DocumentCenter/View/80/Parks-and-Recreation-Master-Plan-PDF?bidId=

Figure 3.9: Baldwin City Bikeways Map



Click above to view an interactive map.

Bikeway Types

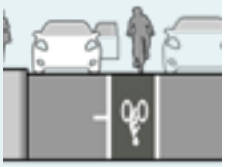
Major Separation

Shared Use Path

Cycle Track/ Protected Lane

Minor Separation

Buffered Bike Lane



Conventional Bike Lane

Shared Street

Marked Shared Lane (Sharrow), Bike Advisory Lane, Bicycle Boulevard, & Roadway with Paved Shoulder

*The heading color matches the future bikeway type in the map.

** Due to the narrow width of the roads, major or minor separation is not currently practical, but should be considered when new developments occur or when roads are widened.

IMPLEMENTING POLICIES AND PROGRAMS

A wide range of policies and programs are listed in Appendix C: Bikeway Toolbox, but the following items are specifically identified as appropriate for Baldwin City.

Education and Enforcement

- Implement the Baldwin City Safe Routes to School (SRTS) programs improve education and encouragement strategies for walking and bicycling to school, and expanding programing for learning safe traveling behaviors for walking, biking, and driving.
    - Obtain a bike fleet and teach Bike Education Safety Training (LBEST), implement policies that ensure walking or biking to school is feasible and encouraged, host walk and bike to school days, and others found in the Action Plan table on page 32 of the Baldwin City Safe Routes to School Plan.
- Enforce the rules of the road for bicycle riders and drivers to improve the safety for all road users. Utilize all technology available including the 3 ft passing enforcement device (shown on the next page) and speed monitoring devices to enforce regulations consistently.
- Develop a bicycle friendly driver education program and work to incorporate the curriculum into driver training.
- Promote the Lawrence-Douglas County MPO produced Rideability Map to assist bicycle riders in choosing routes.
- Support programs, like the Bicycle Friendly Businesses, community bike events, and weekly club rides, which increase access to bicycles, provides education about proper riding behaviors, and promotes a bicycling culture.

Engineering

- Establish data driven processes to support decision-making including asset management, conducting multimodal counts (active users and parked bikes), and crash report analysis.
- Construct and install bikeways, consistent with the bikeway plan during public and private roadway construction, reconstruction, maintenance and standalone projects. Pavement markings should be required when roads are resurfaced, where appropriate, based on the width of the street. Include wayfinding with bikeway projects. Due to the narrow width of the roads, major or minor separation is not currently practical, but should be considered when new developments occur or when roads are widened.
- Evaluate shared streets to determine the appropriate type of bikeway — bike boulevards, bike advisory lanes, or shared-lane markings — and install necessary infrastructure to improve the comfort of the shared streets.
- Consider adopting a complete streets policy.
- Consider developing a systematic approach to maintaining streets and bikeways.
- Consider modifying the development code/adopt design policies to require developers to install bikeways identified on the Baldwin City Bike Map and bike parking as part of the development.
- Consider lowering the local speed limit to improve safety.
- Continue to pursue state and grant funding to install bikeways and crossing improvements.
- Improve the crossing conditions along US-56. As US-56 is a highway continuing conversations with KDOT to determine a location for improved pedestrian and bicycle traffic across it is necessary.
- Plan and install 3 feet passing law education signs. Figure 3.10 displays the KDOT approved 3 feet passing sign.

Figure 3.10: KDOT Approved Sign

Evaluation

- Collect data to develop counts and participation data (including SRTS travel tally data, manual and automatic bicycle and pedestrian counts).
- Track plan performance through plan specific performance measures and measures from Transportation 2040.

The 3 ft passing enforcement device currently costs $1,480 and works by bouncing ultrasonic waves off of passing vehicles to measure the distance the passing vehicle is from the bicycle. Chattanooga, Tennessee and Austin, Texas are some of the jurisdictions using this device to educate and enforce the 3 ft passing law.

https://arstechnica.com/tech-policy/2015/06/police-use-ultrasonic-device-to-make-sure-drivers-stay-3-feet-from-cyclists


EUDORA

Table of Contents

SHARED USE PATH BY WEST RESOURCE CENTER, EUDORA, KS

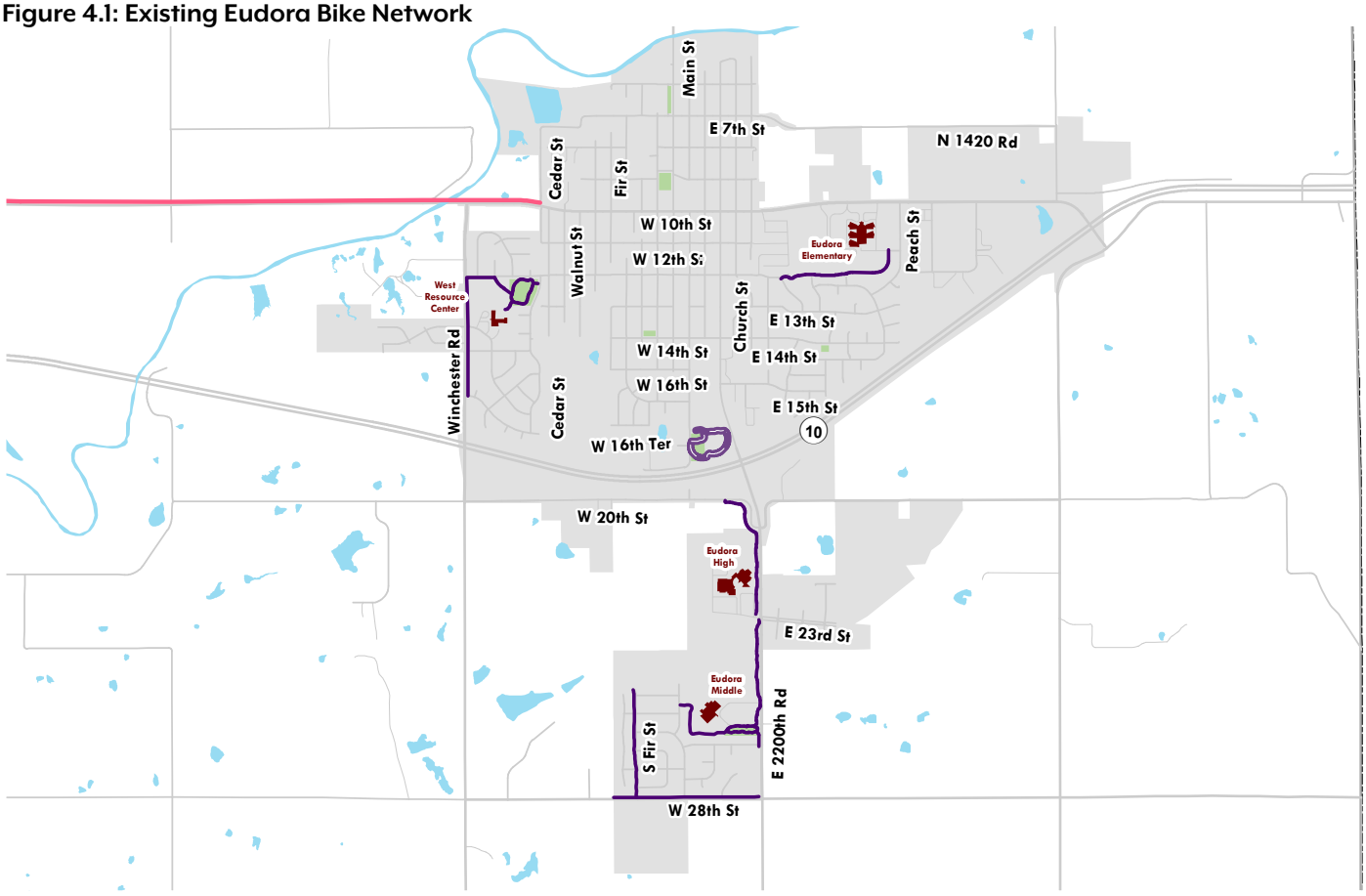
STREET NETWORK

The City of Eudora is located approximately three miles east of Lawrence. The City has an estimated population of 6,602 and covers an area of nearly three square miles. The majority of Eudora lies between the Wakarusa River to the north and State Highway 10 (K-10) to the south, although Eudora High School, Eudora Middle School and two residential subdivisions lie to the south of K-10. The older portions of the City are built around a grid street network that provides relatively good connectivity, but newer development is less well connected with street patterns that include cul-de-sacs. Tenth Street (old Highway 10), Church Street, and Main Street are the primary streets in the City.

EXISTING BICYCLE FACILITIES

No on-street bikeways exist in Eudora; although portions of Tenth Street and Church Street have paved shoulders (Figure 4.1). There are 3.53 miles of existing shared use path. The Lucy Kaegi Trail , which is shown as pending was funded through the Kansas Department of Wildlife, Parks and Tourism. The Trail is 0.4 miles and is expected to be constructed in 2021-2022. When including pending mileage Eudora has 3.93 miles of shared use paths.

Figure 4.1: Existing Eudora Bike Network



Click above to view an interactive map.

BIKE SHARE

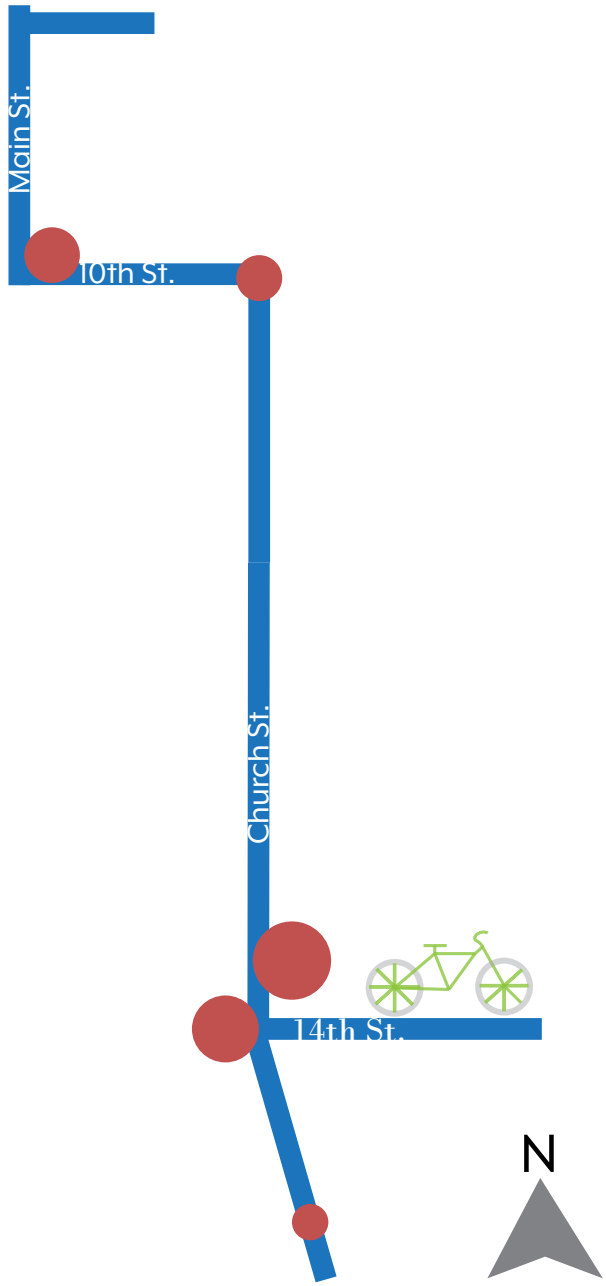
The City of Eudora was a 2017 Summer Spray Lawrence Memorial Hospital grant recipient to create a free bike share program. The program started with six bikes, but currently has three functioning bikes. To cut down on vandalism the bikes were parked in front of the Eudora Community Center and residents need to check out a bike to use it. There were typically 2 – 3 checkouts per month. However, due to continued vandalism and the COVID-19 pandemic the bicycles are currently in storage until the program can be evaluated.

BIKE SHARE LAUNCH,
EUDORA, KS

Bike Count

Bicycle rider counts are collected to calculate an average annual daily number of bicycle trips for each location. This data can be viewed in an interactive map at: www.lawrenceks.org/mpo/bikepedcount. Figure 4.2 displays the annual average daily trips (AADT) bicycle riders take based on counts conducted by the MPO.

Figure 4.2: Annual Average Daily Trips of Bicycle Riders in Eudora



Source: Lawrence-Douglas County MPO Bicycle and Pedestrian Counts conducted in September 2019

Eudora	Bicycle Riders
Church St. At K10	6
10th St.	12
Main St.	7
14th St. At Church	9
Church St. At 14th St.	20

Annual Average Daily Trips

As part of the Safe Routes to School program, students self-identify how they arrive at school. In the spring of 2019, 25 students in the Eudora School District said they biked to school and in the Fall of 2019, 79 students said they biked to school.

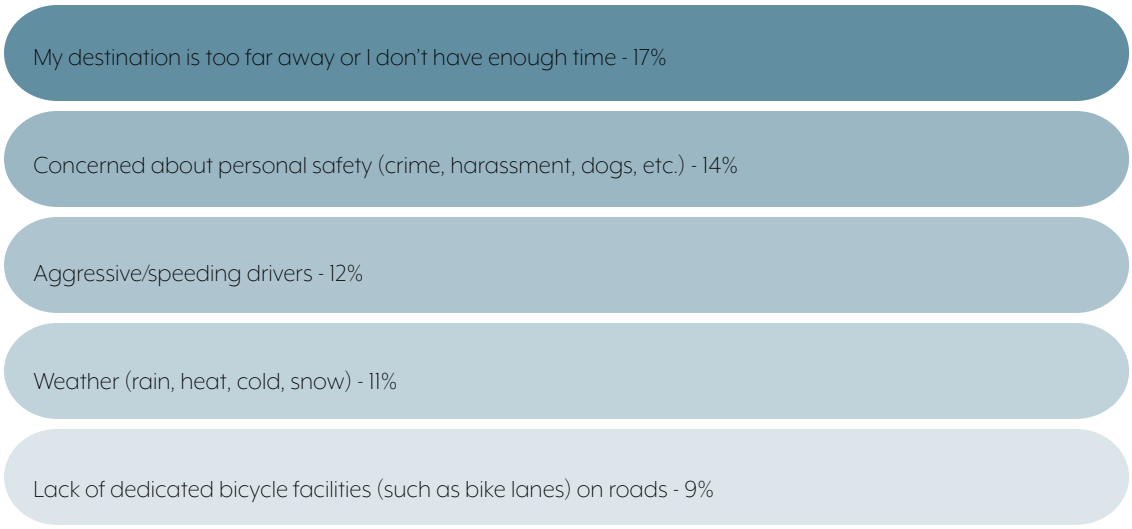
According to the U.S. Census 5-Year American Community Survey 0% of workers commute by bicycle (per year between 2014-2018). This number has a margin of error of plus or minus 0.8% associated with it since the data is from a survey.

Barriers to Bicycling

Nationally the barriers to bicycling include concerns about traffic safety, lack of routes, weather, distance, and the absence of shower and parking facilities.[1] The national data corresponds to what we heard locally from the survey conducted over the summer of 2018, shown in Figure 4.3. The number one reason people selected for what prevents them from bicycling more was a tie between "My destination is too far away or I don't have enough time." The second reason why people don't bicycle more is "Concerned about personal safety (crime, harassment, dogs, etc.) ". The recommendations section of this chapter provides strategies to address many of the reasons not to bicycle.

All reasons respondents could have selected included: ability to afford a bicycle, aggressive/speeding drivers, bicycle facilities don't connect, concerned about personal hygiene/nowhere to shower after riding, concerned about personal safety (crime, harassment, dogs, etc.), i don't know the best route, intersections are too wide/busy, lack of bike racks at my destination, lack of dedicated bicycle facilities (such as bike lanes) on roads, my destination is too far away or i don't have enough time, other, personal ability (physical limitation or don't know how to ride a bicycle), physical barriers (railroads, rivers, hills, highways), poor street lighting at night, there is not enough rack space on the bus for my bike, unsafe roadway conditions (potholes, inlet grates, debris, etc.), weather (rain, heat, cold, snow). Respondents were asked to select all of the reasons that applied to them.

Figure 4.3: Top 5 Reasons not to Bicycle from Survey Responses for Eudora

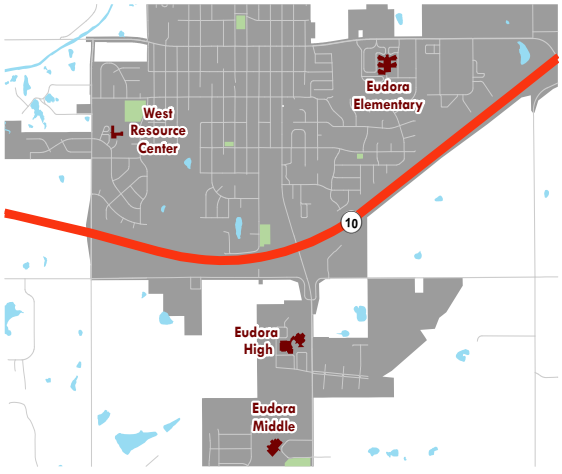


Number of responses - 66

Public comment indicated there is a perceived safety issue as evidenced by people not riding their bicycle due to aggressive/speeding drivers.

K-10 acts as a physical barrier cutting the community in two, which is especially problematic as the High School and Middle School are south of K-10 (shown in Figure 4.4). Planning to accommodate bicycle and pedestrian traffic crossing this major highway is a priority for the community. Distance of destinations, time, or weather cannot be addressed, but aggressive/speeding drivers can be addressed in the recommendations section of this chapter.

Figure 4.4: K-10 Dividing Eudora



1 Reasons Why Bicycling And Walking Are And Are Not Being Used More Extensively As Travel Modes. (n.d.). National Bicycling And Walking Study, FHWA-PD-92-041. Retrieved November 12, 2018, from https://safety.fhwa.dot.gov/ped_bike/docs/case1.pdf

GRANTS AND PRIVATE FUNDING

In Eudora, currently bicycle specific projects are contingent upon grants. Eudora has been fortunate to be awarded KDOT Transportation Alternative (TA) grants in the past including the Blue Jacket Trail. Private grants should be pursued. Eudora should seek government and private funded grants to fund the bikeway network.

PRIVATE DEVELOPMENT

Currently when developers are proposing projects they are encouraged to consider bikeways and bike parking, but are not required to provide it. It is a plan recommendation to require developers to review the Bikeways Map (Figure 4.10) and install bike parking (like they do for vehicles). If a project is identified it should be completed as part of the development. The exact type of bikeway within major or minor separation or shared street will be determined by project engineers. The Facility Selection Criteria Chart in the Bikeway Design Guidelines (Appendix A) can be used as reference.

SAFE ROUTES TO SCHOOLS AND BIKEWAYS

Historically, Safe Routes to School (SRTS) infrastructure projects have focused on walking routes and sidewalk routes for kids bicycling. However, older students could bike to school on appropriate bikeways. When SRTS infrastructure projects are considered the Eudora Bikeways Map should be consulted to determine if bikeway network improvements can be coordinated with SRTS projects.

MAINTENANCE OF BIKEWAYS

Two types of maintenance apply to bikeways. First, is clearing of debris, leaves, sand, and snow. Eudora Parks and Recreation plows snow on shared use paths. Public Works clears sidewalk in front of City buildings and private property owners are required to clear their sidewalks.

Second is general upkeep and maintenance of bikeways. Concrete, asphalt, pavement markings, or flex posts are not built to last forever. Potholes, general wear and tear, and surface defects happen over time and with weather events. The City doesn't currently have a good plan for maintaining bikeways. It is a plan recommendation to develop a systematic approach to maintaining bikeways (including marked shared lane pavement markings).

E. 7TH ST,
EUDORA, KS

Bike Parking

Bikeways are only one component in creating a bicycle friendly community. Bike parking encourages people to commute by bicycle.[1] Currently Eudora does not have any requirements for bike parking, except in the Nottingham Tenant Guide. Imagine riding your bike somewhere, but you do not have a good place to lock it up. That leads to nervousness to let the bike out of view and makes you not want to ride to any destinations. As mentioned previously, it is a plan recommendation to require developers to install bike parking. The recommended short-term and long-term bike parking is described below.

Best Practices Guide
Association of Pedestrian and Bicycle Professionals has several guides:
https://www.apbp.org/bicycle-parking-solutions

Short-term bicycle parking – Short-term parking is designed to meet the needs of people making quick stops typically lasting up to two hours. Short-term parking needs to be located in highly-visible locations and have two anchor points where bicycles can be secured using U-shaped locks. Inverted U's, post and ring, and corrals are good short-term bicycle parking types.

Temporary bike parking at special events should be encouraged. Some special event attendees would prefer to ride their bicycle to the event. Bike parking needs to be provided in designated locations. Preferably, bike parking or bike valets should be located in highly visible places near main entrances. Bike parking should be placed within temporary barriers to direct bicycle riders to a single entrance and exit; this prevents theft and pedestrian traffic interference.

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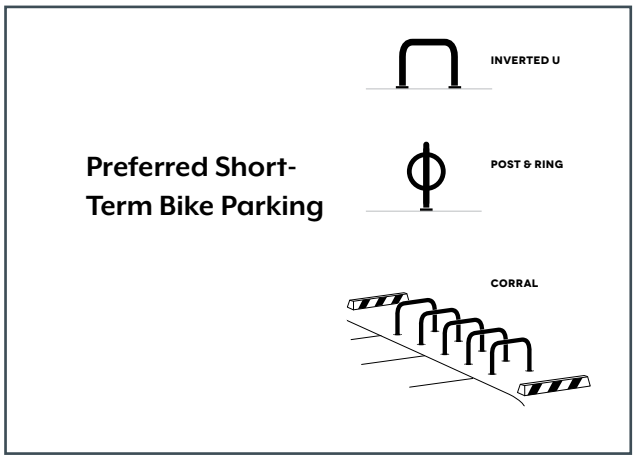
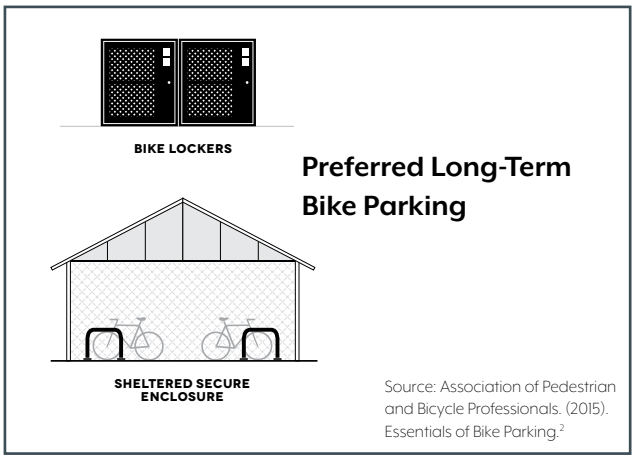




Source: Association of Pedestrian and Bicycle Professionals. (2015). Essentials of Bike Parking.[2]

Nottingham Tenant Guide
The Tenant is encouraged to provide at least 3 short-term bicycle parking spaces or short-term bicycle spaces equal in number to at least 10% of the actual number of off-street vehicle parking spaces provided, whichever is greater. "Inverted-U" or "staple" type bike racks are preferred. Locations shall be close to entrances and not next to trash dumpsters. The city planning and development director is authorized to approve alternative designs that offer an equivalent level of safety, security and effectiveness.
https://cityofeudoraks.gov/DocumentCenter/View/363/Nottingham-Guidelines_2011-Update?bidId=

1 Cycle Note, Queensland Transport. (2006, June). End-of-trip facilities for bicycle riders. Retrieved November 12, 2018, from https://www.bikeleague.org/sites/default/files/BFB_Queensland_End_of_trip_facilities_for_bicycle_riders.pdf

2 Association of Pedestrian and Bicycle Professionals. (2015). Essentials of Bike Parking. Retrieved November 12, 2018, from https://www.apbp.org/assets/docs/EssentialsofBikeParking_FINA.pdf

Bikeway Types

Refer to the regional overview for more detailed information about each bikeway type and the results of the countywide survey providing level of comfort for each type.

Major Separation

Shared Use Path/Sidepath
(BLUE JACKET TRAIL PARK, EUDORA, KS)

Cycle Track/Protected Lane
(INDIANAPOLIS, IN)

Minor Separation

Buffered Bike Lane
MASSACHUSETTS ST. AND E. 13TH ST., LAWRENCE, KS

Bike Lane
(MONTEREY WAY AND PETERSON RD., LAWRENCE, KS)

Shared Street

Bike Boulevard
(21ST ST. AND OUSDAHL RD., LAWRENCE, KS)

Bike Advisory Lane
(HANOVER, NH)

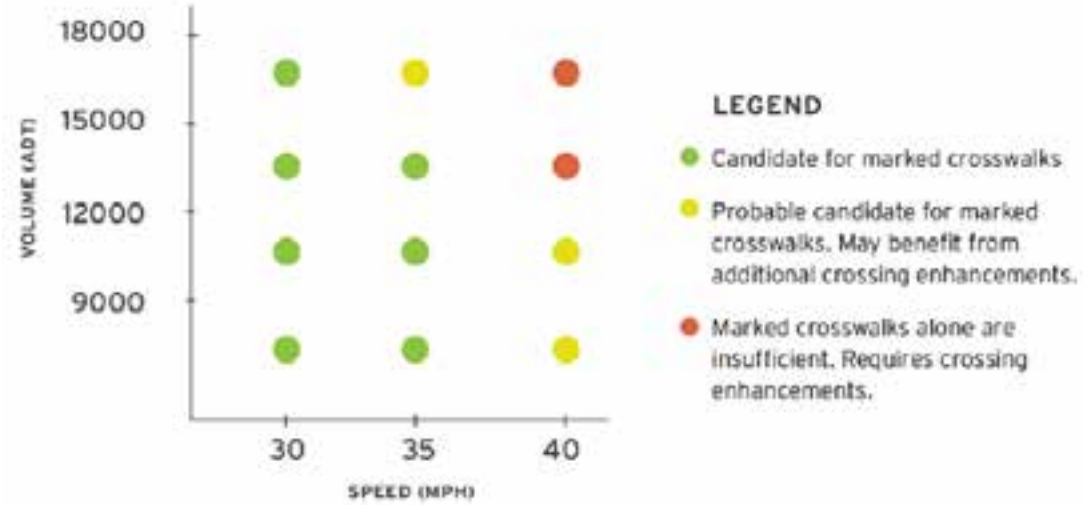
Marked Shared Lane (Sharrow)
(LAWRENCE, KS)

Roadway with Paved Shoulder
E 600 RD., DOUGLAS COUNTY, KS

Crossings

Bikeway crossings are some of the most dangerous locations for a bike rider because of the potential conflict with motor vehicles. The Federal Highway Administration developed an informative guide called Small Town and Rural Multimodal Networks. It illustrates different bikeway types and ways to improve safety when bikeways have crossings. A major component of safety is the speed of vehicles and the number (or volume) of vehicles. Essentially the higher the speed and number of vehicles need more infrastructure to support safety; Figure 4.5 shows this relationship. Intersection enhancements include: Marked Crosswalks, Median Safety Islands, Rectangular Rapid Flash Beacons (RRFB), Pedestrian Hybrid Beacons (or HAWK).[1]

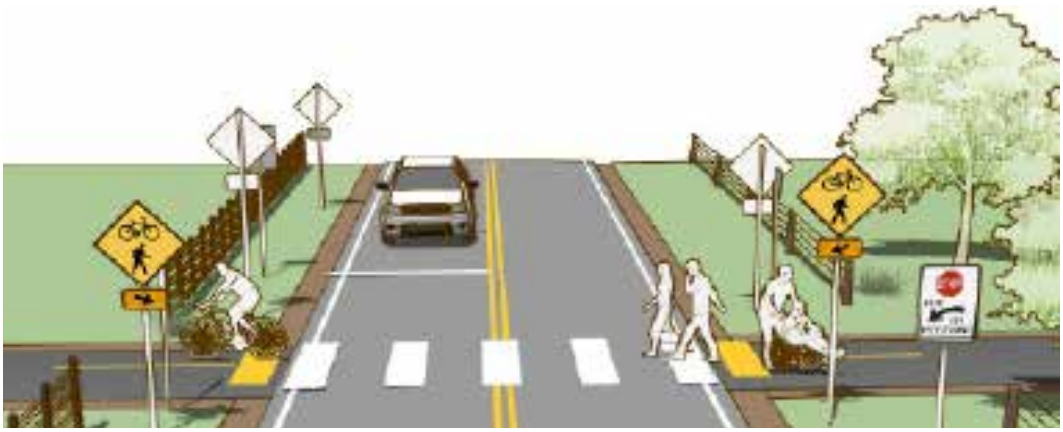
Figure 4.5: Type of Intersection Enhancements by Speed and Volume of Vehicles



Source: Small Town and Rural Multimodal Networks, page 4-7 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf Chart adapted from FHWA Safety Effects of Marked Crosswalks at Uncontrolled Locations 2005 Table 2-11 (data for two-lane roadway at non school crossings).

A Marked Crosswalk may be appropriate at crossings with low motor vehicle speeds and volumes (Figure 4.6).

Figure 4.6: Marked Crosswalk



Source: Small Town and Rural Multimodal Networks, page 4-7 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

A median safety island allows space for bicycle riders and pedestrians to wait in the middle of the road in case they are not able to cross all at once. This is intented for roads with higher speeds or numbers of vehicles or three or more travel lanes. Figure 4.7 shows an example of a Median Safety Island.

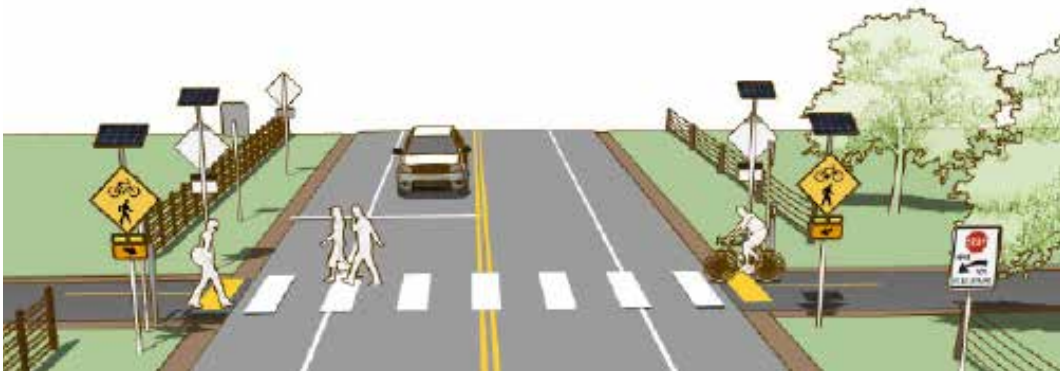
1 Federal Highway Administration. (2016) Small Town and Rural Multimodal Networks. Pages 4-7 and 4-8. Accessed on October 21, 2020 from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Figure 4.7: Median Safety Island

Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

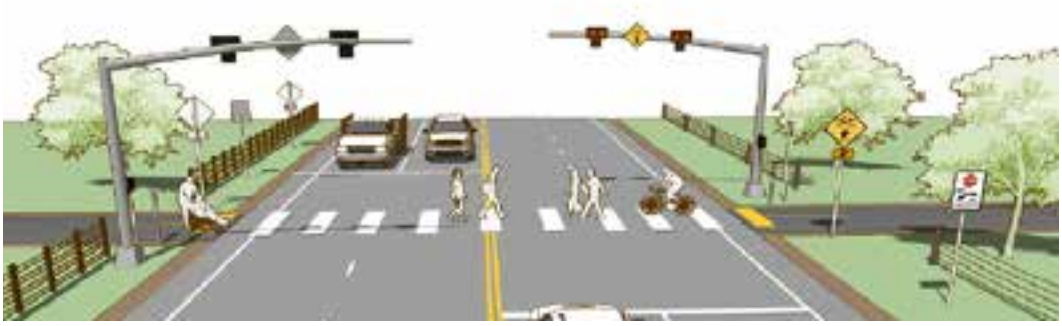
For greater visibility, a Rectangular Rapid Flash Beacon (RRFB) or Pedestrian Hybrid Beacon (also known as a HAWK signal) can be used to actively indicate to drivers someone desires to cross the street. RRFBs are typically used on lower volume streets, while Pedestrian Hybrid Beacons are used in locations with mulitiple lanes or higher volume streets with few gaps for crossing bicycle riders or pedestrians. A RRFB is shown in Figure 4.8, while a Pedestrian Hybrid Beacon is shown in Figure 4.9.

Figure 4.8: Rectangular Rapid Flash Beacon (RRFB)



Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Figure 4.9: Pedestrian Hybrid Beacon (HAWK)



Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

EUDORA BIKEWAY SYSTEM MAP

The Eudora Bikeway System Map was created by incorporating the City's Parks and Recreation Master Plan (2012)[1], coordinating with the Safe Routes to School plan, evaluating the previous Countywide Bikeway Plan, and reviewing best practices.

As in the Safe Routes to School Plan, the highest priority needs are those that serve the school campuses. Six potential grade separated crossings along K-10 are identified on the Bikeway Map (Figure 4.10). Not all of these crossings are necessary, especially the two highlighted with orange. The crossing at Church and K-10 is the highest priority future crossing as students currently cross the intersection to transverse to the Middle and High Schools south of K-10. The crossing at Elm Street is a short term alternative which could improve the crossing before the K-10 bridge is rebuilt.

Further, as part of the Parks and Recreation Master Plan, recreational bikeways along stream corridors going north south both west and east of Church Street were identified. In this Plan, these bikeways are identified as riparian bikeways because they may be comprised of different materials than other segments of the bikeway such as crushed gravel rather than concrete.

While acknowledging Eudora does not have dedicated funding for bicycle projects, many bikeway projects have been achieved through KDOT Transportation Alternative funding. Eudora should continue to pursue state and grant funding to build the bikeway network, but relatively low cost projects can help build out a low stress network.

Shared streets can be signed and marked as shared streets either — bike boulevards, bike advisory lanes, or have Shared-Lane Markings. This can be accomplished by simply painting the appropriate line/symbol on the road, which has adequate width, and placing signs. The type of bikeway is determined by the number of motor vehicles. See the Bikeway Design Guide in Appendix A for specific installation conditions.

Future Bikeways are identified as either major or minor separation, shared streets, or riparian. The exact type of bikeway will be determined when projects are designed and built.

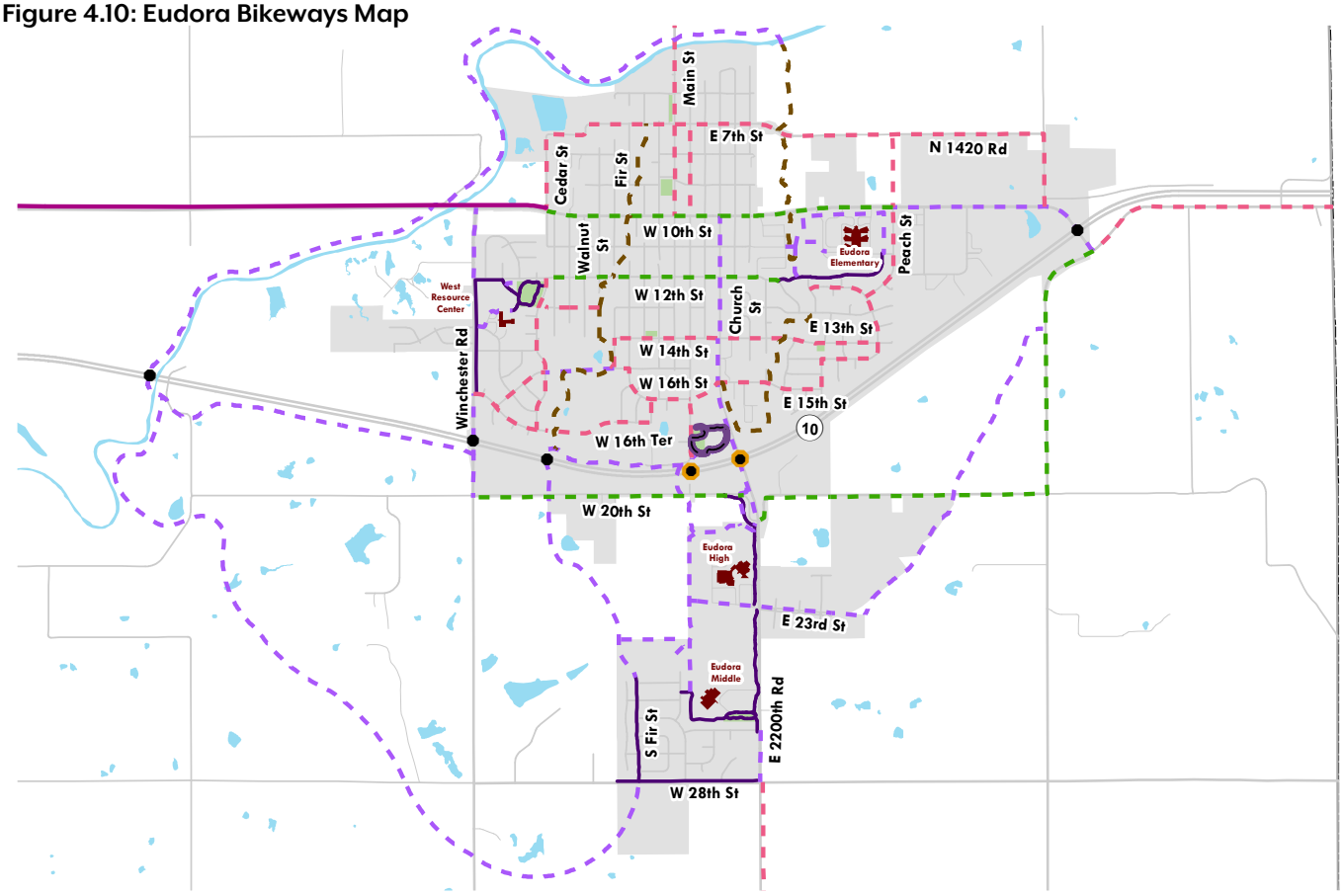
There are 33.5 miles of planned future bikeway in Eudora. Of the planned mileage 8.8 miles are identified as future shared streets (bike boulevards, bike advisory lanes, and shared-lane markings). The City should evaluate the streets to identify the appropriate type of shared street and install the necessary infrastructure necessary to improve the comfort of bicycle riders on the street. Depending on the necessary infrastructure these could be implemented with fairly low cost materials (paint, signs, etc).

This Bikeway Plan sets a goal to increase the mileage of bikeway from 3.9 miles to 7.8 miles (an increase of 4 miles) by 2030. Further, the Plan sets a goal of improving the K-10 crossing to increase safety of non-motorized users by 2025.

BIKE PARKING AT THE EUDORA PUBLIC LIBRARY
EUDORA, KS

1 https://www.cityofeudoraks.gov/DocumentCenter/View/221/Eudora-Parks-and-Recreation-Master-Plan?bidId=

Figure 4.10: Eudora Bikeways Map



Click above to view an interactive map.

Bikeway Types

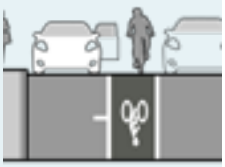
Major Separation

Shared Use Path

Cycle Track/ Protected Lane

Minor Separation

Buffered Bike Lane



Conventional Bike Lane

Shared Street

Marked Shared Lane (Sharrow), Bike Advisory Lane, Bicycle Boulevard, & Roadway with Paved Shoulder

*The heading color matches the future bikeway type in the map.

IMPLEMENTING POLICIES AND PROGRAMS

A wide range of policies and programs are listed in Appendix C: Bikeway Toolbox, but the following items are specifically identified as appropriate for Eudora.

Education and Enforcement

- Implement the Eudora Safe Routes to School (SRTS) programs improve education and encouragement strategies for walking and bicycling to school, and expanding programing for learning safe traveling behaviors for walking, biking, and driving.
    - Obtain a bike fleet and teach Bike Education Safety Training (LBEST), implement policies that ensure walking or biking to school is feasible and encouraged, host walk and bike to school days, and others found in the Action Plan table on page 34 of the Eudora Safe Routes to School Plan.
- Enforce the rules of the road for bicycle riders and drivers to improve the safety for all road users. Utilize all technology available including the 3 ft passing enforcement device (shown on the next page) and speed monitoring devices to enforce regulations consistently.
- Develop a bicycle friendly driver education program and work to incorporate the curriculum into driver training.
- Promote the Lawrence-Douglas County MPO produced Rideability Map to assist bicycle riders in choosing routes.
- Support programs, like the Bicycle Friendly Businesses, bikeshare, community bike events, and weekly club rides, which increase access to bicycles, provides education about proper riding behaviors, and promotes a bicycling culture.

Engineering

- Establish data driven processes to support decision-making including asset management, conducting multimodal counts (active users and parked bikes), and crash report analysis.
- Construct and install bikeways, consistent with the bikeway plan during public and private roadway construction, reconstruction, maintenance and standalone projects. Pavement markings should be required when roads are resurfaced, where appropriate, based on the width of the street. Include wayfinding with bikeway projects.
- Evaluate shared streets to determine the appropriate type of bikeway — bike boulevards, bike advisory lanes, or Shared-Lane Markings — and install necessary infrastructure to improve the comfort of the shared streets.
- Consider adopting a complete streets policy.
- Continue to plan and budget to incorporate consideration for bicycle riders in street maintenance. Street maintenance includes: the general upkeep of pavement markings, concrete or asphalt condition, flex posts replacement, signage, and other maintenance elements; and maintaining operable bikeways cleared of debris and leaves, sand, snow, and ice.
- Modify development code/adopt design policies including street standards to support bicycle friendliness, end-of-trip amenities and bike parking. Apply regulations to retrofit existing developments. Evaluate street standards to determine if streets are too narrow to support on-street parking. Consider lowering the local speed limit to improve safety.
- Continue to pursue state and grant funding to install bikeways and crossing improvements.
- Improve the crossing conditions along K-10. As K-10 is a state road continuing conversations with KDOT to determine a location for improved pedestrian and bicycle traffic across K10 is necessary.
- Plan and install 3 feet passing signs in appropriate locations. Figure 4.11 displays the KDOT approved 3 feet passing sign.

Figure 4.11: KDOT Approved Sign

Evaluation

- Collect data to develop counts and participation data (including SRTS travel tally data, manual and automatic bicycle and pedestrian counts).
- Track plan performance through plan specific performance measures and measures from Transportation 2040.

The 3 ft passing enforcement device currently costs $1,480 and works by bouncing ultrasonic waves off of passing vehicles to measure the distance the passing vehicle is from the bicycle. Chattanooga, Tennessee and Austin, Texas are some of the jurisdictions using this device to educate and enforce the 3 ft passing law.

https://arstechnica.com/tech-policy/2015/06/police-use-ultrasonic-device-to-make-sure-drivers-stay-3-feet-from-cyclists

LECOMPTON

Table of Contents

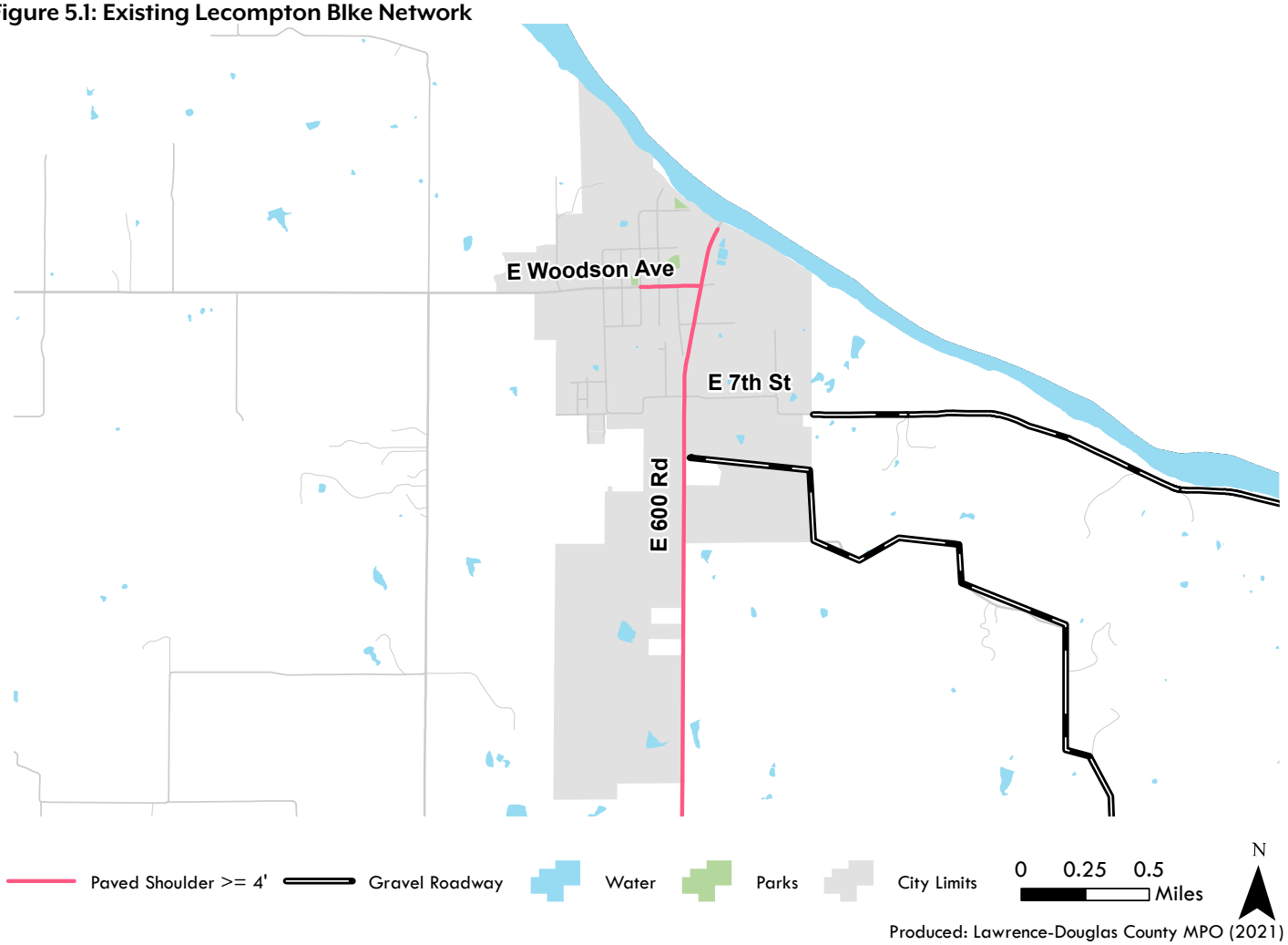
STREET NETWORK

Lecompton is a small city in the northwest corner of Douglas County. The City has approximately 627 residents and covers less than two square miles. The majority of streets in Lecompton carry very little traffic and do not need any special accommodations for bicyclists. East 600 Road/CR 1029, known as Eisenhower Memorial Drive within the City Limits, passes through Lecompton from north to south, and is the busiest street in the City. That street has ample paved shoulders from the Jefferson-Douglas County Line south through Lecompton and then along other county or state highways into the Lawrence City limits. North 2100 Road/CR 1023, known as Woodson Avenue within Lecompton, is the second busiest street in the City. That street is approximately 22 feet wide, and does not have paved shoulders.

EXISTING BICYCLE FACILITIES

E 600 Road and a portion of E Woodson Ave have adequate paved shoulder. Two gravel roadways extend out of Lecompton as shown in Figure 5.1.

Figure 5.1: Existing Lecompton Bike Network



Produced: Lawrence-Douglas County MPO (2021)

Click above to view an interactive map.

Barriers to Bicycling

Nationally the barriers to bicycling include concerns about traffic safety, lack of routes, weather, distance, and the absence of shower and parking facilities.[1] The national data corresponds to what we heard locally from the survey conducted over the summer of 2018; however, no one from Lecompton completed the survey so Lecompton specific data is not available.

While Lecompton has low traffic volume the lack of bikeway facilities may make some uncomfortable to try bicycling. As shown in the picture below, this portion of E Woodson Ave doesn't have a shoulder, which forces people to ride in the traffic lane or on the brick sidewalk, which is uncomfortable for most riders.

E WOODSON AVE,
LECOMPTON, KS

1 Reasons Why Bicycling And Walking Are And Are Not Being Used More Extensively As Travel Modes. (n.d.). National Bicycling And Walking Study, FHWA-PD-92-041. Retrieved November 12, 2018, from https://safety.fhwa.dot.gov/ped_bike/docs/casel.pdf.

GRANTS AND PRIVATE FUNDING

Lecompton should seek government (KDOT administered Transportation Alternative - TA grants) and private funded grants to fund the bikeway network.

MAINTENANCE OF BIKEWAYS

Currently there are no bikeways in Lecompton. However, if any bikeways are developed Leompton may be required to maintain them. There are two types of maintenance which would apply if future bikeways are installed.

First is clearing of debris, leaves, sand, snow, and ice. Second is the general upkeep and maintenance of projects. Concrete, asphalt, or pavement markings are not built to last forever. Potholes, general wear and tear, and surface defects happen over time and with weather events. A systematic approach to evaluating bikeway infrastructure and pavement markings condition would need to be used to assess needed maintenance.

Bicycle Parking

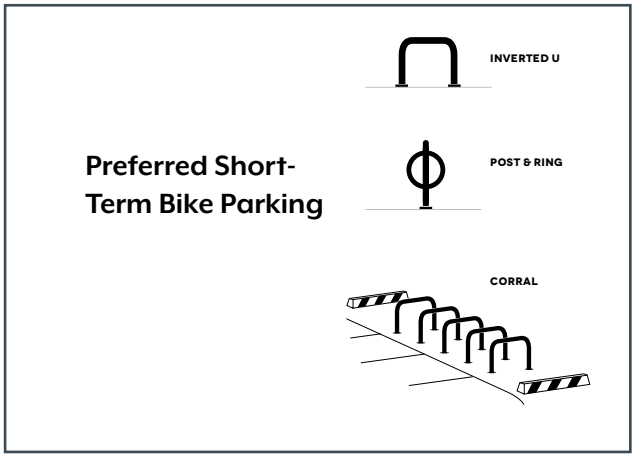
Bikeways are only one component in creating a bicycle friendly community. Bike parking encourages people to commute by bicycle.[1] Currently Lecompton does not have any requirements for bike parking. Imagine riding your bike somewhere, but you do not have a good place to lock it up. That leads to nervousness to let the bike out of view and makes you not want to ride to any destinations. The recommended short-term and long-term bike parking is described below.

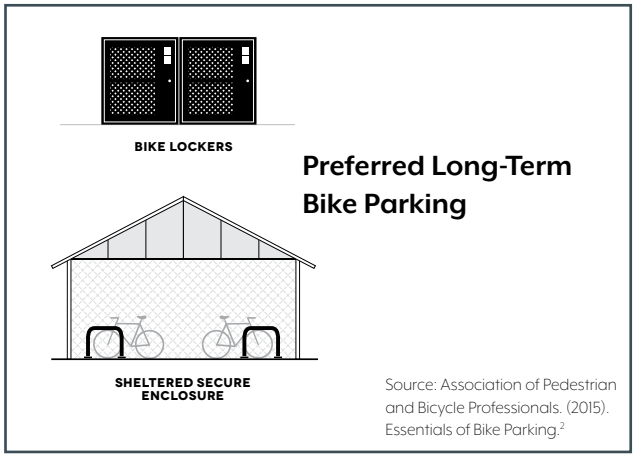
Short-term bicycle parking – Short-term parking is designed to meet the needs of people making quick stops typically lasting up to two hours. Short-term parking needs to be located in highly-visible locations and have two anchor points where bicycles can be secured using U-shaped locks. Inverted U's, post and ring, and corrals are good short-term bicycle parking types.

Best Practices Guide
Association of Pedestrian and Bicycle Professionals has several guides:
https://www.apbp.org/bicycle-parking-solutions

Temporary bike parking at special events should be encouraged. Some special event attendees would prefer to ride their bicycle to the event. Bike parking needs to be provided in designated locations. Preferably, bike parking or bike valets should be located in highly visible places near main entrances. Bike parking should be placed within temporary barriers to direct bicycle riders to a single entrance and exit; this prevents theft and pedestrian traffic interference.

Long-term bicycle parking – Long-term parking is designed to meet the needs of people (commuters, residents, and others) needing to lock their bike for longer than two hours. Long-term parking provides security and protection from weather. Long-term parking can take a variety of forms, including a room within a residential building or workplace, a secure enclosure within a parking garage, or a cluster of bike lockers at a transit center. Some long-term parking is open to the public and some of it is on private property with access limited to employees, residents, or other defined user groups.[2]





Source: Association of Pedestrian and Bicycle Professionals. (2015). Essentials of Bike Parking.[2]

1 Cycle Note, Queensland Transport. (2006, June). End-of-trip facilities for bicycle riders. Retrieved November 12, 2018, from https://www.bikeleague.org/sites/default/files/BFB_Queensland_End_of_trip_facilities_for_bicycle_riders.pdf

2 Association of Pedestrian and Bicycle Professionals. (2015). Essentials of Bike Parking. Retrieved November 12, 2018, from https://www.apbp.org/assets/docs/EssentialsofBikeParking_FINA.pdf

Bikeway Types

Refer to the regional overview for more detailed information about each bikeway type and the results of the countywide survey providing level of comfort for each type.

Major Separation

Shared Use Path/Sidepath
(PATH LEADING TO THE ELEMENTARY SCHOOL INTERMEDIATE CENTER, BALDWIN CITY, KS)

Cycle Track/Protected Lane
(INDIANAPOLIS, IN)

Minor Separation

Buffered Bike Lane
MASSACHUSETTS ST. AND E. 13TH ST., LAWRENCE, KS

Bike Lane
(MONTEREY WAY AND PETERSON RD., LAWRENCE, KS)

Shared Street

Bike Boulevard
(21ST ST. AND OUSDAHL RD., LAWRENCE, KS)

Bike Advisory Lane
(HANOVER, NH)

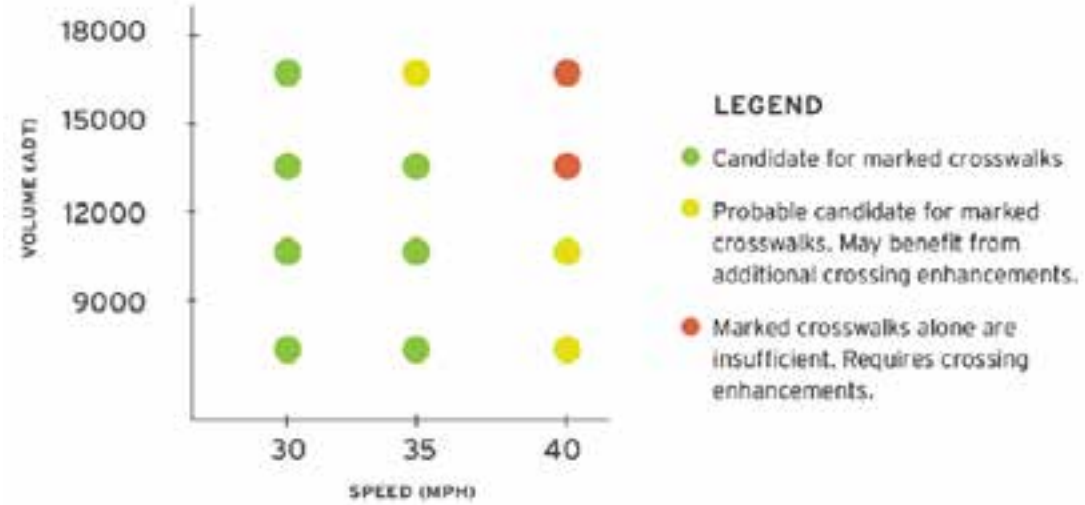
Marked Shared Lane (Sharrow)
(LAWRENCE, KS)

Roadway with Paved Shoulder
E 600 RD., DOUGLAS COUNTY, KS

Crossings

Bikeway crossings are some of the most dangerous locations for a bike rider because of the potential conflict with motor vehicles. The Federal Highway Administration developed an informative guide called Small Town and Rural Multimodal Networks. It illustrates different bikeway types and ways to improve safety when bikeways have crossings. A major component of safety is the speed of vehicles and the number (or volume) of vehicles. Essentially the higher the speed and number of vehicles need more infrastructure to support safety; Figure 5.2 shows this relationship. Intersection enhancements include: Marked Crosswalks, Median Safety Islands, Rectangular Rapid Flash Beacons (RRFB), Pedestrian Hybrid Beacons (or HAWK).[1]

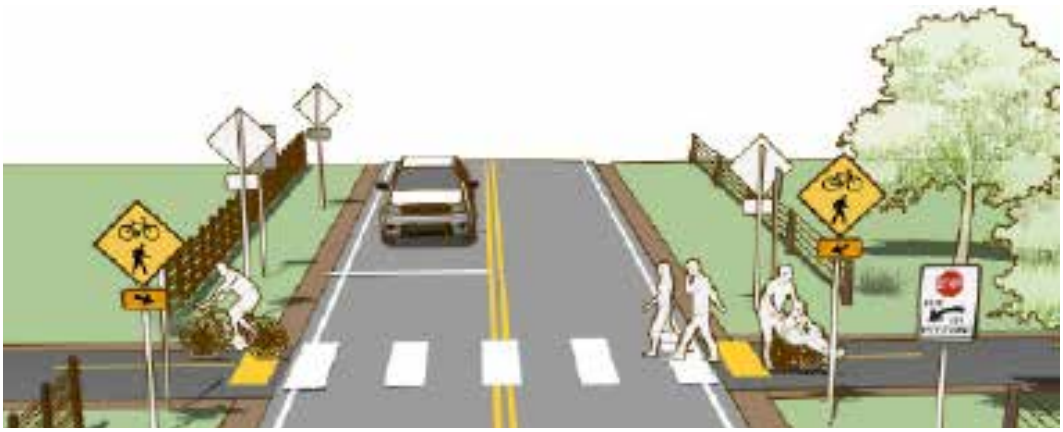
Figure 5.2: Type of Intersection Enhancements by Speed and Volume of Vehicles



Source: Small Town and Rural Multimodal Networks, page 4-7 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf Chart adapted from FHWA Safety Effects of Marked Crosswalks at Uncontrolled Locations 2005 Table 2-11 (data for two-lane roadway at non school crossings).

A Marked Crosswalk may be appropriate at crossings with low motor vehicle speeds and volumes (Figure 5.3).

Figure 5.3: Marked Crosswalk



Source: Small Town and Rural Multimodal Networks, page 4-7 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

A median safety island allows space for bicycle riders and pedestrians to wait in the middle of the road in case they are not able to cross all at once. This is intented for roads with higher speeds or numbers of vehicles or three or more travel lanes. Figure 5.4 shows an example of a Median Safety Island.

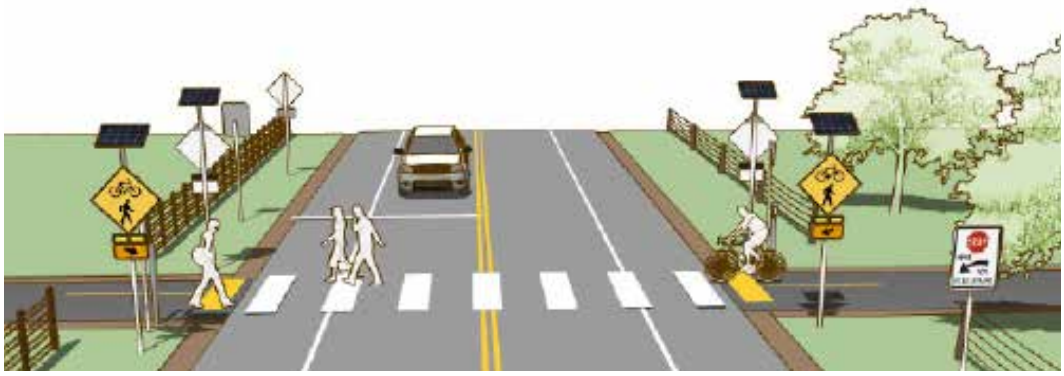
1 Federal Highway Administration. (2016) Small Town and Rural Multimodal Networks. Pages 4-7 and 4-8. Accessed on October 21, 2020 from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Figure 5.4: Median Safety Island

Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

For greater visibility, a Rectangular Rapid Flash Beacon (RRFB) or Pedestrian Hybrid Beacon (also known as a HAWK signal) can be used to actively indicate to drivers someone desires to cross the street. RRFBs are typically used on lower volume streets, while Pedestrian Hybrid Beacons are used in locations with multiple lanes or higher volume streets with few gaps for crossing bicycle riders or pedestrians. A RRFB is shown in Figure 5.5, while a Pedestrian Hybrid Beacon is shown in Figure 5.6.

Figure 5.5: Rectangular Rapid Flash Beacon (RRFB)



Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Figure 5.6: Pedestrian Hybrid Beacon (HAWK)

Source: Small Town and Rural Multimodal Networks, page 4-8 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

LECOMPTON BIKEWAY SYSTEM MAP

The Lecompton Bikeway System Map was created by evaluating the previous Countywide Bikeway Plan and reviewing best practices.

The City of Lecompton does not have dedicated funding for bicycle projects. The City should pursue funding through KDOT to expand the shoulders on N 2100 Rd to create an adequate shoulder bikeway or install a shared use path to provide a separated bikeway. Lecompton should also apply for grant funding. Relatively low cost projects can help build out a low stress network.

Shared streets can be signed and marked as shared streets either — bike boulevards, bike advisory lanes, or have Shared-Lane Markings. This can be accomplished by simply painting the appropriate line/symbol on the road, which has adequate width, and placing signs. The type of bikeway is determined by the number of motor vehicles. See the Bikeway Design Guide in Appendix A for specific installation conditions.

Figure 5.7 displays the Lecompton Bikeway System Map. All Future Bikeways are identified as shared streets. Several of the streets identified in Lecompton are maintained by Douglas County. The 2023 KDOT awarded Transportation Alternative (TA) grant includes 1.75 miles of Marked Shared Lane. These bikeways are shown as pending in Figure 5.7. To complete the network, an additional 0.57 miles of Marked Shared Lane is necessary on the west side of E 600 Rd. The only other remaining bikeway is E 7th St, which connects the gravel roadway to E 600 Rd. The exact type of bikeway will be determined when projects are designed and built.

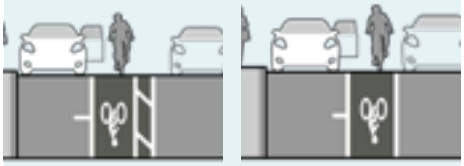
Bikeway Types

Major Separation

Shared Use Path

Cycle Track/ Protected Lane

Minor Separation



Buffered Bike Lane

Conventional Bike Lane

Shared Street

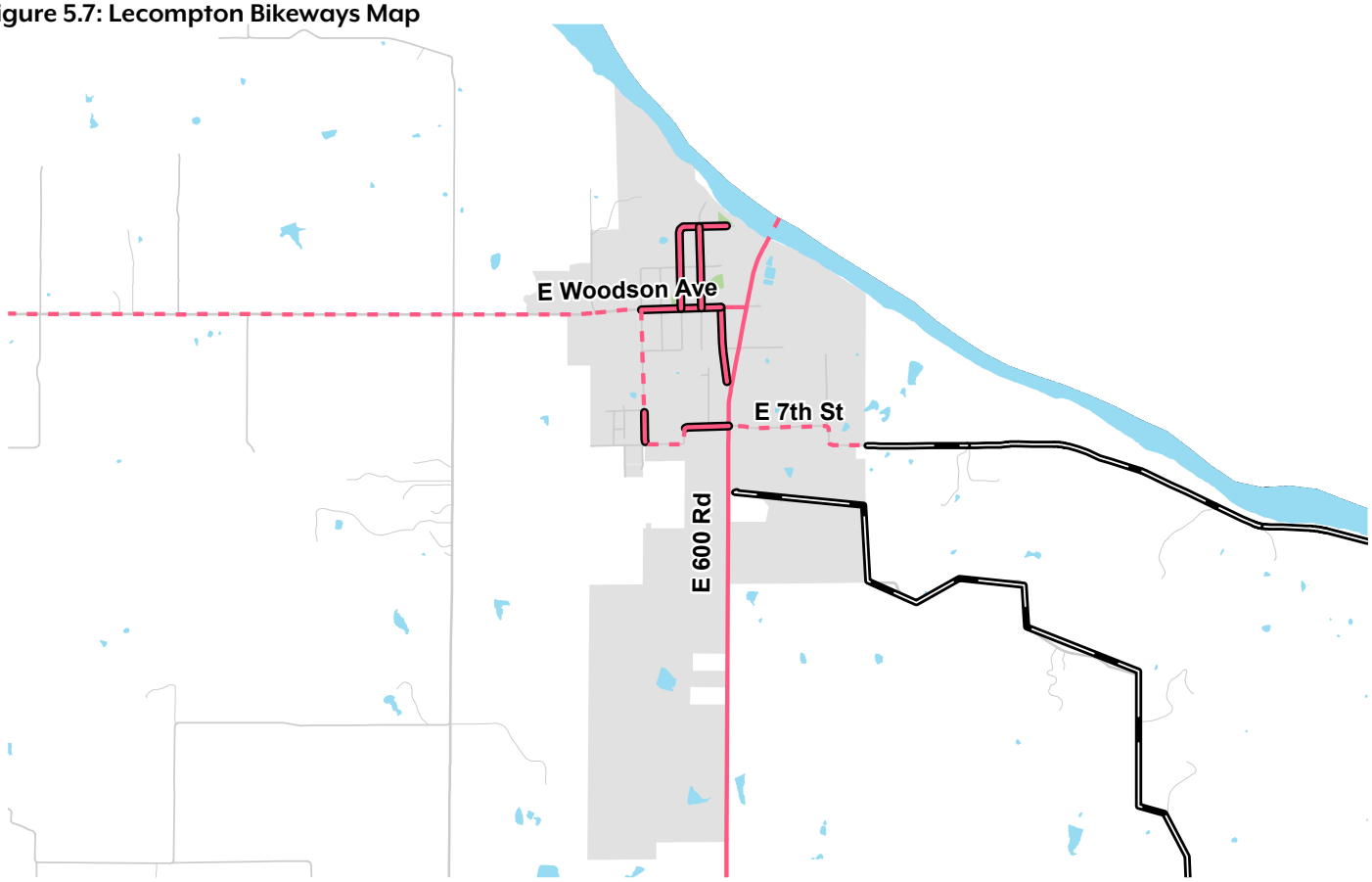
Marked Shared Lane (Sharrow), Bike Advisory Lane, Bicycle Boulevard, & Roadway with Paved Shoulder

*The heading color matches the future bikeway type in the map.

Recreational Gravel Road
(PAT DONNELLY RIDING IN RURAL DOUGLAS COUNTY)

Recreational gravel roads are exclusively in rural areas and are part of the bikeway system. Recreational gravel roads are considered a shared street.

Figure 5.7: Lecompton Bikeways Map



Click above to view an interactive map.

IMPLEMENTING POLICIES AND PROGRAMS

A wide range of policies and programs are listed in Appendix C: Bikeway Toolbox, but the following items are specifically identified as appropriate for Lecompton.

Education and Enforcement

- Enforce the rules of the road for bicycle riders and drivers to improve the safety for all road users. Utilize all technology available including the 3 ft passing enforcement device (shown on the next page) and speed monitoring devices to enforce regulations consistently.
- Promote the Lawrence-Douglas County MPO produced Rideability Map to assist bicycle riders in choosing routes.
- Support programs, like the Bicycle Friendly Businesses, community bike events, and weekly club rides, which increase access to bicycles, provides education about proper riding behaviors, and promotes a bicycling culture.

Engineering

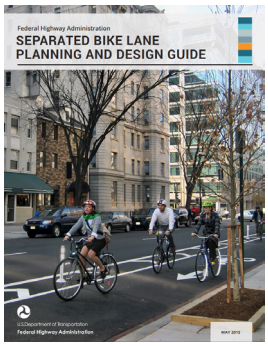
- Establish data driven processes to support decision-making including asset management, conducting multimodal counts (active users and parked bikes), and crash report analysis.
- Construct and install bikeways, consistent with the bikeway plan during public and private roadway construction, reconstruction, maintenance and standalone projects. Pavement markings should be required when roads are resurfaced, where appropriate, based on the width of the street. Include wayfinding with bikeway projects.
- Evaluate shared streets to determine the appropriate type of bikeway — bike boulevards, bike advisory lanes, or Shared-Lane Markings — and install necessary infrastructure to improve the comfort of the shared streets.
- Consider adopting a complete streets policy.
- Consider developing a systematic approach to maintaining streets and bikeways.
- Consider lowering the local speed limit to improve safety.
- Continue to pursue state and grant funding to install bikeways and crossing improvements.
- Plan and install 3 feet passing signs in appropriate locations. Figure 5.8 displays the KDOT approved 3 feet passing sign.

Evaluation

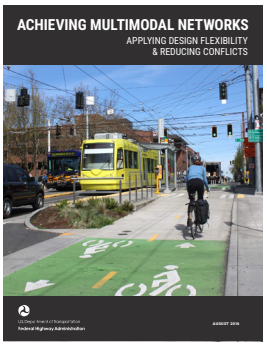
- Track plan performance through plan specific performance measures and measures from Transportation 2040.

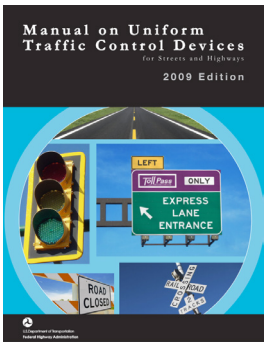
Figure 5.8: KDOT Approved Sign

Appendix A: Bikeway Design Guide


Federal Highway Administration
SEPARATED BIKE LANE
PLANNING AND DESIGN GUIDE


Fundamentals of Bicycle Boulevard
Planning & Design
July 2009
ibpi
alta


ACHIEVING MULTIMODAL NETWORKS
APPLYING DESIGN FLEXIBILITY
& REDUCING CONFLICTS


Manual on Uniform
Traffic Control Devices
for Streets and Highways
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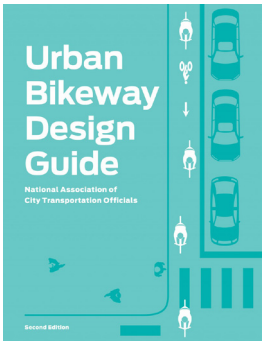
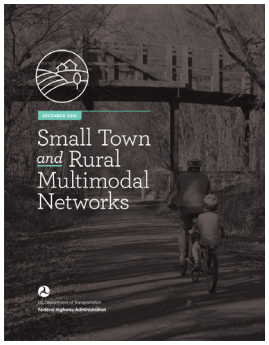
LANE
ENTRANCE
ROAD
CLOSED


Urban
Bikeway
Design
Guide
National Association of
City Transportation Officials
Second Edition

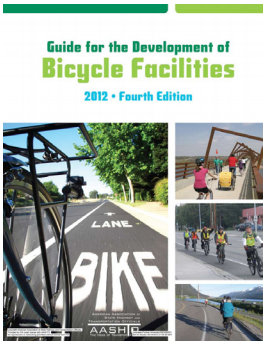

Designing for
All Ages & Abilities
Contextual Guidance for
High-Comfort Bicycle Facilities
December 2017


Small Town
and Rural
Multimodal
Networks


Urban
Street
Design
Guide
National Association of City Transportation Officials


SEPARATED BIKE LANE
PLANNING & DESIGN GUIDE


Don't Give Up
at the Intersection
Designing All Ages and Abilities
Bicycle Crossings
May 2019


Guide for the Development of
Bicycle Facilities
2012 • Fourth Edition
BIKE
LANE
AASHTO

Reference Guide

American Association of State Highway and Transportation Officials (AASHTO)

- AASHTO Guide for the Development of Bicycle Facilities

Alta Planning + Design

- Fundamentals of Bicycle Boulevard Planning & Design

Federal Highway Administration (FHWA)

- Small Town and Rural Multimodal Networks
- Manual on Uniform Traffic Control Devices
- Separated Bike Lane Planning and Design Guide
- Achieving Multimodal Networks

National Association of City Transportation Officials (NACTO)

- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- NACTO Designing for All Ages & Abilities: Contextual Guidance for High-Comfort Bicycle Facilities
- NACTO Don't Give Up at the Intersection

Massachusetts Department of Transportation

- Separated Bike Lane Planning & Design Guide

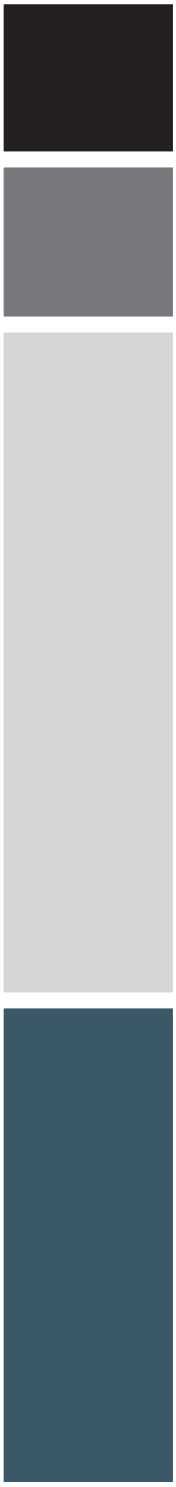
Table of Contents

Guide Purpose

The purpose of this guide is to provide a toolbox of available bicycle related facility and treatment options. This guide is not intended to create a standard, warrant, or mandate or supersede the City of Lawrence design criteria, codes, or standards. Application of bike guide elements should be accompanied by appropriate public involvement and engineering study. Final bicycle elements and design features will be approved by the City Engineer. This guide provides a supplement to the Lawrence Bike Plan in an effort to create a more bikeable city.

Types of Bicycle Riders

Lawrence is a diverse community composed of urban, suburban, and rural roadways. This diversity makes bicycle facility design complex and requires special attention to the abilities of each resident. In order for a bikeway to successfully serve the needs of all residents, it is important to take into consideration the varying skill and confidence levels that comprise each community. Different facility types will naturally appeal to different types of riders, and create opportunities that helps make riders feel more confident which each trip they take.



4-7%

Highly confident

Bicycle riders are comfortable sharing the road with vehicles and will ride in nearly any road conditions or environment.

5-9%

Somewhat confident

Bicycle riders will ride comfortably on most types of streets, but may be uncomfortable in certain situations or road conditions.

51-56%

Interested but concerned

Bicycle riders require physical bicycle infrastructure improvements before they will choose to ride.

31-37%

Not able or interested

People who identify as not able or interested will not ride a bicycle, no matter the circumstances.

These percentage values are typical ranges for most US communities.

Dill, Jennifer and McNeil, Nathan, Revisiting the Four Types of Cyclists: Findings from a National Survey, Transportation Research Record: Journal of the Transportation Research Board, January 1, 2016.

Designing for All Ages and Abilities

To achieve growth in bicycling, bikeway design should meet the needs of a broader set of potential bicycle riders. Many existing bicycle facility designs exclude many people who might otherwise ride, favoring very confident riders.

PEOPLE WITH DISABILITIES

High comfort bicycle facilities provide comprehensive mobility options, have positive health impacts, and ensure full independence. A high quality bicycle network is designed to accommodate adaptive bicycles, which may include tricycles or recumbent handcycles that typically operate at lower speeds, are lower to the ground, or are wider than other bicycles.

SENIORS

A safe, well-designed bicycle network allows seniors to make more trips and provides a higher degree of mobility. Bikeway design should take into consideration those who have poor eyesight and incorporate features which are suitable for slower riding speeds.

WOMEN

For some women, concerns about personal safety often go beyond traffic stress and separation, although the share of women riding does increase in correlation to better bicycle facilities.

CONFIDENT CYCLISTS

Confident cyclists are often very experienced and comfortable riding in mixed motor vehicle traffic, although they make up a small percentage of the bicycling population. They may still choose to ride in mixed traffic, but all ages and abilities facilities provide more safe route options.

LOW-INCOME RIDERS

Low-income bicycle riders often rely heavily on bicycles for a wide variety of essential transportation needs.

PEOPLE MOVING CARGO

Bicycle facilities that are designed with minimal design standards do not adequately accommodate bicycle and tricycles that are outfitted to carry multiple passengers or cargo. However, high quality facilities increase the amount of trips that can be made by bicycles.

CHILDREN

Bicycles can provide a greater sense of freedom and mobility for school-age children, who are an essential part of the cycling demographic. Children face unique risks compared to adults because they are smaller and less visible from the drivers seat, and often have less of an ability to negotiate conflicts.

BIKE SHARE USERS

Bike share users range in ability level and stress tolerance, and typically prefer to ride in high visibility networks.

Developing a Connected Network

No matter how many great bikeways are developed, if they are not connected, the network is not useful for riders. To develop a connected network the following actions need to be taken.

- Bikeways should be included on all new and reconstructed arterial and collector streets. The bikeway type should be determined based on the number and speed of vehicles during final design and engineering for the project (a chart is shown on the next page). Context sensitive solutions should be developed to provide comfortable bikeways. Even if a shared use path/side path is included with the project an on-street bikeway should also be included. Side paths are a good bicycle facility for some bicycle riders; however, they can present conflicts at intersections and driveways.

- Intersections should be addressed in project development. If intersections are not safe and comfortable, people will not use the bikeway. There are various treatments to improve intersections: bicycle/ pedestrian overpasses/underpasses, path crossing with high visibility markings or signs, raised path crossings, refuge islands, and many others.

- Projects should be evaluated by the Complete Streets policy and checklist to ensure streets appropriately accommodate motor vehicles, bicycle riders, and pedestrians. Lawrence, KS Complete Streets Policy.

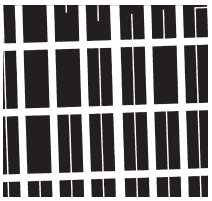
- When a development project occurs developers should build bikeway connections identified as future bikeways in the Lawrence Bikes Plan (Figure 19, page 38). This process will expand the bikeway network as developments connect into the wider network.

- While the most comfortable bikeway is desired, sometimes streets need to be retrofitted with quick and easy projects during a maintenance or striping project to at least expand the network. See the **Retrofitting Streets with the Next Best Facility** section for more information.

Context Matters

Street patterns greatly influence which bicycle facility is the most suitable for a given location. Typically development patterns fall into either "the grid" category or the "suburban/ cul-de-sac" category.

Grid



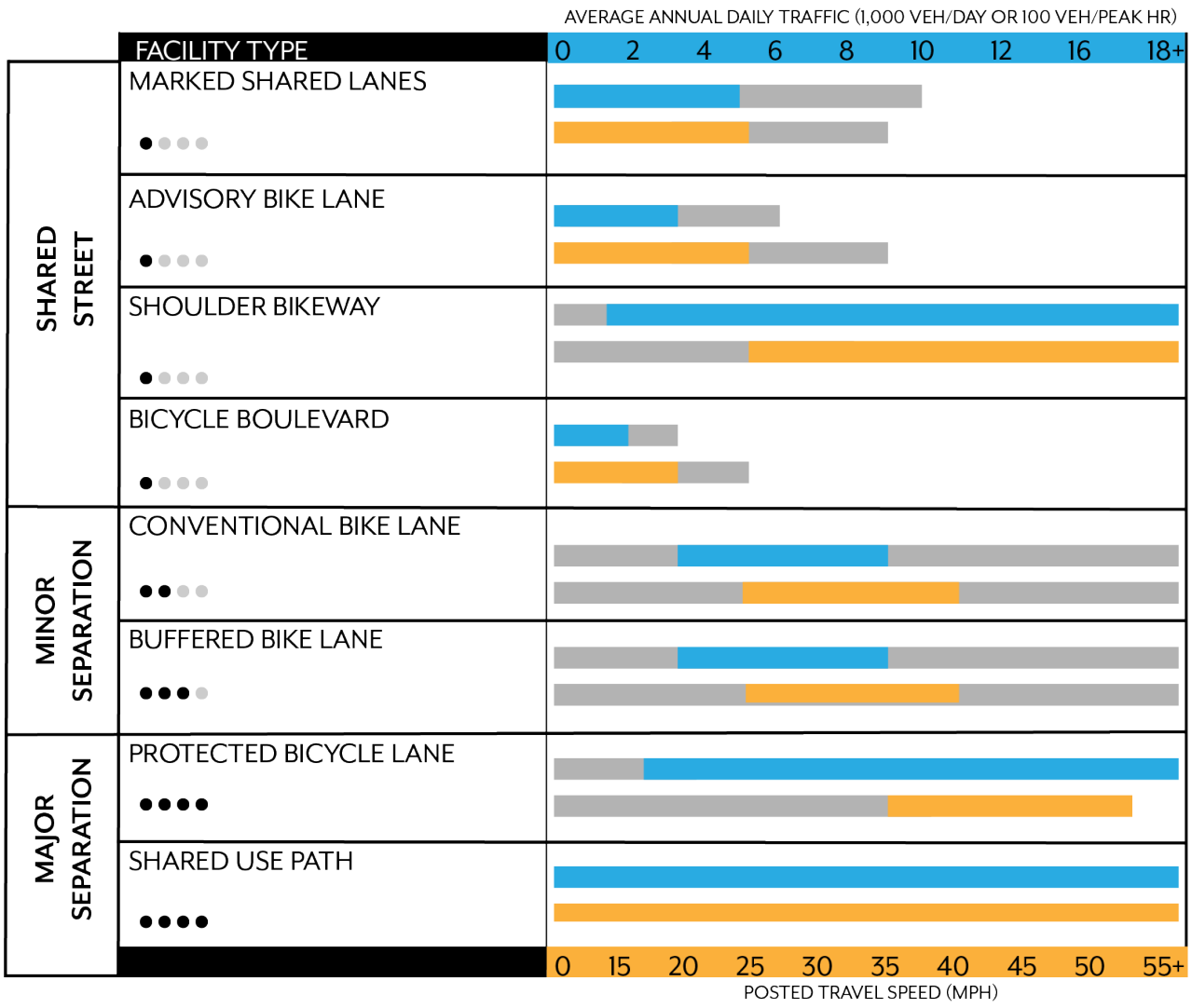
Traditional grid networks typically provide more continuous routes over long distances, provide numerous route options to destinations, and are generally easy to navigate for all modes of transportation .

Curvilinear

Curvilinear street patterns are good at limiting through traffic on residential streets, but often lack connectivity. Trips that are relatively short "as the crow flies" typically require a person to travel long distances just to get to a road that connects to their destination.

5TH ST, LAWRENCE, KS

Facility Selection Criteria



Proximity to motor vehicle traffic is a significant source of stress and discomfort for bicycle riders. There is no "one size fits all" criteria for bikeway design decisions, as user preference varies with bicycle rider's skill level, trip purpose, and individual characteristics. Motor vehicle operating speeds and traffic volumes are key factors to consider when deciding on an appropriate bicycle facility along a particular roadway. Typically, bicycle riders are less comfortable in areas with high motor vehicle volumes and faster speeds. In general, the greater the speed and volume of motor vehicle traffic, the greater the amount of separation that is required for a comfortable bicycle trip. It is possible that streets which have low speeds and low volumes require less separation. This guide is intended to select the facility that will provide the greatest amount of protection within the existing roadway context. To use the chart above, identify the appropriate daily traffic volume and travel speed on the existing or proposed roadway, and locate the facility types indicated by those key variables. Other factors beyond speed and volume which affect facility selection include traffic mix of automobiles and heavy vehicles, the presence of on-street parking, intersection density, surrounding land use, and roadway sight distance. These factors are not included in the facility selection chart below, but should always be considered in the facility selection and design process.

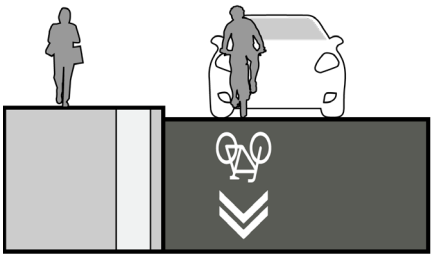
Bicycle Facility Classifications

The level of comfort is often dependent on the degree of separation from adjacent traffic.

LEAST

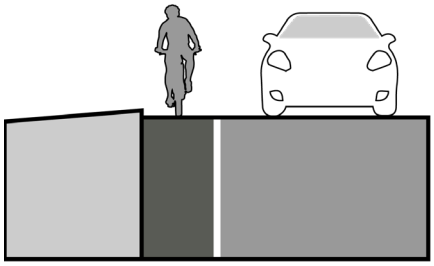
SEPARATION FROM TRAFFIC

MOST



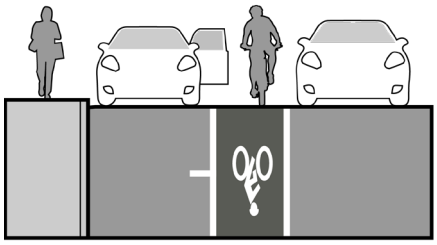
MARKED SHARED LANE

Shared Streets can take many forms: Shared-lane markings (Sharrows), Bike Advisory Lanes, and Bicycle Boulevards. Sharrows help position bicycle riders and provide visual cues to drivers. Bike Advisory Lanes have a single motor vehicle lane shared by vehicles going in both directions. When two oncoming vehicles meet, drivers yield to bicycle riders before merging into the bike lane. Bicycle Boulevards are streets with low motorized traffic volumes and speeds designated and designed to give bicycle riders and neighborhood motor vehicle traffic travel priority.



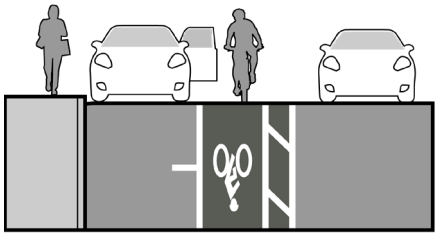
ROADWAY WITH PAVED SHOULDER

Paved shoulders are often used by bicycle riders. Because the portion of the roadway accommodates stopped vehicles and emergency use, it can require more caution than other elements of bicycle infrastructure.



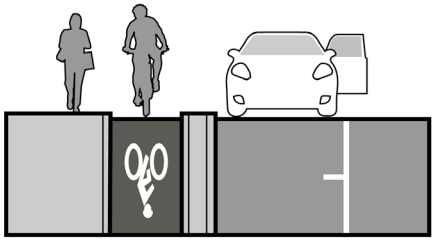
CONVENTIONAL BIKE LANE

A bike lane is a pavement marking located adjacent to motor vehicle travel lanes and flows in the same direction as travel, unless it is designed as a contraflow bike lane where bike traffic flow in the opposite direction of vehicle traffic on a one-way street.



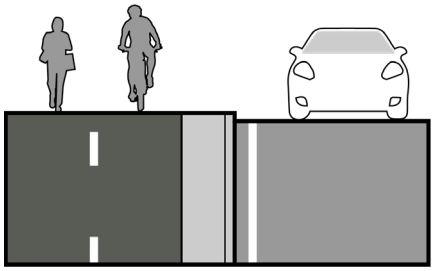
BUFFERED BIKE LANE

Buffered bike lanes are nearly identical to bike lanes, however they have a wider, striped buffer zone between the bike lane and the adjacent travel lane to establish a greater degree of separation.



PROTECTED BIKE LANE/CYCLE TRACK

Protected bike lanes and cycle tracks incorporate a combination of buffer space and vertical separation to alleviate many of the stressors of on-street bicycling.



SHARED USE PATH

Shared use paths provide a continuous corridor for bicycle riders and pedestrians that is separate from vehicular roadways. Paths work best when connected to an on-street network which meets robust safety and design standards.

Retrofitting Streets with the Next Best Facility

When the preferred bikeway facility type is not feasible within a project, temporary treatments like paint and flex posts can be used to establish a minimum network and maximize safety and comfort. The inability to provide the preferred bikeway should not result in the dismissal of other options. Although the facility may not be as comfortable or appealing as desired; it is still better than no bikeway facility. In the future, when there is a major roadway project or a stand alone bicycle/pedestrian project, the facility can be improved to the ideal bikeway. The idea is it is better to do something to connect bikeways than to do nothing waiting for full funding. The actual type of Next Best facility should be considered based on the context and constraints of the project including maintenance. It may also be necessary to consider alternative parallel routes.

There are several modification strategies to be used when roadways have surface projects to retrofit streets with the Next Best facility.

LAWRENCE, KS

Lane Reconfiguration

+ Reduce lanes and/or width of lanes
+ Adds room for bicycle amenities
+ Add/remove turning lane

Parking

+ Remove on-street parking when not warranted
+ Consider diagonal parking
+ Consider reverse angle parking

LAWRENCE, KS

Paint

+ Green paint (Lawrence has interim FHWA approval)
+ Paint mixing/conflict zones
+ Stripe bike lanes/buffered bike lanes
+ Bike boxes at intersections

JOSE, BEN. MARCH (2018). SFMTA. VALENCIA AT 18TH STREET SAN FRANCISCO, CA

Flex Posts

+ Inexpensive vertical barrier between motor vehicle traffic and bicycle riders
+ Prevents drivers from crashing into bicycle riders
+ Can be used to shorten crossing distances

Reverse Angle Parking

In areas with high parking demand and sufficient street width, diagonal parking is sometimes used to increase parking capacity and reduce travel speeds on streets that are excessively wide. Bike lanes should normally not be placed adjacent to conventional front-in diagonal parking, since drivers backing out of parking spaces have poor visibility of bicycle riders in the bike lane. The use of back-in diagonal parking can help mitigate the conflicts normally associated with bike lanes adjacent to angled parking. There can be numerous benefits to back-in diagonal parking for all roadway users[1]:

- Improved sight distance between exiting drivers and other traffic compared to parallel parking or front-in angled parking.
- No conflict between bicycle riders and open car doors.
- Passengers (including children) are naturally channeled toward the curb when alighting.
- Loading and unloading of the trunk occurs at the curb, not in the street.

When bike lanes are placed adjacent to back-in diagonal parking spaces, parking bays should be long enough to accommodate most types of vehicles.

Lawrence Standards for 60 Degree Reverse Angle Parking:
15' depth perpendicular to curb, including 2' minimum behind curb for bumper overhang, (a 5' sidewalk on back of curb would need to be 7'). Minimum width of stall of 9.5'

1 Guide for the development of bicycle facilities [4th Edition]. (2012). American Association of State Highway and Transportation Officials Retrieved November 12, 2018, from http://imentaraddod.com/wp-content/uploads/2017/07/AASHTO-GBF-4-2012-bicycle.pdf, page 4-17.

PHOTO SOURCE: SACHS, DAVID. (2017). *EYES ON THE STREET 11TH AVE. BIKE LANE AND ROAD DIET.* RETRIEVED FROM: HTTPS://DENVER.STREETSBLOG.ORG/2015/11/17/EYES-ON-THE-STREET-11TH-AVENUE-BIKE-LANE-AND-ROAD-DIET/ DENVER, CO

Use of Narrow Travel Lanes

The potential to add bike lanes by widening streets increases greatly when streets are reconstructed. However, to add bike lanes to an existing street, adequate width must be available. Many streets in Lawrence can accommodate bike lanes by re-striping the existing roadway, but some streets would require 10 or 11 foot wide travel lanes. Traditionally, 12 feet is the desired standard for motor vehicle travel lanes. Narrower lane widths have been avoided in the past due to concerns about vehicle occupant safety, congestion, and emergency vehicle access especially on arterial roadways. The only substantial research effort published which documented safety benefits were attributable to 12-foot lanes on rural two-lane highways. However, research on suburban and urban arterials has shown that 12 feet is not always needed for safety and capacity and lane widths between 10 feet and 11 feet on arterials and collectors do not negatively impact overall motor vehicle safety or operations. A summary of safety and capacity-related research is provided below.

Safety of Narrow Travel Lanes

A study by the Midwest Research Institute entitled Relationship of Lane Width to Safety for Urban and Suburban Arterials concluded, "That there is no indication that crash frequencies increase as lane width decreases for arterial roadway segments or arterial intersection approaches."[1] The study compared 408 miles of urban and suburban arterials under state and local jurisdictions in two states. The types of roads in the analysis included the following arterial roadway types:

- Two-lane undivided arterials
- Four-lane undivided arterials
- Five-lane arterials (two lanes each direction + center turn lane)
- Three-lane arterials (one lane each direction + center turn lane
- Four-lane divided arterials

According to the study, "A safety evaluation of lane widths for arterial roadway segments found no indication, except in limited cases, that the use of narrower lanes increases crash frequencies." Further, the study found, "The lane width effects in the analyses conducted were generally either not statistically significant or indicated that narrower lanes were associated with lower rather than higher crash frequencies." Similarly, the study found no indication, except in limited cases, that the use of narrower lanes for arterial intersection approaches increases crash frequencies.

It is important to note this study highlighted three situations in which the observed lane width effect was inconsistent including: lane widths of 10 feet or less on four-lane undivided arterials; lane widths of 9 feet or less on four-lane divided arterials; and lane widths of 10 feet or less on approaches to four-leg STOP-controlled arterial intersections. According to the study, these inconsistent findings do not mean that the use of narrower lanes must be avoided in these situations, but rather, "It is recommended that narrower lane widths be used cautiously in these situations unless local experience indicates otherwise."

The study also provides a caveat, "Lane widths less than 12 feet should be used cautiously where substantial volumes of bicycle riders share the road with motor vehicles, unless an alternative facility for bicycles such as a wider curb lane or paved shoulder is provided." This statement is intended to suggest bicycle riders' comfort and safety should be accommodated on projects where lanes are narrowed to add additional roadway capacity for drivers.

19TH ST, LAWRENCE, KS

1 Harwood, D. W., F. M. Council, E. Hauer, W. E. Hughes, A. Vogt. (2000, December). Prediction of the Expected Safety Performance of Rural Two-Lane Highways. Report FHWA-RD-99- 207. Federal Highway Administration Potts, I., Harwood, D. and Richard, K. (2007). Relationship of Lane width to Safety for Urban and Suburban Arterials. Washington, D.C. Transportation Research Board.

Bikeway facility types

Shared Street

Marked Shared Lane
Advisory Bike Lane
Roadway with Paved Shoulder
Bicycle Boulevard

OMAHA-COUNCIL BLUFFS METRO AREA

Minor Separation

Conventional Bike Lane
Buffered Bike Lane
Contra-flow bike lane

OMAHA-COUNCIL BLUFFS METRO AREA

Major Separation

Protected Bike Lane & Cycle Track
Shared Use Path & Sidepath

CHICAGO, IL

SHARED STREETS

Marked Shared Lanes
Advisory Bike Lanes
Roadway with Paved Shoulder
Bicycle Boulevard

Marked Shared Lanes

A key component of shared roadways is the presence of markings and signage that indicates to drivers the rights that bicycle riders have on the road. Shared-lane markings (sharrows) are used on streets where bicycle riders and motor vehicles share travel lanes. Sharrows help position bicycle riders and provide visual cues to drivers. They can be configured to offer directional and wayfinding guidance.

BENEFITS

+ Encourages bicycle riders to position themselves safely in lanes too narrow for a motor vehicle and a bicycle to comfortably travel side by side within the same traffic lane.
+ Alerts drivers to the potential presence of bicycle riders.
+ Indicates a proper path for bicycle riders through difficult or potentially hazardous situations, such as railroad tracks or "door zones" of parked cars.
+ Advertises the presence of bikeway routes to all users.
+ Requires no additional street space required.
+ Reduces the incidences of wrong-way bicycling and sidewalk riding.

PAVEMENT MARKINGS, LAWRENCE BICYCLE BOULEVARDS INFORMATIONAL WEBSITE

UNKNOWN LOCATION

WHAT ARE SHARROWS?

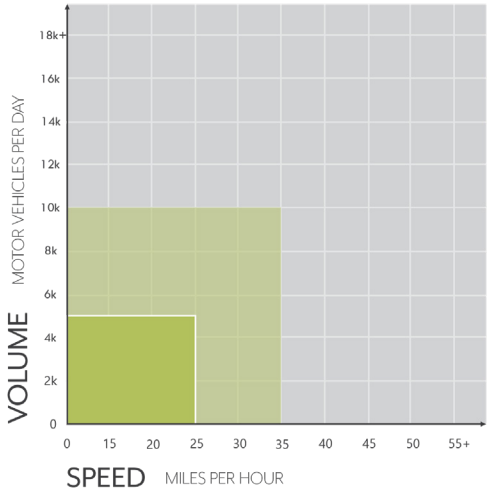
COMPATIBLE FEATURES

PAVEMENT MARKINGS

+ Sharrows
+ Place after intersections and no more than 250 feet apart after

SIGNAGE

+ Bike Route/Wayfinding
+ Bike May Use Full Lane
+ Share the Road



SOURCE: NACTO URBAN BIKEWAY DESIGN GUIDE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (2012).
AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES (2012).

LAWRENCE, KS

Advisory Bike Lane

Advisory bike lanes or dashed bike lanes are a type of a shared roadway which provide space for biking on low-volume, low-speed streets that are too narrow for conventional bike lanes. A single motor vehicle lane is established, where drivers share the single lane with oncoming vehicles. When two vehicles meet they yield to bicycle riders before merging into the dashed bike lane. This treatment is currently experimental and has to be approved by FHWA for each location or corridor rather than an agency wide basis.

BENEFITS

+ May reduce some types of crashes due to reduced motor vehicle travel speeds.
+ Increases predictability and clarifies desired lateral positioning between people bicycling or walking and people driving in a narrow roadway.
+ Functions well within a rural and small town traffic and land use context.
+ Supports the natural environment through reduced paved surface requirements.
+ Provides a delineated but nonexclusive space available for walking and biking on a roadway otherwise too narrow for dedicated shoulders.
+ Minimizes potential impacts to visual or natural resources through efficient use of existing space.
+ May function as an interim measure where plans include shoulder widening in the future.

ADVISORY SHOULDER. SMALL TOWN AND RURAL MULTIMODAL NETWORKS (2016).

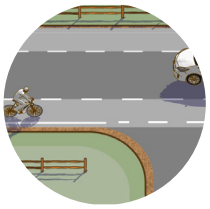
HANOVER, NH

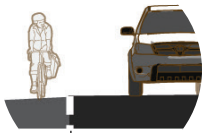
FUNDAMENTALS OF BICYCLE BOULEVARD PLANNING AND DESIGN (2009).

NETHERLANDS

Advisory Bike Lane

Compatible Features



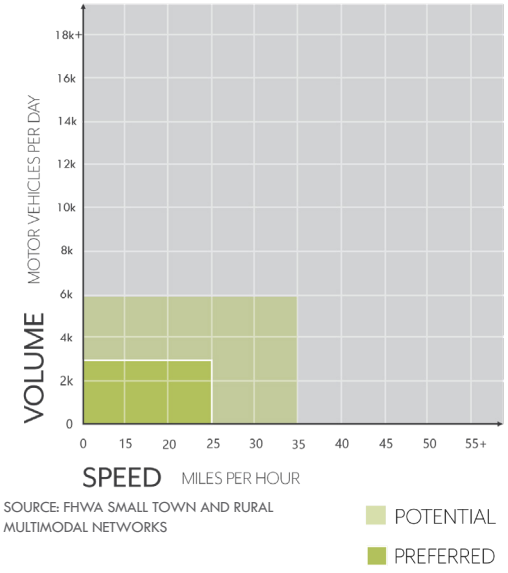


Clear pavement markings and signs

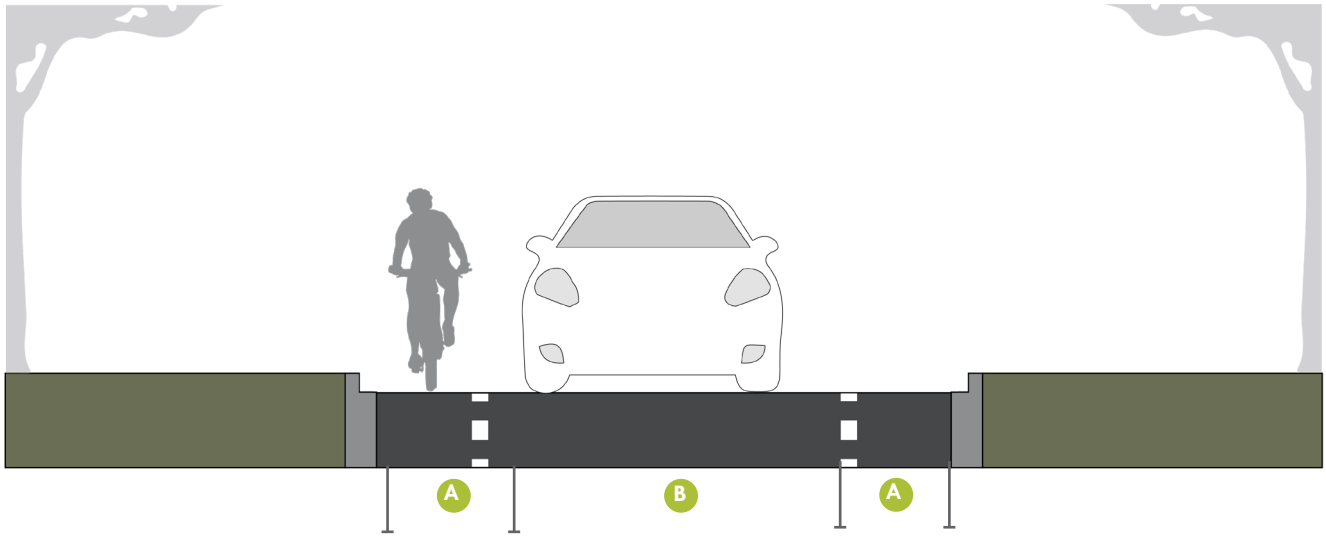
+ A broken line should consist of 3 feet segments and 6 feet gaps.
+ Solid white lines may be used when additional edge definition is needed.
+ Warning or explanatory signs.

Adequate space

+ To promote safe passing.
+ 6 feet width is preferred with a minimum of 4 feet when no curb or gutter is present.



SOURCE: FHWA SMALL TOWN AND RURAL MULTIMODAL NETWORKS



A Shoulder Area

B Travel Lane

Roadway with Paved Shoulder

Paved shoulders are most often used on rural roadways. Paved shoulders extend the service life of the road by reducing edge deterioration, and provide space for temporary storage of disabled vehicles. It is important to understand the differences between paved shoulders and bike lanes. Bike lanes are travel lanes, whereas in many jurisdictions, paved shoulders are not (and can therefore may be used for parking).

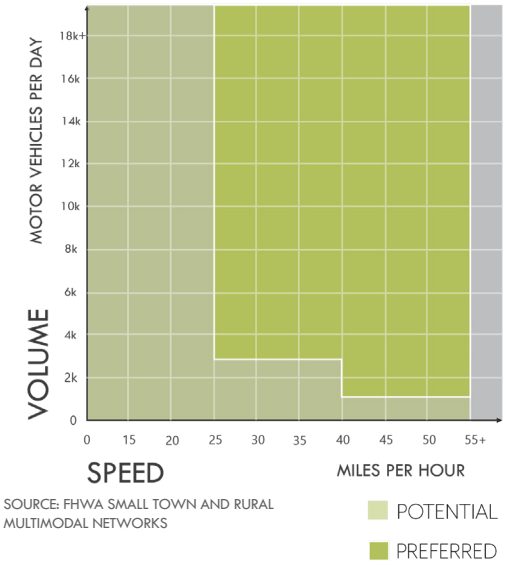
BENEFITS

+ Can reduce crashes where bicycle riders are struck from behind.
+ Improves bicycle riders' experiences on higher speed or volume roads.
+ Provides a stable surface off the road for pedestrians and bicycle riders when sidewalks are not present.
+ Provides more space for all road users including drivers, bicycle riders, and pedestrians.
+ Can provide safe bicycle connections to and from town centers and other attractions.

LECOMPTON, KS

Roadway with Paved Shoulder

Compatible Features



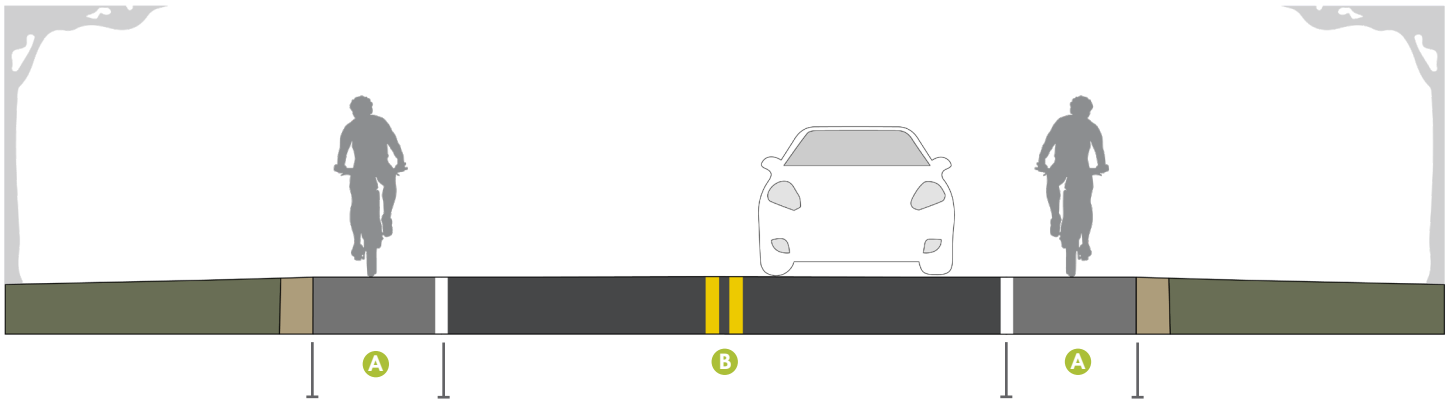
SOURCE: FHWA SMALL TOWN AND RURAL MULTIMODAL NETWORKS

Clear markings and signs

+ 1.5 - 4 feet optional buffer.
+ Rumble strips.
+ Contrasting paving materials.
+ No required signs, but could be used to identify the route as a bicycle boulevard signs.

Adequate space

+ To promote safe passing.
+ 5 to 7 feet required depending on the speed of the vehicle travel lane.



Ⓐ Shoulder Area

- Minimum width: 5 to 7 feet depending on speed of adjacent travel lane

Ⓑ Travel Lane

Bicycle Boulevard

Bicycle Boulevards are streets with low motorized traffic volumes and speeds, designated and designed to offer low-stress bicycle travel for all ages, safe crossings for pedestrians, placemaking opportunities, as well as allow for motor vehicle travel at low speeds. Bicycle boulevards use signs, pavement markings, and speed and volume management measures to discourage pass-through motor vehicle trips and create safe, convenient bicycle crossings of busier streets.

BENEFITS

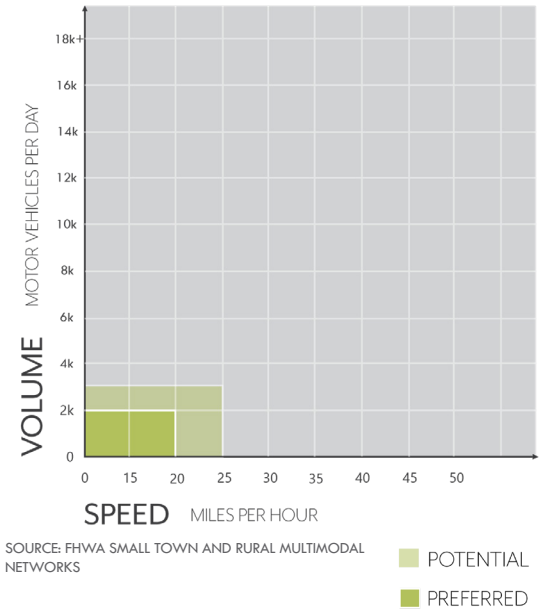
+ Provides direct access to destinations with minimal bicycle rider delay.
+ Easy to find and follow.
+ Slow motor vehicle speeds.
+ Reduced motor vehicle volumes.
+ Provides proper path and safe navigation.
+ Alerts drivers and prioritizes bicycle.
+ Reduces the incidence of sidewalk riding.

Photo Source: Russ Roca for PeopleForBikes

PORTLAND, OR

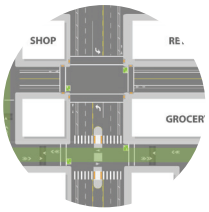
Bicycle Boulevard

A key component to the success of a bicycle boulevard is the application of design flexibility. There is no one-size-fits-all application. Instead, it's important to apply specific design features which are most suitable to the needs of a specific roadway.



SOURCE: FHWA SMALL TOWN AND RURAL MULTIMODAL NETWORKS

Compatible Features [1]



Route Planning

+ Continuous and direct route along low-traffic streets
+ Sensible patterns to ensure traffic flow

Signage

+ Identification Signs
+ Wayfinding Signs
+ Warning Signs

Pavement Markings

+ Bicycle Boulevard
+ Colored pavement
+ Sharrows
+ Conflict areas

Speed Management

+ Raised pavement
+ Lane reconfiguration
+ Reduced speeds

Volume Management

+ Street narrowing
+ Curb extensions
+ Diverters

Minor Street Crossings

+ Raised crosswalks
+ Pavement markings
+ Crossing islands

Major Street Crossings

+ Bike Box
+ Two-Stage Turn box
+ Signal Phasing
+ Bicycle Detection

Green Infrastructure

+ Bioswales
+ Infiltration basins
+ Permeable pavement
+ Street trees

1 Lawrence Bike Boulevards

MASSACHUSETTS ST,
LAWRENCE, KS

MINOR SEPARATION

Conventional Bike Lane
Buffered Bike Lane

Conventional Bike Lane

Conventional Bicycle lanes designate a portion of the roadway to be used by bicycle riders. Typically, they are one way facilities that carry bicycle traffic in the same direction as adjacent motor vehicle traffic, while safely separating each mode. Although separate, properly designed bike lanes encourage bicycle riders to operate in a manner consistent with the legal and effective operations of all vehicles. Contra-flow bicycle lanes can be implemented on one-way streets. Contra-flow bicycle lanes convert one way streets into two-way streets: one direction for bicycle riders and one way for drivers.

BENEFITS

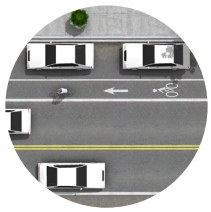
+ Increases bicycle rider comfort and confidence on busy streets.
+ Creates separation between bicycle riders and automobiles.
+ Increases predictability of bicycle rider and motorist positions and interaction.
+ Increases total capacities of streets carrying mixed bicycle and motor vehicle traffic.
+ Visually reminds drivers of bicycle riders' right to the street.
+ Contra-flow bike lanes reduce dangerous wrong-way riding and allow bicycle riders to use less trafficked streets leading to increased connectivity.

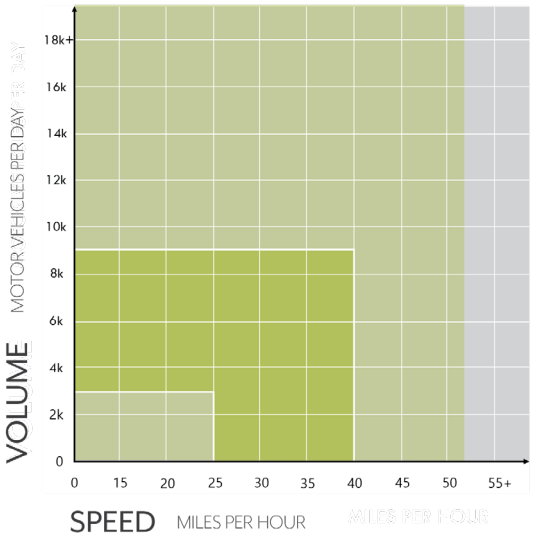
Photo Source: Dan Burden for PeopleForBikes

UNITED STATES

Conventional Bike Lane

Compatible Features





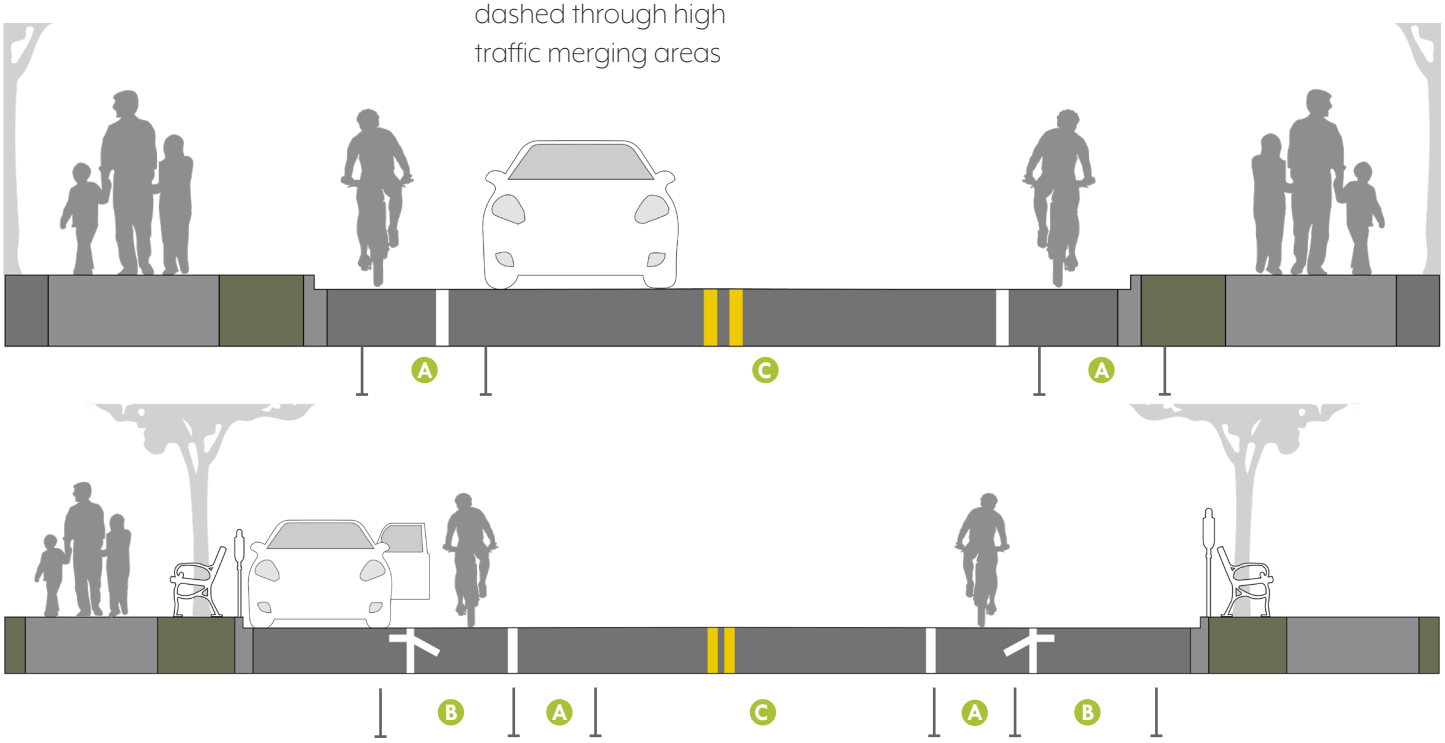
SOURCE: FHWA SMALL TOWN AND RURAL MULTIMODAL NETWORKS

Signage

+ "BIKE LANE" signs may be placed at the beginning of a marked lane on bike lanes adjacent to a curb.
+ "NO PARKING" signs may be used to discourage parking inside the bike lane.

Pavement Markings

+ Bicycle lane word and/or symbol.
+ Arrow markings.
+ Solid white line of 6 to 8 inches in width should be used to separate vehicle travel lanes
+ Lane stripping should be dashed through high traffic merging areas



A Bicycle Lane
- Bicycle lane symbol and arrow markings should be used to define the bike lane
- Minimum width: 5 to 7 feet wide depending on adjacent land uses
- Bicycle lane should be placed adjacent to curb
- A bike lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane

B Parking Lane
- If located adjacent to a parking lane, the bicycle lane should be placed between the parking area and the travel lane

C Travel Lane

Buffered Bike Lane

Buffered bike lanes are essentially conventional bicycle lanes with the added benefit of a designated buffer space that creates further separation between the bicycle lane and the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes should be considered wherever a conventional bike lane is being considered and on streets with high travel speeds and volumes.

BENEFITS

+ Provides greater distance between motor vehicles and bicycle riders.
+ Provides space for bicycle riders to pass without encroaching into the adjacent vehicle lane.
+ Encourages bicycle riders to ride outside of the door zone.
+ Appeals to a wider variety of bicycle users.
+ Contributes to the perception of safety among users of the bicycle network.

Photo Source: Adam Coppola for PeopleForBikes

CHICAGO, IL

Buffered Bike Lane

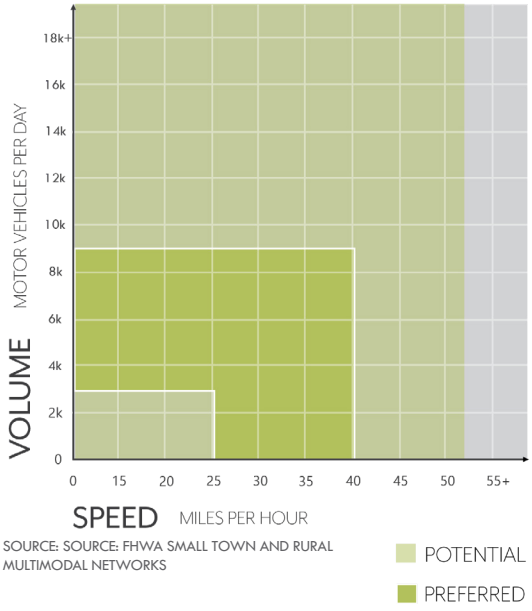
Compatible Features

Signage

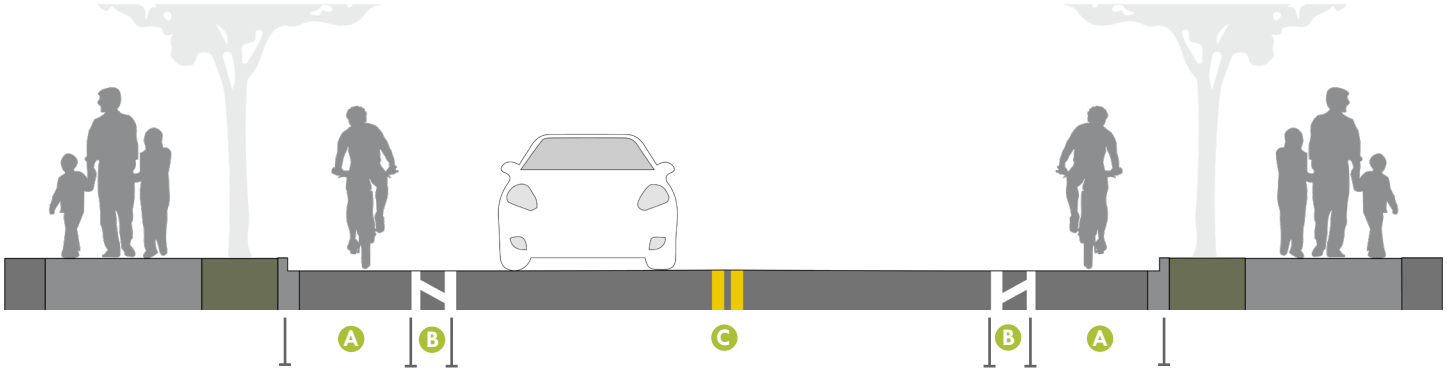
+ Standard bicycle lane signs in clear visibility of drivers.

Pavement Markings

+ Bicycle lane word and/or symbol and arrow markings.
+ Two solid white lines with diagonal hatching when the width is 3 feet or more.
+ White lines on both edges mark where crossing is discouraged.
+ Colored pavement at beginning of each block discourage drivers from entering the lane.



SOURCE: SOURCE: FHWA SMALL TOWN AND RURAL MULTIMODAL NETWORKS



A Bicycle Lane
- Minimum width: 5 to 7 feet depending on adjacent land uses
- Follow same marking placement criteria as conventional bike lane

B Buffer
- Minimum width: 18 inches
- Diagonal cross hatching are recommended for buffers that are 3 feet or wider
- Buffer may be located on the parking lane side of the bike lane, the travel lane side of the bike lane, or on both sides of the bike lane.

C Travel Lane

CLINTON PKWY,
LAWRENCE, KS

MAJOR SEPARATION

Protected Bike Lane & Cycle Track
Shared Use Path & Side Path

Protected Bike Lane & Cycle Track

Protected bike lanes, also called cycle tracks, are exclusive bicycle facilities which have features which establish physical separation between the bicycle lane and adjacent motor vehicle lanes. Protected bike lanes isolate bicycle traffic through the use of concrete barriers/raised medians, landscape buffers (trees and lawn), flex posts, planter boxes, bollards, or a variety of other measures. Protected bike lanes can be one-way and placed on each side of the road, or two-way and installed on one side of the road, but if a vertical element of separation is not included then the facility cannot be considered a protected bike lane/cycle track. Pedestrians are provided sidewalks separate from protected bike lanes/ cycle tracks to travel and are not supposed to use the dedicated bicycle facility for walking.

BENEFITS

+ Dedicates and protects space for bicycle riders to improve comfort and safety.
+ Eliminates the risk of collision with over-taking vehicles.
+ Eliminates the risk of dooring.
+ Attractive option for bicycle riders of all levels and ages.
+ Encourages proper use of bikeway and discourages/reduces sidewalk riding.
+ Offers a higher level of security than bike lanes.

FORMS OF SEPARATION

DELINEATOR POST

BOLLARDS

CONCRETE BARRIERS

PLANTERS

BIKE RAILS

TWO-WAY

Adam Coppola for www.pedbikeimages.org

SEATTLE, WA

ONE-WAY

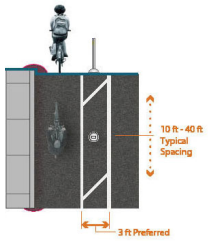
UNITED STATES

Protected Bike Lane & Cycle Track

Compatible Features

SIGNAGE

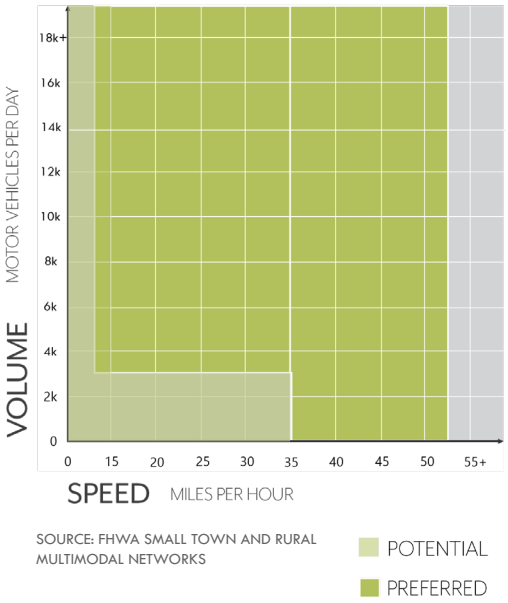
+ When a separated bike lane ends at an off-street trail or sidepath, markings and signage should be placed to emphasize the connection and enforce space designations for different users.
+ Wayfinding signs should be added to the end of the separated bike lane.



Source: FHWA. *Forms of separation.* Separated bike lane planning and design, Bicycle and pedestrian program.

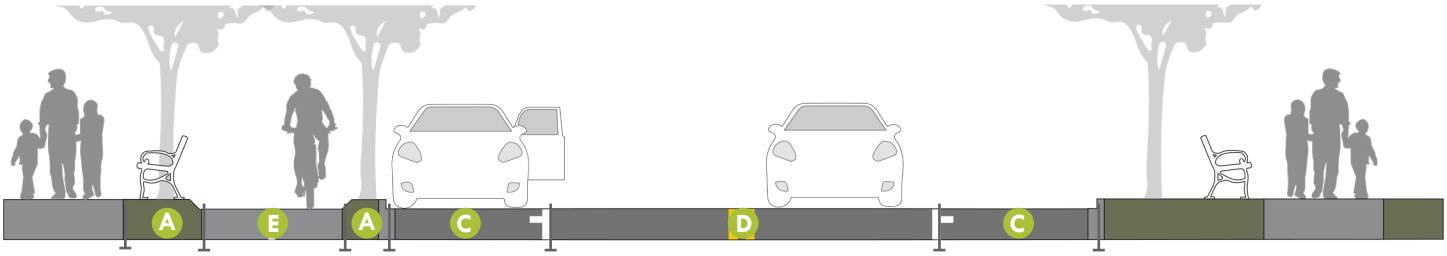
MARKINGS AND SEPARATION

+ If at sidewalk level, a curb or median is used to separate bicycle riders from drivers, and colored pavement and texture can separate the track from the sidewalk.
+ If at street level, tracks can be protected with raised medians, on-street parking, or bollards.
+ Bicycle lane word, symbol, and/or arrow markings .

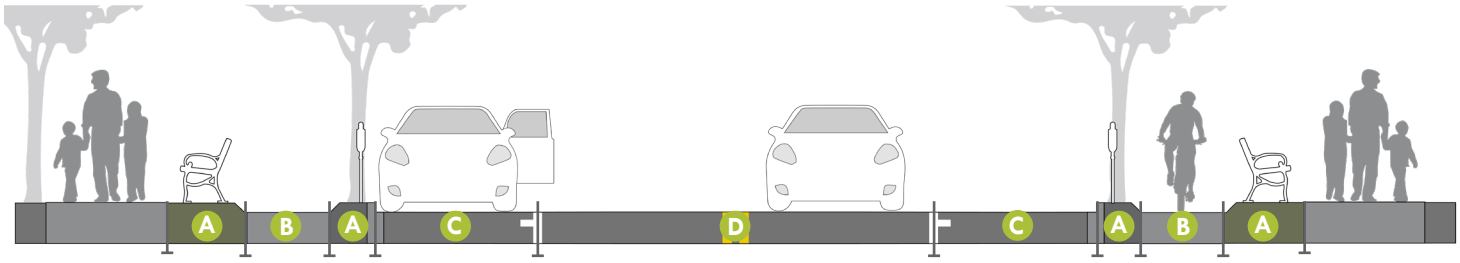


SOURCE: FHWA SMALL TOWN AND RURAL MULTIMODAL NETWORKS

TWO-WAY



ONE-WAY



A Buffer/Form of Separation
- If located adjacent to on-street parking, a minimum buffer width of 3 feet should be placed between parking and travel lane

B One-Way Cycle Track
- Width: Minimum 6.5 feet

C Parking Lane
- Buffer may be located on the parking lane side of the bike lane, the travel lane side of the bike lane, or on both sides of the bike lane.

D Travel Lane

E Two-Way Cycle Track
- Width: Minimum 10 feet (preferred 14 feet)
- At transit stops, protected bike lanes should be routed between the passenger waiting area and the sidewalk to reduce conflicts while passengers are boarding.

Shared Use Path & Sidepath

A shared use path is an off-street bicycle and pedestrian facility that is physically separated from motor vehicle traffic. SUPs can be located in independent right-of-way such as a park, greenway, along a utility corridor, an abandoned railroad corridor, or adjacent to a street. When SUPs are adjacent to a street they are called sidepaths. SUPs are used by other non-motorized users including pedestrians, skaters, wheelchair users, and joggers.

BENEFITS

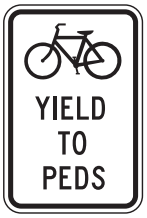
+ Provides a dedicated facility for users of all ages and abilities.
+ Provides, in some cases, access to areas that are otherwise served only by limited-access roadways.
+ Completes networks where high-speed roads provide the only corridors available.
+ Provides non-motorized transportation access to natural and recreational areas, which can especially help low-income people obtain access to recreation.
+ Provides, in some cases, a short-cut between cities or neighborhoods.
+ Supports tourism through convenient access to natural areas or as an enjoyable recreational opportunity itself.

NAISMITH VALLEY PARK TRAIL, LAWRENCE, KS

CLINTON PKWY, LAWRENCE, KS

Shared Use Path & Sidepath

Facility Features

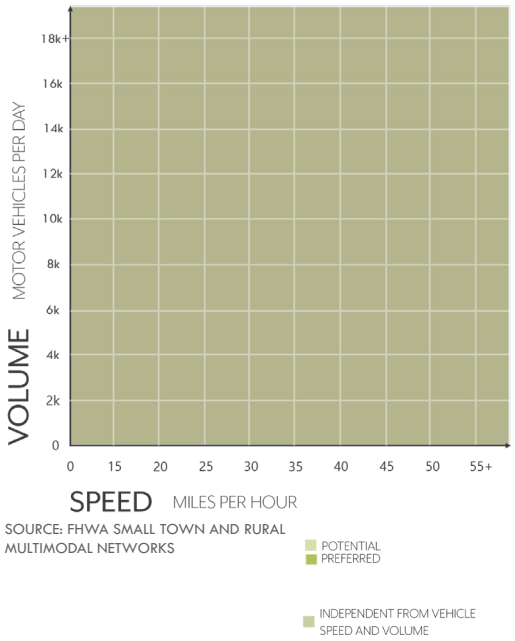


Signage

+ BIKE YIELD TO PEDS signs may be used at entrances of path to remind bicycle riders of this requirement.
+ Crossings sign assemblies should be used to warn users of the crossing location.
+ Signs may be used to remind bicycle riders to pass on the left and give verbal warnings.

Pavement markings

+ When striping is required, use a 4 inch broken yellow center line may help organize the flow of traffic.
+ Solid center lines can be provided on tight corners or approaches to roadway crossings.
+ Edge lines should be marked on paths expecting evening use.
+ "LOOK" pavement markings should be placed when paths cross driveways.



SOURCE: FHWA SMALL TOWN AND RURAL MULTIMODAL NETWORKS

Considerations

+ Typically the widths range from 10 to 14 feet with narrower widths acceptable when physical constraints are present such as bridges or fences.
+ Wider paths are needed to provide an acceptable level of service on pathways frequented by pedestrians, wheeled users, steep grades, and higher use in general.
+ All pavement markings added should be retro-reflective.
+ The speed of the pathway should be at least as high as the preferred speed of the fastest common user, and should consider the type of the user's equipment, the purpose and length of the trip, the condition and grade of the path, and the number of other users.

BURCHAM PARK TRAIL, LAWRENCE, KS

INTERSECTION & CONFLICT ZONE TREATMENTS

Protected Intersection

Raised Driveway Crossing

Separated Bike Lane Mixing Zones

Conventional Bike Lane at Intersections

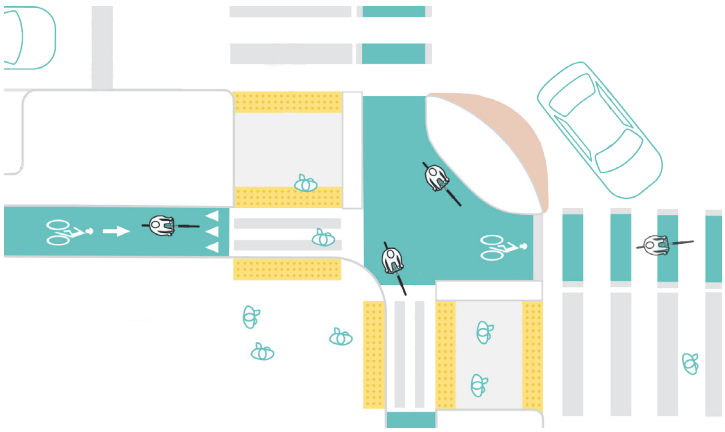
Crossing Treatments

Protected Intersection

Maintaining physical separation, protected intersections eliminate shared spaces with turning and merging vehicles and bicycle riders. This separation limits bicycle riders' exposure to a single point where the motorist turns across the bike lane and meets the pedestrian crossing. Separated bike lanes and side paths at intersections should manage conflicts with turning vehicles and increase visibility for all users. Protected intersections are compatible with one- and two-way separated bike lanes. Contraflow bicycle movements may require signal-phasing. See NACTO Don't Give Up at the Itersections for more details.

BENEFITS

+ Controls speed of turning vehicles at conflict points.
+ Minimizes exposure to conflict areas.
+ Communicates right-of-way priority.
+ Provides increased sight distance.
+ Forward bicycle queuing areas allow stopped bicycle riders to wait in direct sight of drivers and enter the intersection before them.
+ High level of comfort



NACTO DON'T GIVE UP AT THE INTERSECTION, 2019

Considerations

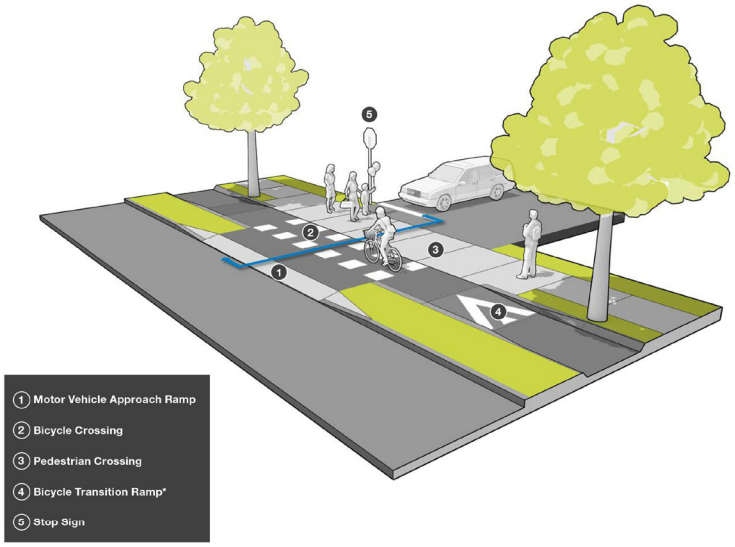
+ Consider restricting right turn on red at protected intersections to reduce vehicle encroachment into the crossings.
+ Colored pavement and/or shared lane markings can supplement short dashed lines to distinguish the bike lane through the intersection.
+ Consider warning signs or raised intersections or crosswalks at non-signalized intersections.
+ Truck aprons can be used to slow turning vehicles while accommodating large vehicles. The aprons should have a maximum height of 3 inches.
+ Bike yield pavement markings
+ Pedestrian islands reduce crossing distances and improve visibility
+ A modified TURNING VEHICLES YIELD TO BIKES AND PEDS sign is reccommended
+ Detectable warning surfaces to alert pedestrians as they enter the conflict zone

Facility features

+ Forward bicycle queues should be at least 6.5 feet long to fit a typical bike. Enlarging corner islands can increase this space.
+ The smallest feasible curb radius should be selected for corner designs requiring vehicles to turn no faster than 10 mph which is typically 10 - 15 feet.
+ The crossing may be bound by white 12 inch (perpendicular) and 24 inch (parallel) pavement dashes known as elephant's feet.
+ When separated bike lanes are provided at roundabouts, they should be continuous around the intersection and parallel to the sidewalk. Separated bike lanes should generally follow the contour of the circular intersection.
+ A motorist waiting zone creates space between the vehicle lane and the crossbike provides a place for cars to wait before turning across the bike rider's lane of travel.
+ The setback determines the amount of room available for drivers to wait and yield and the angle they cross the bikeway. Setbacks should be 10 feet and 14 - 20 feet where practical. Larger setbacks create more visibility but may increase turning speeds if larger than 20 feet.

Raised Driveway Crossing

Most bicycle riders will need to cross a street, driveway, or alley during their route, often at multiple locations. Raised driveway crossings help encourage yielding behavior and increase visibility of bicycle riders at crossings. This facility is appropriate on minor road crossings and designate a clear path for bicycle riders through an intersection.



MASSDOT. BIKE LANE PLANNING AND DESIGN GUIDE (2015). CHAPTER 4.

BENEFITS

+ Increases visibility of bicycle riders and pedestrians.
+ Increases yielding behavior of drivers.
+ Slows turning and crossing speed of motor vehicles.

Considerations

+ Collector streets and local street crossings.
+ Yield lines can be used to indicated priority for bicycle riders and may be used in advance of unsignalized crossings at driveways.
+ Green colored pavement may be utilized within the crossing to increase visibility especially where vehicle sightliness is low or turning speeds exceed 10 mph.
+ Raising bike lanes to intermediate or sidewalk level going into the crossing could increase visibility and avoid to many transition ramps.

Facility Features

+ Pavement should be elevated 4-6 inches above the street.
+ Approach ramps should be at a 5-15 percent slope at driveways and a 5-8 percent slope at street crossings.
+ Crossing should be at least 6 feet wide for one-way travel and 10 feet for two-way.
+ Surface materials should extend through the crossing maintaining visual continuity encouraging drivers to yield.
+ The crossing may be bound by white 12 inch (perpendicular) and 24 inch (parallel) pavement dashes known as elephant's feet.

Separated bike lane mixing zones

When drivers have to turn across a separated bike lane at an intersection a mixed zone is required. A mixing zone design limits bicycle riders' exposure to vehicles by defining a limited merge area for the turning motorist, unlike a standard bike lane where a motorist can merge across at any point. Mixing zones are only compatible with one-way separated bike lanes.

BENEFITS

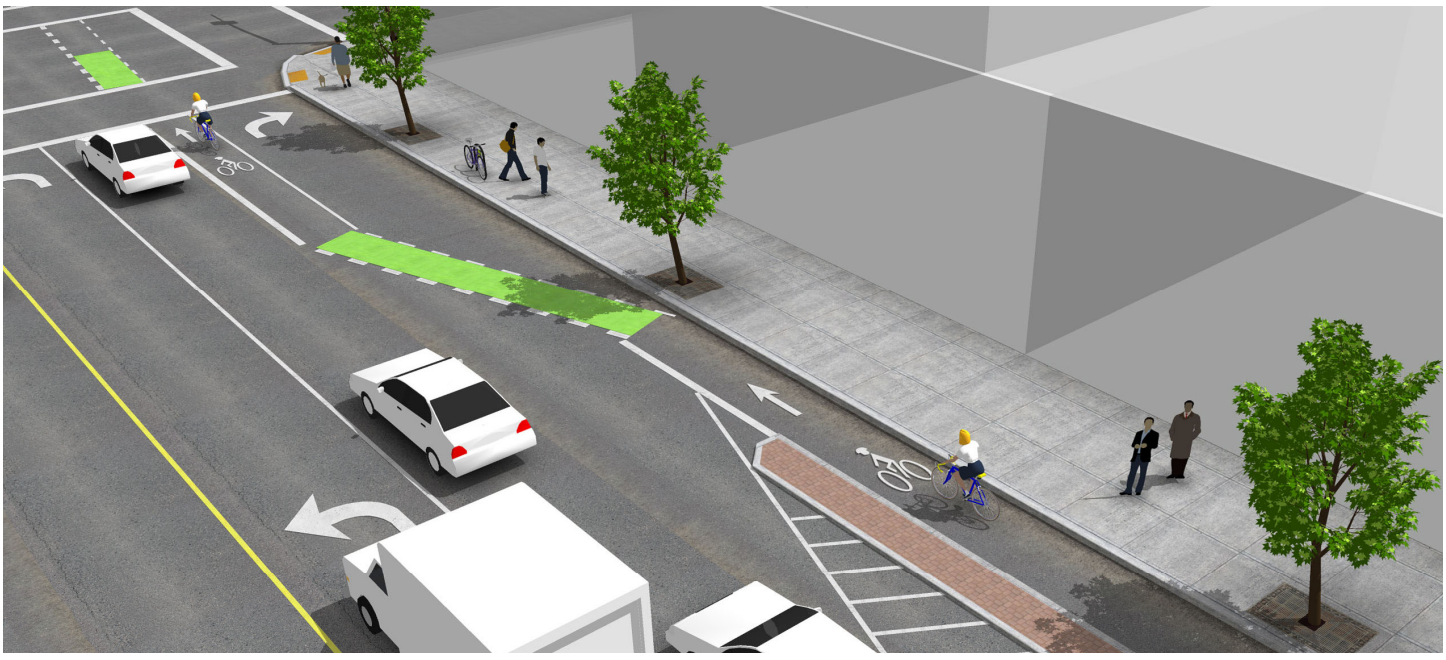
+ Increases visibility of bicycle riders and drivers in advance of the intersection.
+ Reduces the risk of "left or right-hook" crashes with turning drivers.
+ Cost efficient.

Considerations

+ When there is a right turn lane, the bike lane must go around the lane and be marked with either solid or striped green pavement.
+ Tactile warnings or pavement markings should be used on slopes from raised bike lanes to slow bicycle riders before the transition out of the protected bike lane.
+ Where speeds are 35 mph or higher, or at locations where it is necessary to provide storage for queued vehicles, consider providing a deceleration/storage lane in advance of the merge point.

Facility Features

+ Parking should be prohibited 30 to 50 feet before the cylce track buffer ends to increase visibility.
+ When the cycle track ends the intersection should provide a bicycle facility to receive cycle track users.
+ Minimize the lengths of left turn lanes.
+ Provide BEGIN RIGHT (or LEFT) TURN LANE YIELD TO BIKES signs at the merge area and throughout the facility.
+ Restrict parking within the merge area.



NACTO URBAN BIKEWAY DEISGN GUIDE

Conventional bike lanes at intersections

Protected intersections preserve the separated bike lane up to and through the intersection. Physical separation eliminates shared spaces with turning vehicles, which limits bicycle riders' exposure to a single point where the motorist turns across the bike lane and adjacent pedestrian crossing. Protected intersections are compatible with one- and two-way separated bike lanes; however, contraflow bicycle movements may require signal-phase separation in some situations.

SEATTLE, WASHINGTON. INTERSECTION CROSSING MARKINGS, NACTO URBAN BIKEWAY DESIGN GUIDE.

BENEFITS

+ Controls speed of vehicle turns through geometric design.
+ Improves sight distance by recessing the crossings.
+ Reduces conflict areas with vehicles and bicycle riders.

Considerations

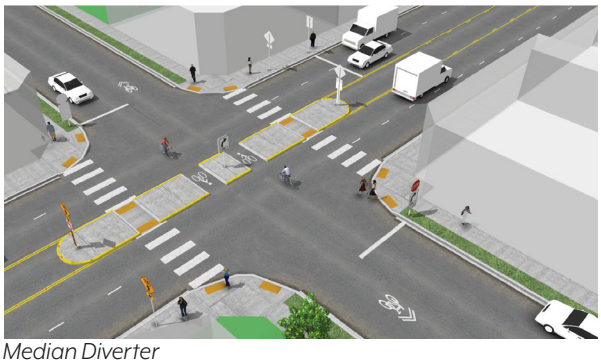
+ Consider restricting right turns on red at protected intersections to reduce vehicle encroachment into the crossings.
+ Forward bicycle queuing areas allow bicycle riders to wait in direct line of sight of drivers.
+ Mountable truck aprons can be used to slow turning vehicles while accommodating large vehicles.
+ Pedestrian crossing islands reduce crossing distances, allow pedestrians to manage bicycle and motor vehicle conflicts separately, and discourage pedestrians from queuing in the bike lane.

Facility features

+ A bicycle crossing offset of 6- to 16.5 feet from the parallel roadway provides the greatest safety benefit.
+ Forward bicycle queues should be at least 6 feet long to fit a typical bicycle.
+ Bike lanes markings, including green-colored pavement, shared lane markings, dashed lane markings, and signage may be provided through the intersection.

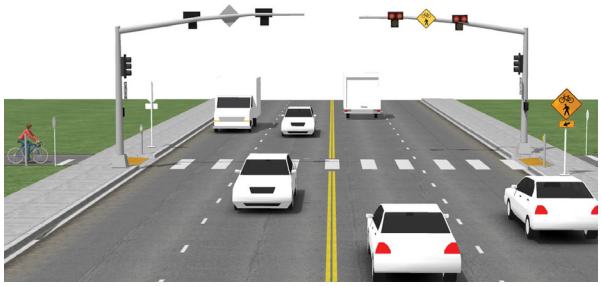
Crossing Treatments

Designs for intersections with bicycle facilities should reduce conflict between the bicycle riders, and other vulnerable road users, and vehicles and increase comfort among bicycle riders. Intersection treatments should achieve these goals by heightening level of visibility, denoting clear right-of-way, and facilitating eye contact and awareness with competing modes. The level of treatment required for bicycle riders at an intersection will depend on the facility type, whether bicycle facilities are intersecting, the adjacent street function and land use.

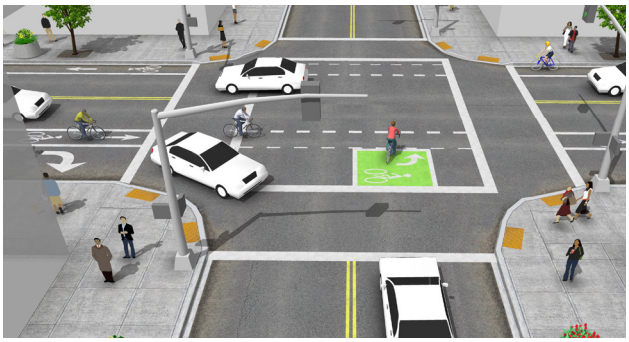


Median Diverter

Bicycle Box with Lead-In Bike Lane



Pedestrian Hybrid Beacon



Two-Stage Turn Queue Box

Considerations

+ Median islands can offer protection in the center of the street to facilitate bicycle and pedestrian crossing.
+ Adjustments to traffic control such as implementation of a pedestrian hybrid beacon or adjustments to stop signs may require a traffic study.
+ Colored pavement in bike boxes and queued turn lanes increase visibility and clearly mark bicycle facilities.
+ Install a median island or centerline hardening on the receiving street to prevent corner cutting.

Facility Features

+ Medians should be a minimum of 6 feet in width, but 8 feet is preferable.
+ Unsignalized crossings of arterial or collector streets with high volumes and speeds as well as offset intersections where the bike boulevard route makes two turns in short succession
+ Bike boxes should be considered where a left turn is required to follow a designated bike route, access a shared-use path, when the bicycle lane moves to the left of the street or when the dominant vehicle traffic flows right and bicycle traffic continues straight.

IMAGE SOURCES: NACTO URBAN BIKEWAY DESIGN GUIDE

Pedestrian Crossing Treatments

When determining crossing treatments for increased pedestrian safety the number of lanes and medians must be considered. Alta Planning + Design provides guidance for selecting crossing treatments.

Pedestrian Crossing Contextual Guidance

At Unsignalized Intersections

	Local Streets 15-25 mph		Collector Streets 25-30 mph			Arterial Streets 30-45 mph							
FACILITY TYPE	**2 lane**	**3 lane**	**2 lane**	**2 lane with median refuge**	**3 lane**	**2 lane**	**2 lane with median refuge**	**3 lane**	**4 lane**	**4 lane with median refuge**	**5 lane**	**6 lane**	**6 lane with median refuge**
Crosswalk Only (high visibility)	✓	✓	EJ	EJ	X	EJ	EJ	X	X	X	X	X	X
Crosswalk with warning signage and yield line	EJ	✓	✓	✓	✓	EJ	EJ	EJ	X	X	X	X	X
Active Warning Beacon (RRFB)	X	EJ	✓	✓	✓	✓	✓	✓	X	✓	X	X	X
Hybrid Beacon	X	X	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓	✓	✓
Full Traffic Signal	X	X	EJ	EJ	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓
Grade Separation	X	X	EJ	EJ	EJ	X	EJ	EJ	✓	✓	✓	✓	✓

Legend	
Most Desirable	✓
Engineering Judgement	EJ
Not Recommended	X

ALTA PLANNING + DESIGN

CROSSWALK

CROSSWALK WITH WARNING

RRFB

HYBRID BEACON

TRAFFIC SIGNAL

GRADE SEPARATION

LAWRENCE, KS

IMAGES FROM NACTO URBAN BIKEWAY DESIGN GUIDE

TRAFFIC CONTROL & SIGNS

Bicycle Signals, Detection, and Actuation

Rectangular Rapid Flashing Beacon

Hybrid Beacon (HAWK)

Bicycle Routing/Wayfinding

Shared Lane Markings

Bike Box

Two-Stage Turn Queue Box

Conflict Area Markings

Traffic Calming

Lane Reconfiguration

Bicycle Signals, Detection, and Actuation

Bicycle movements may be controlled by several methods at signalized intersections - the same lights as motor vehicles, pedestrian signals, or specific bicycle traffic signals. They can reduce conflicts between motor vehicles, transit vehicles, bicycle riders, and pedestrians. Traffic signal design, which includes detection, phasing, timing, and equipment, should provide a safe and predictable environment for all users, especially the most vulnerable.

Considerations

+ Pedestrian comfort, safety, and needs must be considered when designing traffic signals.
+ Alternate signalization should be considered where bicycle riders cannot see vehicle signal faces, or where bicycle riders have a separate directional movement, phase, or interval.
+ Video detection, microwave, and infrared detection can be alternative to loop detectors. Detection is important to trigger a green light when lights are not automatically timed to complete a full light cycle for each intersection leg.
+ Another strategy in signal timing is providing a "green wave" where bicycle riders will receive a green indication as they reach each signal.
+ Consider installing advanced bicycle detection on the intersection approach to extend the phase, or prompt the phase and allow for continuous bicycle through movements.

BENEFITS

+ Makes crossing intersections safer for bicycle riders by clarifying when to enter an intersection.
+ Restricts conflicting vehicle movements.

Facility Features

+ The BIKES USE PED SIGNAL sign may be used where the crossing of a street by bicycle riders is controlled by pedestrian signal indications.
+ A bicycle signal is more suitable as is can be timed for bicycle speeds increasing the time a bicycle rider may legally enter the roadway compared to a pedestrian signal.
+ The MUTCD instructs that 8-inch circular signal indications may be used "in a signal face installed for the sole purpose of controlling a bikeway or a bicycle movement" and can be installed without requesting approval.
+ A bicycle signal face may only be used with a protected phase. Designers should request permission from FHWA before installing a bicycle signal face.
+ Leading Bike Intervals (LBI), Lagging left turn signals, or the Split LBI can be used to direct bicycle and vehicle traffic separatley at busy intersections. See NACTO Don't Give Up at the Intersection.

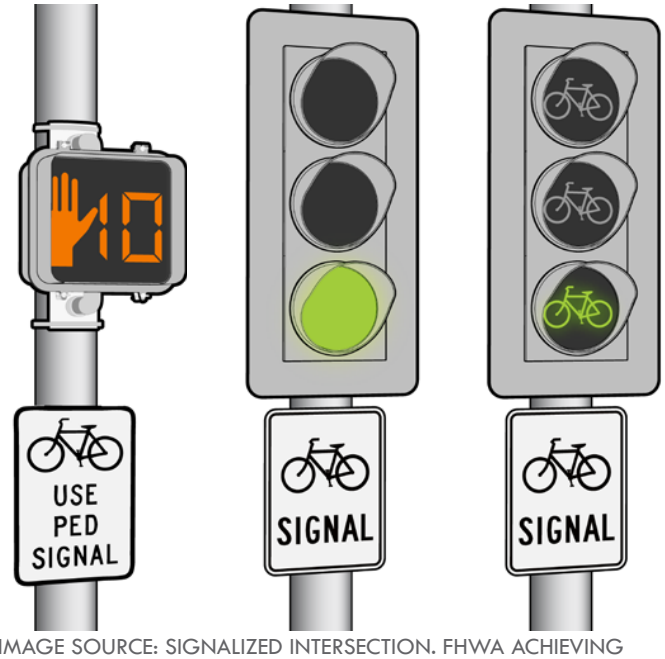


IMAGE SOURCE: SIGNALIZED INTERSECTION. FHWA ACHIEVING MULTIMODAL NETWORKS (2016).

Rectangular Rapid Flashing Beacon

RRFBs are used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at an unsignalized marked crosswalks and mid-block crossings by increasing driver awareness. RRFBs can be activated manually by a push button or by a detection system and use an irregular flash pattern similar to emergency flashers on police vehicles. RRFBs can be installed on two-lane or multi-lane roadways.

RECTANGULAR RAPID FLASHING BEACON SEQUENCE AT CROSSWALK. MUTCD.

EXAMPLE PUSHBUTTON AND SIGN. MUTCD.

BENEFITS

+ Lower cost alternative to traffic signals.
+ Increases driver yielding rates than traditional overhead beacons.
+ Increases effectiveness of other safety treatments like yield markings and signs.

Facility Features

+ Two rectangular-shaped yellow indications that flash in a rapid "wig-wag" (left light on then right light) sequence when activated.
+ RRFBs are particularly effective at multi-lane crossings with speeds less than 40 mph.
+ RRFBs should be placed on the left and right side of a crosswalk.
+ On a divided highway the left-hand beacon should be place should be placed on the median if practical.

Considerations

+ Can be powered by standalone solar panel units or a traditional power source.
+ Flashing beacon may be activated by a push button or video or infrared detection.
+ RRFBs can be placed on pedestrian islands or medians for assisted guidance across larger intersections.
+ For roads with higher speeds consider the Pedestrian Hybrid Beacon.

Hybrid Beacon (HAWK)

A hybrid beacon is also known as a High-intensity Activated Crosswalk (HAWK) and has two red lights above a yellow light. These beacons were designed specifically to enhance non-motorized crossings of major streets. When not activated, the beacon displays no indication.

BENEFITS

- Can significantly improve bike routes, particularly along bicycle boulevards.
- Can be modified to specifically include bicycle movements.
- Creates a gap for bicycle riders and pedestrians to cross.
- High driver compliance.
- Creates more flexibility for bicycle riders as they do not have to activate if they find ample crossing opportunity.

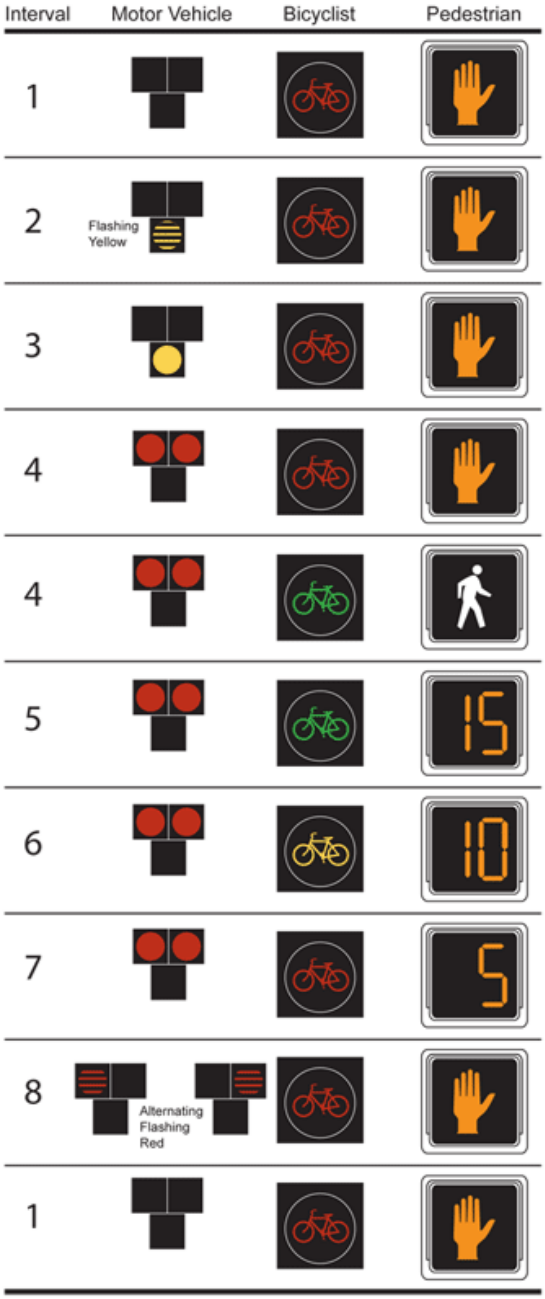
Facility Features

- Two red lights above one yellow light.
- Should be installed where side-street volumes do not support installation of a traffic signal (or where there are concerns installation of a traffic signal would encourage more traffic).
- Where off-street bicycle or pedestrian facilities intersect major streets without traffic signals or at mid-block crossings of major roadways with high bicycle or pedestrian volumes.
- When activated, the beacon flashes in a "wig-wag" red that allows drivers to stop and proceed when clear like a stop sign.

Considerations

- Consider supplementing the hybrid beacon with bike signal and signal detection for minor street approaches to facilitate bike crossings.
- Maintain signage and painting to help users understand the traffic control.

Sequence for Coordinated HAWK, Bicycle and Pedestrian Signal.



HAWK SEQUENCING. NACTO URBAN BIKEWAY DESIGN GUIDE.

Bicycle routing/wayfinding

The purpose of signage on bicycle boulevards is to identify routes to both bicycle riders and drivers, provide destination and distance information, and warn users about changes in road conditions as needed. In addition to serving these roles, signage also helps to "brand" the bicycle boulevard network, fostering familiarity among cyclists and drivers with traffic conditions that are to be expected on these facilities. Wayfinding can improve bicycling in an area because it helps identify the best routes to destinations, helps overcome a barrier of not knowing where to ride, and reminds drivers to watch for bicycle riders.

BENEFITS

+ Helps bicycle riders navigate within and between a variety of destinations in urban, suburban, and rural areas.
+ Can provide guidance and connectivity between two or more bike facilities and in gaps between existing sections of a bikeway.
+ Can increase drivers' awareness of bicycle riders sharing the road.

Oakland, CA

Concept

Portland Metro Cities, OR

Berkeley, CA

BIKEWAY SIGNING & MARKING, NACTO URBAN BIKEWAY DESIGN GUIDE

Considerations

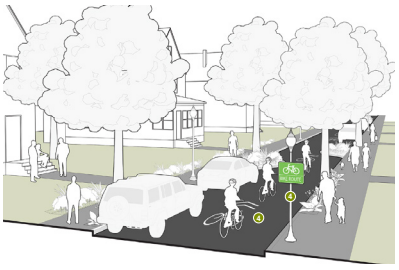
+ Wayfinding should coordinate with bicycle route maps.
+ Fingerboards are long skinny signs that tell riders how far you are from a short list of destinations and what direction they're in.
+ Decision and confirmation assemblies consist of Bike Route identification and optional fingerboard signs placed where routes intersect or at the beginning of bike routes. These signs can serve as breadcrumbs helping riders know directions and where the bike route is.
+ Signs can be customized to add community branding, but clarity and accuracy should remain the top priority.
+ Be mindful to avoid "sign clutter" that can diminish the effectiveness of signage.

Facility Features

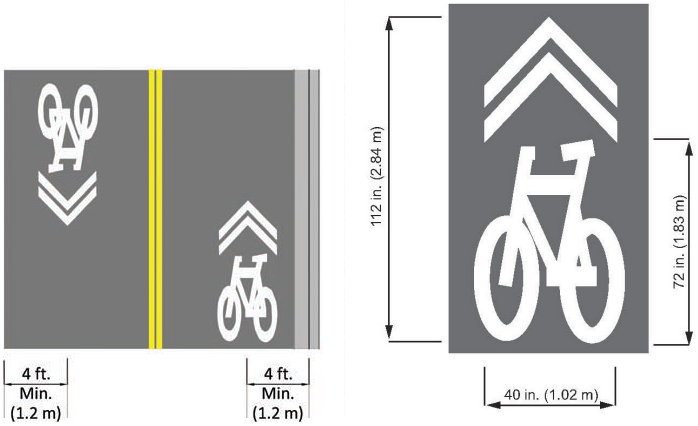
+ Signs should be made of retro-reflective material to remain visible at night.
+ Colors reserved for regulatory and warning road signs (red, yellow, orange, etc.) are not recommended. Colors commonly used for bike boulevards include green and purple.
+ Install wayfinding signs in advance of turns at a distance great enough to allow cyclists to recognize, prepare for, and safely execute a turn.
+ Letter size should be no less than 2 inches in height.
+ Install ahead of or at the beginning of the bicycle boulevard and ahead of major intersections or connections with other bikeways.
+ Ensure that signs are not obscured by vegetation through regular monitoring and maintenance.

Shared Lane Markings

Shared lane markings (or "sharrows") are pavement markings that denote shared bicycle and motor vehicle travel lanes. Shared lane markings can be useful in locations where there is insufficient width to provide bike lanes. These markings also alert road-users to the possible presence of bicycle riders. In general, this design solution should be used in areas with low traffic speeds and volumes as a part of a signed route or bicycle boulevard.



SLOW STREETS, AASHTO ACHIEVING MULTIMODAL NETWORKS (2016).



DESIGN OF ON-ROAD FACILITIES, AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES (2012).

BENEFITS

+ Increases driver awareness of possible bicycle riders.
+ Provides guidance for bicycle riders to ensure they are on the correct path.
+ Cost efficient and does not require construction of the roadway.
+ Can be a short- or long-term solution.

Considerations

+ Sharrows may be used as a temporary solution on constrained streets with up to 10,000 vehicle trips per day where the maximum street limit is 35 mph until a more appropriate bike facility can be implemented.
+ Provide signs such as BIKES MAY USE FULL LANE.
+ Sharrows may be used at transit stops to provide visual cues to drivers and bicycle riders on the correct path to follow.

Facility Features

+ On streets with on-street parallel parking, shared-lane markings should be placed at least 11 feet from the face of the curb, or edge of the traveled way where there is no curb.
+ On streets without on-street parallel parking, shared-lane markings should be placed at least 4 feet from the face of curb, or edge of the traveled way where there is no curb.
+ Where lanes are too narrow for side-by-side operation of a bicycle or motor vehicle, shared-lane markings can be placed farther into the lane than the minimum distance shown above.
+ Should be used on streets with speed limits of 25 mph or lower and less than 5,000 vehicle trips per day.
+ The markings are two chevrons above a bicycle symbol placed where the bicycle rider is anticipated to ride.
+ Shared-lane markings should be placed immediately after an intersection and spaced at intervals of no more than 250 feet after.

Bike boxes

A bike box is a designated area at the head of a traffic lane at a signalized intersection that allows bicycle riders with a safe and visible way to get ahead of queuing traffic during a red light. Bike Boxes are typically used at signalized intersections with high volumes of bicycles and/or motor vehicles, especially with frequent bicycle rider left-turns and/or motorist right-turns and where there is a desire to better accommodate left turning bike traffic.

BENEFITS

+ Increases visibility of bicycle riders.
+ Reduces signal delay for bicycle riders.
+ Facilitates left turn positioning for bicycle riders at intersections and the transition from a right-side bike lane to a left-side bike lane during red signal indication.
+ Helps prevent 'right-hook' conflicts with turning vehicles at the start of the green indication.

Facility Features

+ Boxes should be 10 to 16 feet deep. Deeper boxes show less encroachment by motor vehicles.
+ Stop lines should be used to indicate where motor vehicles are required to stop.
+ Pavement markings should be used between the crosswalk line and the stop line to designate the space as a Bike Box.
+ NO TURN ON RED signs should be installed overhead to prevent vehicles from entering the Bike Box.
+ Colored pavement should be used within the Bike Box to encourage compliance and visibility for drivers.
+ An ingress lane should be used to define the bicycle space with 25 to 50 feet colored to guarantee bicycle access.
+ An egress lane should be used to clearly define the potential conflict areas in the intersection when the light is green.

BIKE BOXES, NACTO URBAN BIKEWAY DESIGN GUIDE

PORTLAND, OREGON

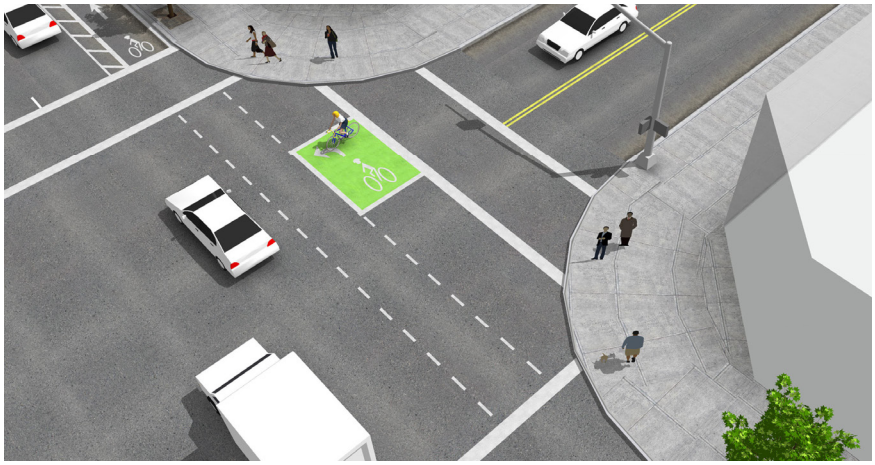
BIKE BOXES, NACTO URBAN BIKEWAY DESIGN GUIDE

Considerations

+ WAIT HERE or STOP HERE may be marked before the bike box to further instruct drivers and discourage encroaching.
+ Right turns on red must be prohibited, though exceptions may be made for cyclists (EXCEPT FOR BIKES).
+ Bicycle Boxes may not be compatible at intersections with a high volume of right-turning vehicles.
+ A YIELD TO BIKES sign should be mounted in advance of an egress lane to reinforce bicycles have the right-of-way through the intersection.

Two-stage turn queue box

Two-stage turn queue boxes designate a space for bicycle riders to wait while performing a two-stage turn across a street outside the path of traffic. Two-stage turn queue boxes offer bicycle riders a safe way to make turns at multi-lane signalized intersections from a cycle track or bike lane. This facility should be considered where separated bike lanes continue up to an intersection and a protected intersection is not provided.



TWO-STAGE TURN QUEUE BOXES, NACTO URBAN BIKEWAY DESIGN GUIDE

Facility Features

+ Pavement markings should include a bicycle stencil and a turn arrow to clearly indicate bicycle direction and positioning.
+ The queue box should be placed in a protected area like within an on-street parking lane or between the bike lane and pedestrian crossing.
+ The queue box should be positioned laterally in the cross-street to promote visibility of bicycle riders.
+ Colored pavement should be used inside the box to define the bicycle rider space.
+ "No Turn on Red" restrictions should be applied to prevent vehicles from entering the queuing area.
+ A minimum width of 10 feet and a width of 6.5 feet is recommended.

Benefits

+ Helps prevent bicycle riders from merging into traffic to turn.
+ Increases bicycle comfort and safety when making left turns.
+ Prevents conflicts arising from bicycle riders queuing in a bike lane or crosswalk.
+ Separates turning bicycle riders from through bicycle riders.

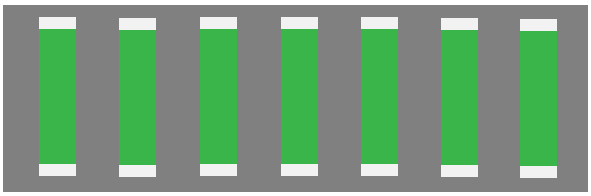
Considerations

+ Dimensions of two-stage queue boxes will vary based on the street operating conditions, the presence of a parking lane, traffic volumes and speeds, and available street space.
+ A bicycle signal, with a leading bicycle interval may be used in conjunction with the two-stage turn queue box.
+ Guideline, pavement symbols and/or colored pavement can be used to lead bicycle riders into the queue box.
+ At mid-block turning locations the queue box may be integrated into the sidewalk space. This configuration is known as a "jug-handle."

Conflict area marking

Conflict area markings improve bicycle riders' visibility, alert roadway users of expected behaviors, and reduce conflicts with turning vehicles. The appropriate treatment for conflict areas depends on the desired emphasis and visibility. Dotted lines may be sufficient for guiding bicycle riders through intersections; however, the addition of green colored pavement enhances visibility and awareness for both drivers and bicycle riders.

MASSACHUSETTS ST, LAWRENCE, KS



Colored Dashed

BENEFITS

+ Improves visibility of bicycle riders to drivers.
+ Increases bicycle riders' level of comfort at intersections.
+ Facilitates more accurate positioning of bicycle riders.
+ Increases driver awareness of potential bicycle riders.

Facility Features

+ Green pavement can be added behind the word, symbol and arrow markings, but cannot replace them or the required lane barrier markings.
+ Green pavement may be used through an intersection, driveway, or ramp to guide the bicycle rider and increase turning drivers' awareness.
+ The green pavement may be dotted to match the pattern of the dotted lines, filling in only the areas directly between a pair of dotted line segments that are on opposite sides of the bicycle lane extension.

Considerations

+ Green pavement may be retroreflective for increased visibility in the dark.
+ If paint is applied to roadways to simulate green pavement, consider selecting traction losses when selecting materials.
+ Symbol placement within an intersection should consider vehicle wheel paths to minimize maintenance needs from wheel wear.
+ Driveways with higher volumes may require additional pavement markings and signage.

See the FHWA Interim Approval for Optional Use of Green Colored Pavement for more details and specifications on luminance.

Traffic Calming

Horizontal traffic calming reduces speeds by narrowing lanes, creating a sense of enclosure and additional friction between passing vehicles. Narrower conditions require more careful maneuvering around fixed objects and when passing bicycle riders or oncoming motor vehicle traffic. Vertical traffic calming can add protection for bicycle riders in the form of bike rails, curb extensions or medians, or cause drivers to slow down with speed tables, humps rumble strips etc..

GUIDANCE

+ Horizontal treatments are most effective if they deflect drivers mid-block or within intersections with neighborhood traffic circles.
+ Mid-block curb extensions known as pinch points or chokers may include cut-throughs for bicycle riders.
+ Curb extensions used as gateways to minor streets are known as neckdowns.
+ Chicanes are offset curb extensions that force vehicles to move laterally in a serpentine alignment and reduce speed.
+ Traffic circles allow bicycle riders to maintain momentum through intersections. They offer a better alternative to stop signs as bicycle riders often ignore these signs on neighborhood streets.
+ Bike rails create a physical barrier between bicycle riders and drivers and can be used to create other traffic calming configurations temporarily to ensure functionality or permanently.
+ Speed humps or dips slow drivers.
+ Speed tables slow drivers and increase visibility of pedestrians and bicycle riders.

CURB EXTENSION

1

NEIGHBORHOOD TRAFFIC CIRCLE

1

BIKE RAILS

2

CHICANE

3

SPEED HUMP

3

MEDIAN CHANNELIZER

4

1: FUNDAMENTALS OF BICYCLE BOULEVARD PLANNING & DESIGN (2009)
2: DEZIGNLINE.COM
3: URBAN STREET DESIGN GUIDE, NACTO
4: LAWRENCE, KS

LANE RECONFIGURATION

(Before Lane Reconfiguration)

A common misconception is the best way to alleviate traffic congestion is to build additional travel lanes and provide additional road space. Wider roadways actually generate worse traffic conditions by encouraging more vehicle trips. Instead, a street network with fewer travel lanes and smaller intersections functions more efficiently because it processes more turning traffic, shortens pedestrian crossings, and provides more route options for all modes of transportation (FHWA)[1] . For existing streets, lane reconfigurations are one strategy to reduce the width and provide a denser street network that contributes to a robust multimodal transportation network. Lane reconfigurations allow right-of-way to be allocated to other beneficial uses, such as turn lanes, bus lanes, pedestrian refuge islands, bike lanes, sidewalks, bus shelters, or landscaping amenities.

A lane reconfiguration provides a low-cost solution that addresses safety concerns and benefits users of all modes of transportation. One reason lane reconfigurations are often a cost effective solution is because they can be initiated in tandem with reconstruction or simple overlay projects, meaning the safety and operational benefits are achieved essentially for the cost of re-striping. A typical lane reconfiguration involves converting a four-lane roadway segment into a three-lane segment consisting of two through lanes, a center, two-way left-turn lane, and bikeway. Another version of a lane reconfiguration is to eliminate parking and turning lanes on roads that do not warrant them and convert the newly available space to bikeways.

1 Knapp, K. K....(2014). Road diet informational guide. Washington, DC: United States Department of Transportation, Federal Highway Administration. Retrieved January 24, 2019, from https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/

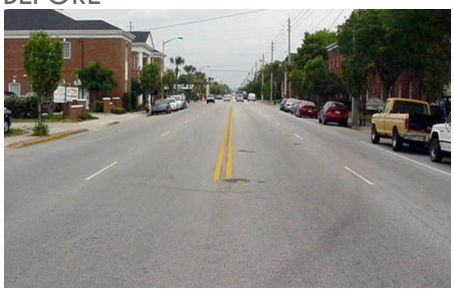
(After Lane Reconfiguration)

BENEFITS

+ Improved safety
+ Operational benefits
    + Separating left turns
    + Side-street traffic crossings
    + Speed differential reductions
+ Pedestrian and bicycle rider benefits
+ Livability benefits

Source: FHWA Road Diet Guide

BEFORE



AFTER

PEDESTRIAN BIKE INFORMATION CENTER, "ROAD DIETS" TRAINING MODULE, 2009

The FHWA Road Diet Guide should be used when determining if a roadway is eligible for a lane reconfiguration.

1

Parking

+ Remove parking when not warranted
+ Consider diagonal parking
+ Consider reverse angle parking

2

Turning Lanes (implement or remove)

+ Narrow existing
+ Remove when not warranted
+ Implement new

2

Reduce Lanes

+ Number of lanes
+ Width of lanes

Parking Warrants:
Parking studies should be completed to better understand parking demand and land use in the area. Studies can help determine where unwarrented parking occurs and could be removed.

PHOTO SOURCES:
AASHTO. GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES (2012). CHAPTER 4.
NACTO. URBAN STREET DESIGN GUIDE, NEIGHBORHOOD MAIN STREET.

Glossary Resources

American Association of State Highway Transportation Officials (AASHTO)
Federal Highway Administration (FHWA)
Manual on Uniform Traffic Control Devices (MUTCD)
Massachusetts Department of Transportation (MassDOT)
National Association of City Transportation Officials (NACTO)
National Center for Safe Routes to School
National Cooperative Highway Research Program (NCHRP)
Transit Cooperative Research Program (TCRP)

Amenities – Elements such as benches, kiosks, bicycle parking, points of interest displays, or trash receptacles that are placed on a sidewalk, pedestrian mall, or at transit stops in order to improve the convenience and attractiveness of the facility. (AASHTO)

Average Daily Traffic (ADT) – The total volume of traffic on a street during a given time period divided by the number of days in that time period. (AASHTO)

Bicycle Boulevard – Bicycle boulevards, sometimes also called neighborhood greenways, are streets with low motorized traffic volumes and speeds designated and designed to give bicycle riders and neighborhood motor vehicle traffic travel priority. Bicycle boulevards use signs, pavement markings, and traffic calming features such as traffic circles, medians, speed humps, and diverters to slow traffic and discourage through trips by motor vehicles. Street crossing improvements like supplemental signs or refuge islands are implemented to create safe, convenient bicycle crossings of arterial streets. Bicycle boulevards benefit neighborhoods by reducing cut-through traffic and speeding without limiting access by residents.

Bicycle Box – Designated area on the approach to a signalized intersection consisting of an advanced stop line and bicycle symbols. Bicycle boxes should be primarily considered to mitigate conflicts between through bicycle riders and right-turning drivers and to reduce conflicts between drivers and bicycle riders at the beginning of the green signal phase.

Bicycle Signal – Traffic control device used to improve intersection safety and operations for bicycle riders. Bicycle signal heads can be installed at signalized intersections to indicate bicycle signal phases and other bicycle-specific timing strategies. (FHWA)

Bike Advisory Lane – Bike advisory lanes have a single motor vehicle lane shared by motor vehicles going in both directions. When two oncoming motor vehicles meet, motorists yield to bicycle riders before merging into the bike lane.

Bike Route – A signed route that is preferred for bicycling due to low traffic or access to destinations. Does not necessarily have a delineated or dedicated space for bicycling.
Bikeway – Any type of bicycle facility, including paths in separate rights-of-way and on-street bikeways. Includes bike lanes, paved shoulders, signed bike routes, and sidepaths.

Buffered Bike Lane – Buffered bike lanes are created by striping a buffer zone between a bike lane and the adjacent travel lane. Some buffered bike lanes also offer a painted buffer between the bike lane and the adjacent parking lane. Buffered bike lanes should be considered at locations where there is excess pavement width or where adjacent traffic speeds exceed 35 mph.

Colored Bike Lane – All of the above bike lanes may have green color applied to them to highlight the presence of the bike lane. Colored lanes are typically used in high-conflict areas such as through complicated intersections, in areas where traffic is merging across the bike lane, or in areas where traffic frequently turns across the bike lane. In 2011, colored bicycle lanes received interim approval from the FHWA to be used on streets, thereby making way for their ultimate inclusion in the Manual of Uniform Traffic Control Devices in its next update.

Conflict Areas – A two-dimensional zone within which potential travel paths cross and crashes could occur between users of the same mode or users of differing modes. Typical conflict areas include approaches to intersections, intersections, and driveways.

Contra-Flow Bikeway – A bikeway (usually a bike lane) in the opposite direct of motor vehicle traffic on a one-way street. Contra-flow bikeways require careful consideration of traffic control and conflicts with motor vehicle traffic.

Conventional Bike Lane – A bike lane is a pavement marking that designates a portion of a street for the use of bicycles. Bike lane markings are typically dashed where vehicles are allowed to cross the bike lane, such as right turns or at bus stops. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or parking lane.

Crossing Island – Raised islands placed on a street at intersections or mid-block locations to separate crossing pedestrians from motor vehicles. Also known as refuge areas, refuge islands, center islands, pedestrian islands, or median slow points. (FHWA)

Crosswalk – Legal crosswalks exist at all intersections, whether marked or unmarked. Mid-block crosswalks must be marked in order for pedestrians to legally have the right-of-way.

Curb Extension – Treatment or application designed to visually and physically narrow the roadway in order to create safer and shorter crossing distances for pedestrians while increasing the available space for street furniture, benches, plantings, and trees. (NACTO)

Curb Ramp – The transition for pedestrians from the sidewalk to the street. ADA Standards require all pedestrian crossings to be accessible to people with disabilities by providing curb ramps at intersections and mid-block crossings as well as other locations where pedestrians can be expected to enter the street.

Design Speed – Design speed is a selected speed used to determine various geometric design features of the roadway. The assumed design speed should be logical with respect to the topography, anticipated operating speed, adjacent land uses, and the functional classification of the roadway. (AASHTO)

Flexible Delineator Posts – Flexible delineator posts, also called flex posts or flex stakes, are used to provide vertical demarcation of a roadway feature, including some bike lanes. These posts are typically made of plastic with an internal spring mechanism mounted to a base plate. Flexible delineator posts can be secured to the pavement using bolts, epoxy, or other techniques. The color of the plastic post

should match the color of the pavement marking or striping with which it is associated.

Horizontal Deflection Treatment – Traffic calming techniques that compel drivers to reduce their travel speed by changing the width or directionality of travel lanes at defined locations along a street. Examples include narrow lanes, chicanes, neckdowns, traffic circles, and curb extensions.

Lane Narrowing – A design strategy used for traffic calming effects and for reallocating existing pavement width to create designated space for other uses, including bicycle lanes.

Lane Reconfiguration – Reconfiguring a roadway to remove lanes in order to provide more space for pedestrians and bicycle riders. Lane reconfigurations are most typically performed on roadways where traffic volumes do not necessitate the existing number of lanes.

Level of Comfort (LOC) – The bicycle level of comfort analysis recognizes different bikeways (shared use path, bike lane, etc.) may have varying levels of comfort for bicycle riders based on several factors: the number of motor vehicles, the speed of the motor vehicles, and proximity of adjacent traffic. Individual bicycle rider level of comfort is also influenced by their riding experience and may change over time. To conduct this analysis, roads and existing bikeways were evaluated based on the number of motor vehicles carried on the road and the posted speed limit.

Mid-Block Crossing – Designated crosswalks away from an established intersection provided to facilitate crossings at places where there is a significant pedestrian desire line such as bus stops, parks, and building entrances. (NACTO)

Mixing Zone – A mixing zone requires turning drivers to merge across a protected bike lane at a defined location in advance of an intersection. Unlike a standard bike lane, where a motorist can merge across at any point, a mixing zone design limits bicycle riders' exposure to motor vehicles by defining a limited merge area for the turning motorist. Mixing zones are compatible only with one-way protected bike lanes.

Mountable Curb/Curb Apron – Mountable curbs with curb aprons deter passenger vehicles from making higher-speed turns but accommodate the occasional large vehicle without encroachment or off-tracking into pedestrian areas.

Neighborhood Traffic Circles – Raised islands typically built at the intersections of local residential streets to reduce motor vehicle speeds. They may be operated without stop control, or as two-way or all-way stop-controlled intersections. Neighborhood traffic circles frequently do not include raised channelization to guide approaching traffic into the circulatory roadway. (FHWA)

Offset Intersection - Offset intersections are locations where two segments of a street connection do not directly align where they meet another street. These configurations are most challenging for bicycle riders when offset local streets serving as bike routes or bike boulevards intersect with larger collector or arterial streets.

Path - Short for "shared use path" and often synonymous with the word "trail", a path is a protected facility, typically in an independent right-of-way such as a green belt of abandoned railroad. See Shared Use Path.

Protected Bike Lane/Cycle Track – A protected bike lane/cycle track is an exclusive bike facility that is physically separated from both the street and the sidewalk. A cycle track may be constructed at street level using street space, or at the sidewalk level using space adjacent to the street. Cycle tracks designed to be level with the sidewalk should provide a physical separation from pedestrian space. Cycle tracks can be one way for bicycles on each side of a two-way road, or two-way and installed on one or both sides of the road. Cycle tracks are typically used on large multi-lane arterials where higher vehicle speeds exist.

Rumble Strip – A textured or grooved pavement treatment designed to create noise and vibration to alert drivers of a need to change their path or speed. Longitudinal rumble strips are sometimes used on or along shoulders or center lines of highways to alert drivers who stray from the appropriate traveled way. Transverse rumble strips are placed on the roadway surface in the travel lane, perpendicular to the direction of travel. Rumble strip dimensions vary depending on their purpose and jurisdiction. (AASHTO)

Shared Lane Markings – Shared-lane markings (sharrows) are used on streets where bicycle riders and motor vehicles share travel lanes. Sharrows help position bicycle riders and provide visual cues to motorists. They can be configured to offer directional and wayfinding guidance. Sharrows are not appropriate on streets with speed limits greater than 35 mph.

Shared Roadway – Roadway that is open to both bicycle and motor vehicle travel.

Shared Use Path – A shared use path is an off-street bicycle and pedestrian facility that is physically separated from motor vehicle traffic. Typically SUPs are located in an independent right-of-way such as in a park, stream valley greenway, along a utility corridor, or an abandoned railroad corridor. SUPs are used by other non-motorized users including pedestrians, skaters, wheelchair users, joggers, and sometimes equestrians.

Shoulder – The portion of the roadway contiguous with the traveled way that accommodates stopped vehicles, emergency use, and lateral support of the subbase, base, and surface courses. Paved shoulders are often used by bicycle riders. (AASHTO)

Roadway with Paved Shoulder – Signed bike routes on busier roads should provide a paved shoulder for bicycle riders to use. In addition to benefiting bicycle riders, paved shoulders increase the longevity of the roadway, reduce pavement maintenance, provide safety benefits to motorists, provide additional space for agricultural equipment and other slow moving vehicles, and provide a number of other benefits to all users of the roadway.

Side Path – A side path is a shared use path located adjacent to a street. It is designed for two-way use by bicycle riders and pedestrians.

Side paths are sometimes created by designating a wide sidewalk for shared use, or they may be a segment of a longer trail or network of trails. Side paths are sometimes provided to facilitate connections to on- and off -street bicycle facilities. A side path is not generally a substitute for on-street bicycle facilities, but may be considered in constrained conditions, or in addition to on-street facilities. Side paths may not be appropriate in areas of high pedestrian activity unless there is space to separate pedestrians and cyclists and to successfully manage conflicts. Side paths may also not be appropriate along streets with numerous driveways or intersections, particularly in commercial areas with high traffic volumes.

Sight Distance – Sight distance is the visually unobstructed distance required to execute a stopping maneuver (stopping sight distance), pass another vehicle (passing sight distance), perform an unexpected maneuver (decision sight distance), or execute a movement at an intersection (intersection sight distance). Sight distances depend on roadway geometry, travel speeds, deceleration rates, and reaction times.

Signal Timing/Phasing – The process of selecting appropriate values for timing parameters implemented in traffic signal controllers and associated system software. (NCHRP)

Signalized Intersection – Intersection between two traveled ways (roadway/roadway or roadway/shared use path) where user movements are regulated by a traffic control signal.

Speed Hump – Parabolic vertical traffic calming devices intended to slow traffic speeds on low-volume, low speed. streets. (NACTO)

Street – A public corridor designed to provide access to businesses, housing, parks, and civic buildings within a city. The entire right-of-way, including sidewalks, the roadway, vegetated buffers, etc. is considered part of the street.

Traffic Calming – Traffic calming techniques are employed to reduce traffic to a "desired speed" by incorporating physical features, such as chicanes, traffic circles, speed humps, and curb extensions, medians, pinch points, lane shifts, diverters, and on-street parking.

Traffic Control – Devices such as traffic signals, warning signs, stop signs, yield signs, and other regulatory signs.

Traffic Diversion – A traffic calming technique in which raised areas are constructed to redirect motor vehicle traffic to alternate routes but permit passage of bicycle riders and pedestrians. Traffic diverters are common treatments on bicycle boulevards.

Traffic Volume – The number of vehicles passing a given point over a specific period of time.

Transit Stop – Location where public transportation vehicles (bus or rail) will stop to allow passengers to board or alight the transit vehicle.

Two-Stage Turn Queue Box – Two-stage turn queue boxes are areas set aside for bicycle riders to queue to turn at signalized intersections outside of the traveled path of motor vehicles and other bicycles. In addition to mitigating conflicts inherent in merging across traffic to turn, two-stage bicycle turn boxes reduce conflicts between bicycles and pedestrians and separate queued bicycle riders waiting to turn from through bicycle riders moving on the green signal. (MUTCD)

Vertical Deflection Treatment – Traffic calming techniques that compel drivers to reduce their travel speed by changing the elevation of the roadway at defined locations along a street. Examples include speed humps, speed tables, and raised crosswalks.

Wayfinding – A system of directional signs along streets or paths that assist people in finding major destinations. Wayfinding can be designed specifically for drivers, bicycle riders, or pedestrians.

6TH ST AND KASOLD DR,
LAWRENCE, KS

Appendix B: Public Input

Overview

The Transportation 2040 (T2040) plan completed in March of 2018 included planning for people who bicycle, walk, ride transit, and drive vehicles. The plan reflects the regional values and priorities, which are shifting towards non-single occupancy motor vehicle modes of travel. The public engagement process identified the desire for improved bicycle safety and additional bikeway design options. There is a need to update the Countywide Bikeway System Plan, which was approved in March of 2014, to better reflect the community's vision.

The first phase of public engagement began in late May and ended on August 31st. It consisted of open houses, guided bicycle rides, mobile meetings, and a survey to better understand comfort levels for bicycle riders. There were 638 responses (which included people who live or work in Lawrence, Eudora, Baldwin City, Lecompton, or Douglas County).

Prior to the beginning of the second phase of public engagement it was determined the Countywide Bike Plan would be developed in two pieces – the Lawrence Bike Plan and the Unincorporated Douglas County, Eudora, Baldwin City, Lecompton plan. The MPO developed Safe Routes to School (SRTS) plans for Eudora and Baldwin City in 2020 and realized the best way to achieve momentum for the bike plan is to incorporate it into facilitating kids safely walking and bicycling to school. Thus the Unincorporated Douglas County, Eudora, Baldwin City, Lecompton portion of the plan was paused to match up with the SRTS planning occurring in 2019-2020.

A full record of the Unincorporated Douglas County, Eudora, Baldwin City, Lecompton survey responses and public comments are found in this Appendix. A 30-day public comment period was held May 6 - June 5, 2021.

Open Houses

There were 3 open houses held during the public engagement phase.

- Baldwin City Public Library – June 12th, 2018, 5:00 – 6:00 pm
- Aunt Netters Café – June 15th, 2018, 11:00 am – 1:00 pm
- Eudora City Hall – June 19th, 2018, 5:30 – 6:30 pm

BALDWIN CITY, KS

Guided Bicycle Rides

Two guided bicycle rides were held during the first public engagement phase.

- Baldwin City Public Library – June 12th, 2018, 6:30 – 7:30 pm
- Eudora City Hall, June 19th, 2018, 7:00 – 8:00 pm

Mobile Meetings

Mobile meetings were held at locations people were already gathering or passing through. This enabled planners and MPO Bicycle Advisory Committee (BAC) members to engage the public in the planning process inviting them to participate in the surveys.

- Eudora Family Fun Night, CPA Park - 9th & Main St, Eudora, August 3rd, 2018, 7-8:30 pm
- 3rd Friday Artwalk at the Lumberyard Arts Center, 718 High Street, Baldwin City, August 17th, 2018, 6:30 - 8:30 pm
- Back 2 School Picnic, Baker University, Baldwin City, August 18th, 2018, 5:00 - 7:00 pm

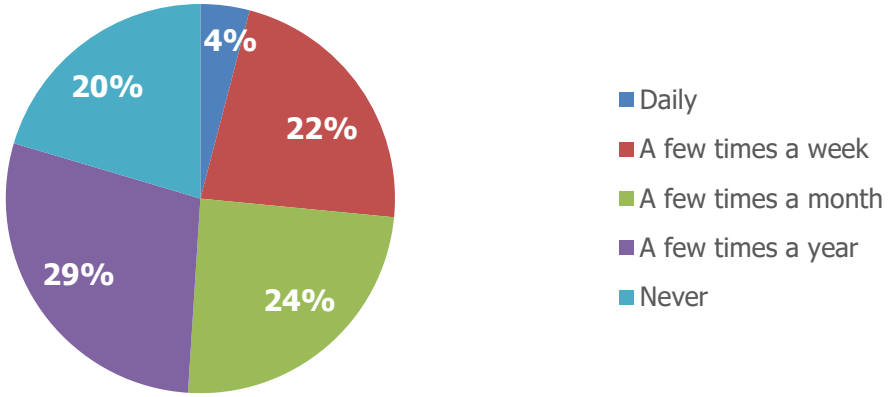
EUDORA, KS

The following survey results only include responses who self-reported they either live or work in Unincorporated Douglas County, Eudora, Baldwin City, Lecompton.

SURVEY 1

When asked " How often do you ride a bicycle (in good weather)? (Select one)"
Respondents indicated:

Figure B1: Frequency of Bicycle Riding

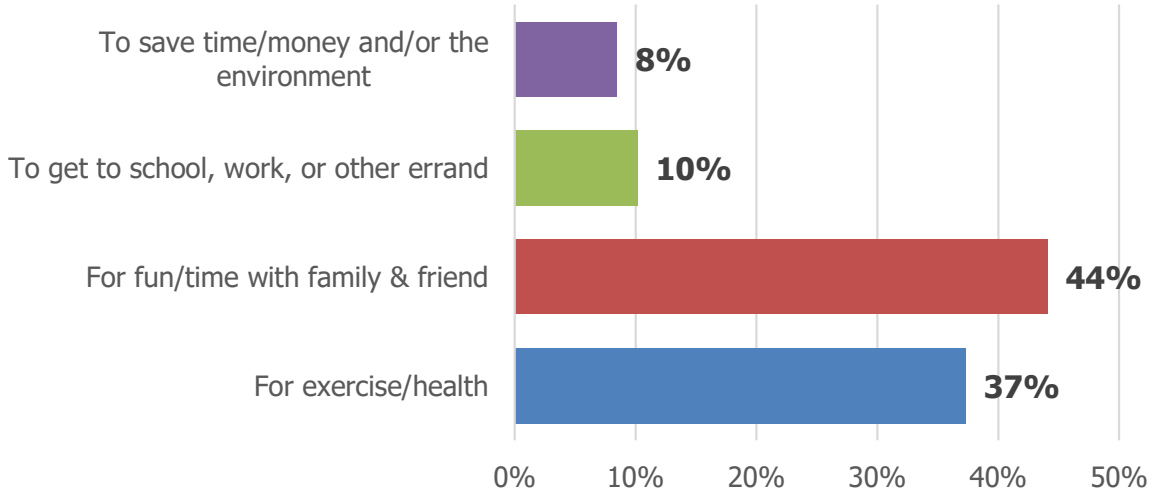


Number of Responses - 49

EUDORA, KS

When asked "What is your primary reason for bicycling? (Select all that apply)" Respondents indicated:

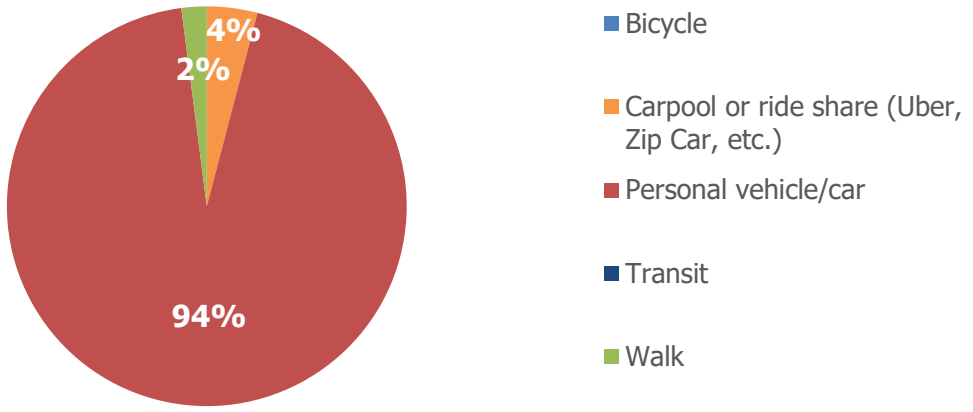
Figure B2: Reason for Bicycling



Number of Responses - 59

When asked "What is your primary mode of transportation? (Select one)" Respondents indicated:

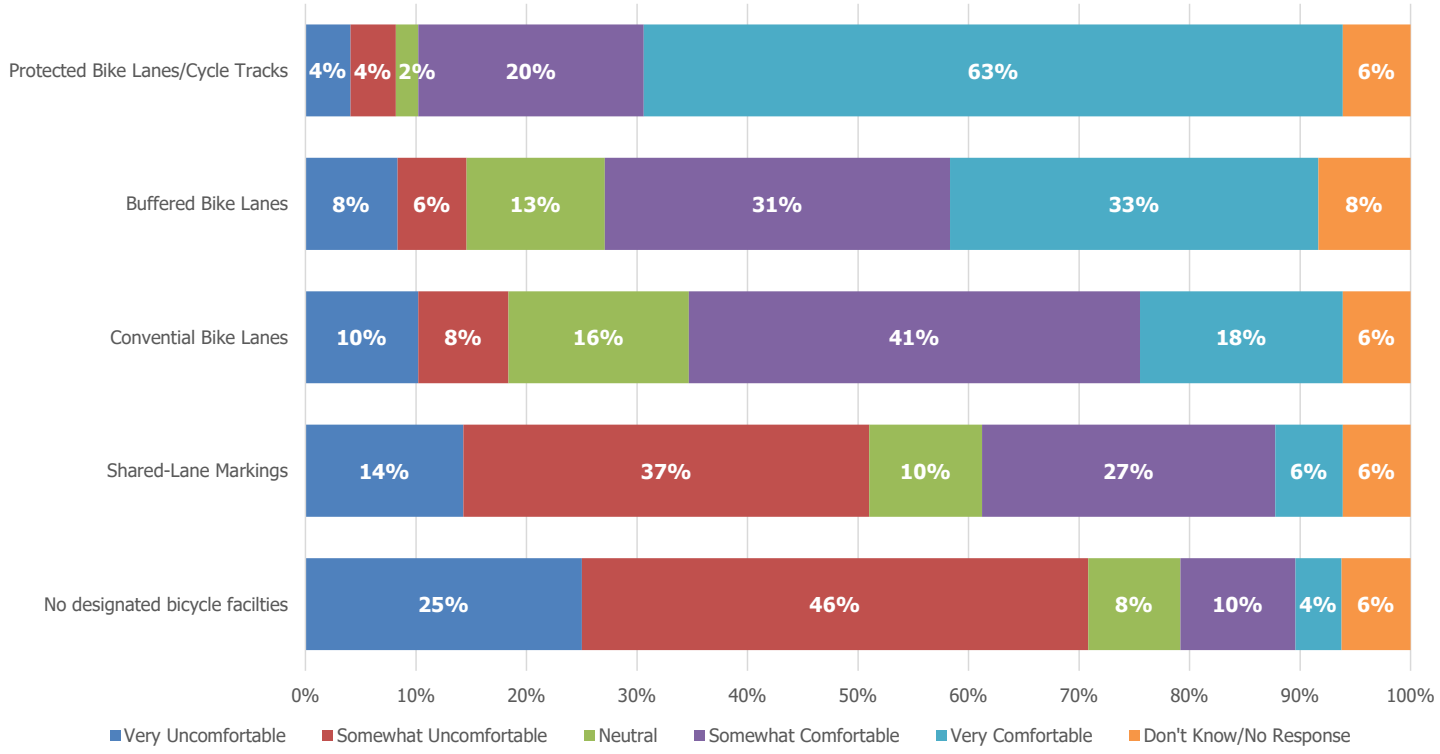
Figure B3: Primary Mode of Transportation



Number of Responses - 49

When asked "How comfortable do you feel bicycling on different forms of bicycling forms of bicycle facilities on commercial streets?" Respondents indicated:

Figure B4: Comfort Levels on Commercial Streets



Additional Comments about Bicycling on Commercial Streets:

ROADS ARE NOT FOR BIKES -

- Should not be allowed. Safety hazards for bikes and cars.

FACILITIES -

- Bicycled in Lawrence for over 40 years - great experience & I am in favor of protected lanes for bicycles & driver's education. (2)
- I am not a huge fan of biking shared with vehicles. I do, however, like the protected lanes of biking.
- I would bike for more than just recreation ((as a mode of transportation) if we had buffered bike lanes
- There should be designated bicycle paths or. Lanes not on the. Streets with cars. I. Am uncomfortable with bikes on the roads.
- We could use more designated bike lanes in Eudora!

OTHER -

- I get nervous with cars because kids get picked up.
- Led not do it at all.

SAFETY -

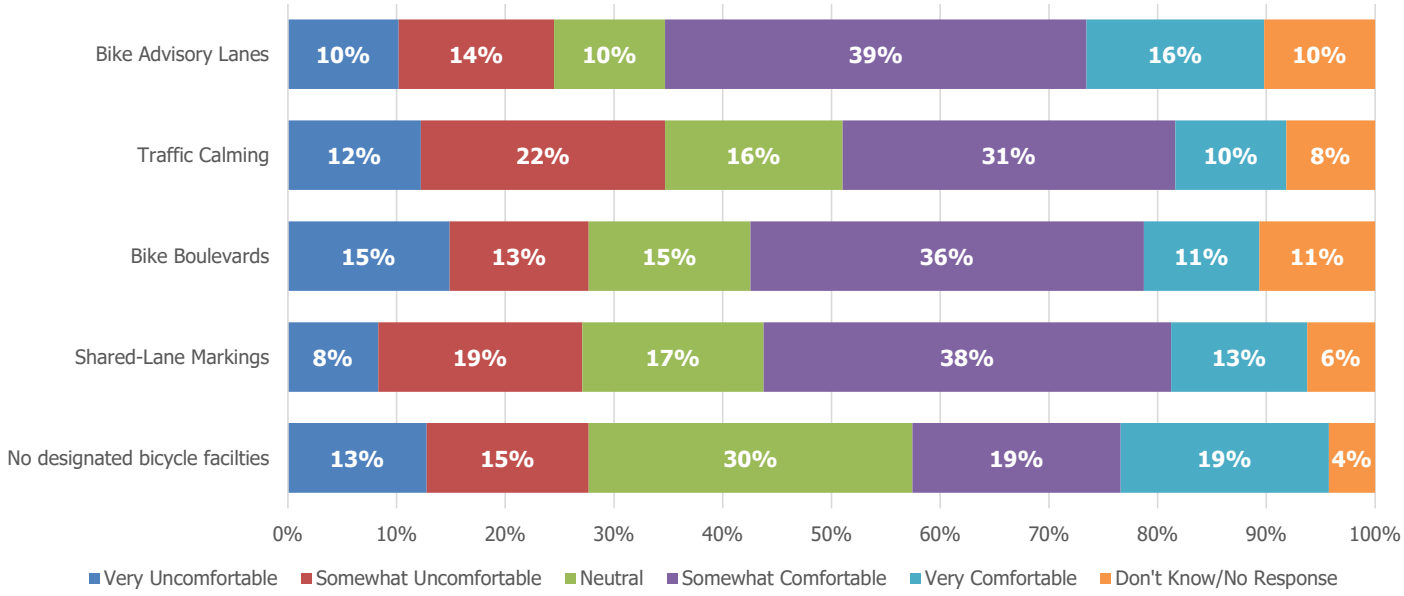
- Whenever cyclists are combined with traffic, higher risk is assumed because motorized traffic often does not notice cyclists due to situation blindness. It's a risk that most cyclists accept because there are not many choices in this area.

TRAFFIC -

- 10th street in Baldwin is extremely busy with large city vehicles, semis, grain and delivery trucks. Although it appears to be a somewhat quiet, residential street, there is a lot of commercial traffic on a daily basis.

When asked "How comfortable do you feel bicycling on different forms of bicycling forms of bicycle facilities on Residential/Neighborhood Streets?" Respondents indicated:

Figure B5: Comfort Levels on Neighborhood/Residential Streets



Additional Comments about Bicycling on Residential/Neighborhood Streets

- 1055 needs fixed not for just bikes but cars too
- Due to their lower traffic, residential streets are easier but cyclists still have to pay acute attention.
- I think biking in residential areas it less. Dangerous than the more congested streets.
- Make it legal to ride on the sidewalk.
- Safety hazard for all
- The most uncomfortable thing about biking on residential streets in downtown Baldwin is the cars backing up from parking spaces on the streets.

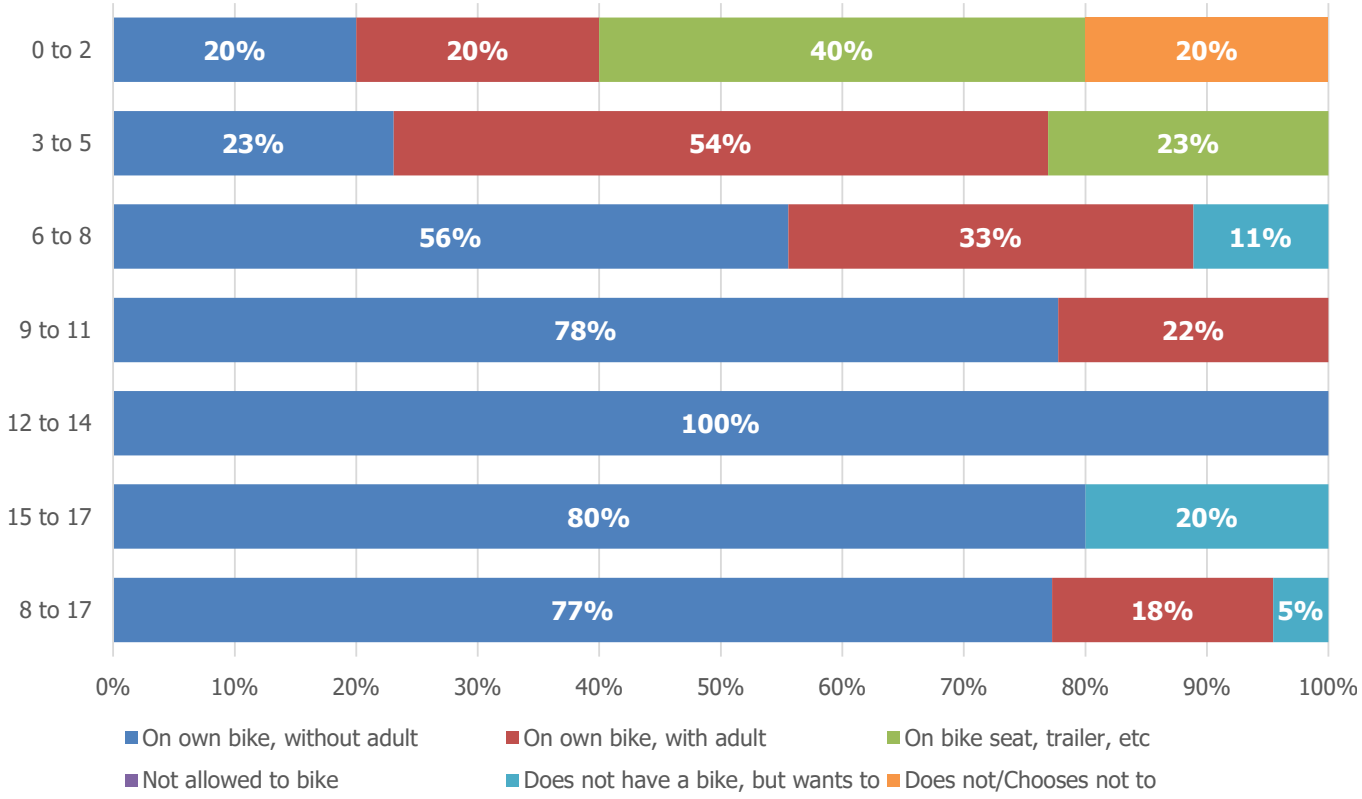
When asked "Do you have children currently under 18? (Select one)" Respondents indicated:

Figure B6: Comfort Levels on Neighborhood/Residential Streets

Number of Responses - 49

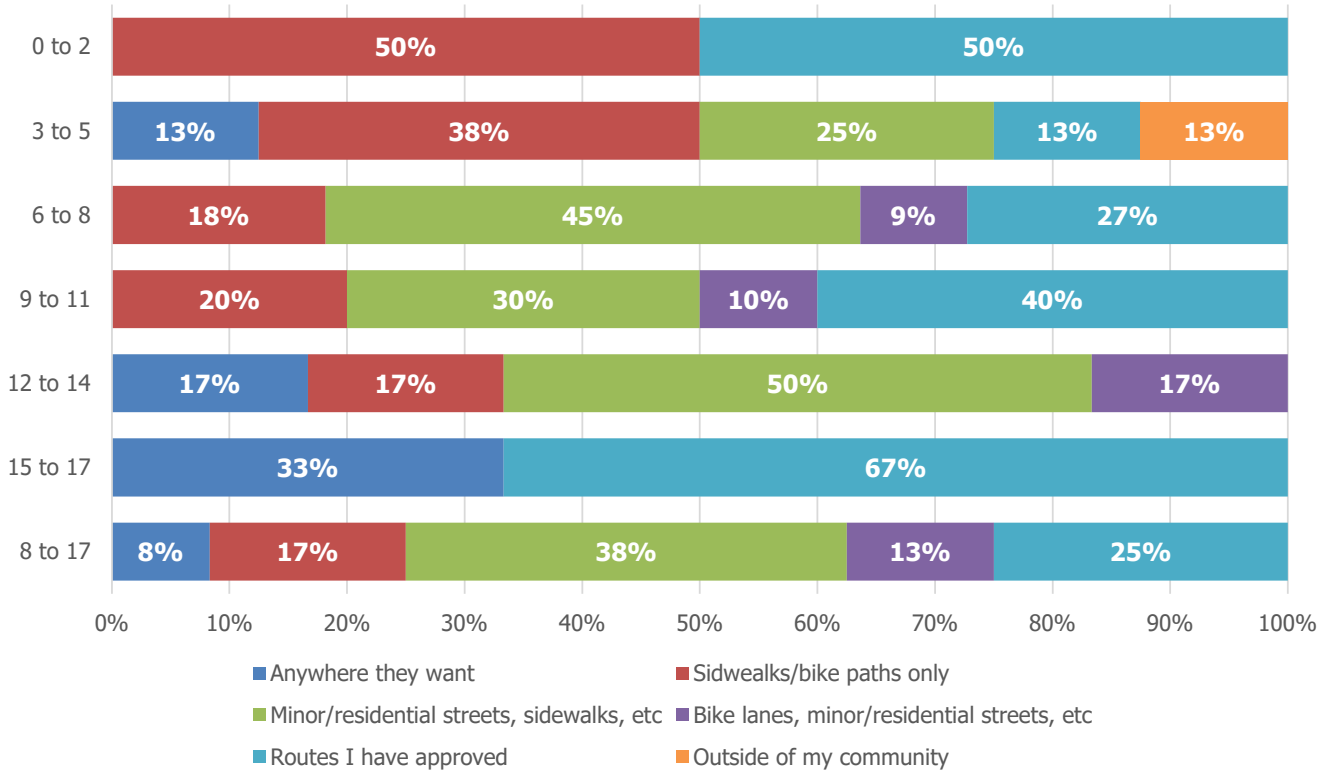
When asked "Do you bicycle with your children or do your children bike?" Respondents indicated:

Figure B7: Do Children Bicycle



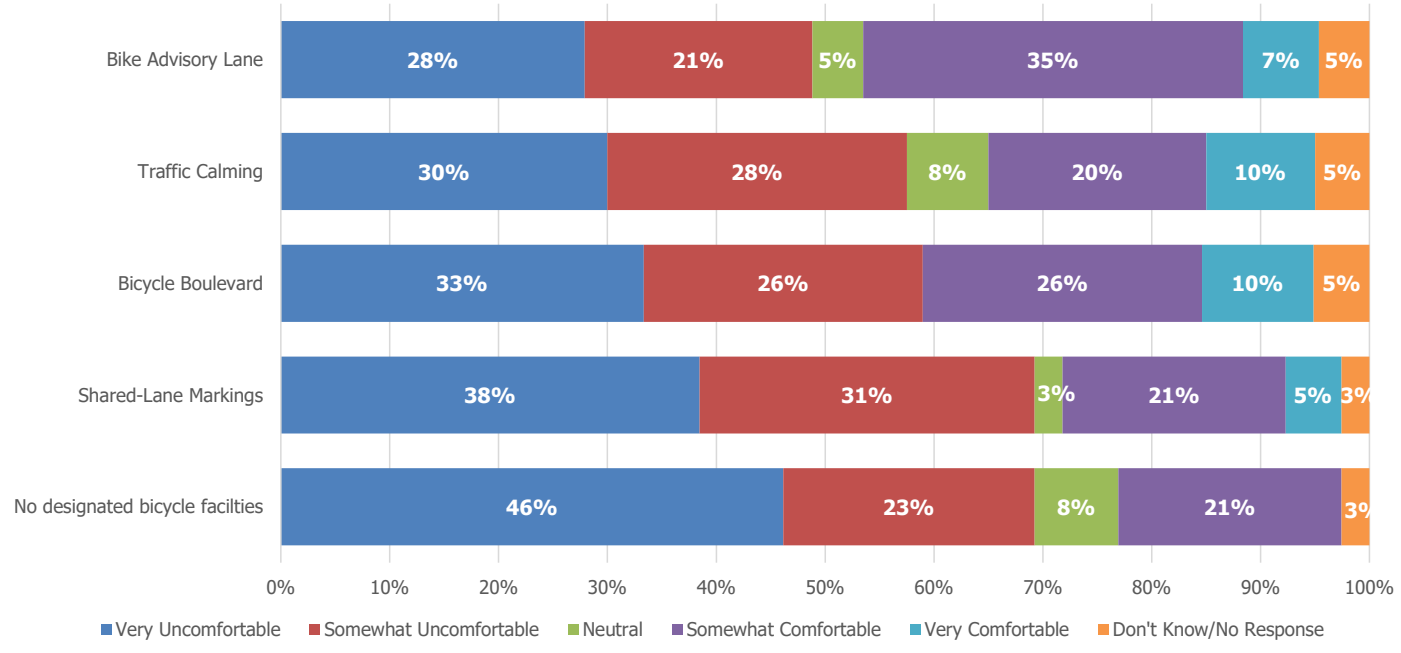
When asked "If your child does bike without an adult, where do they bike?" Respondents indicated:

Figure B8: Where Do Children Bicycle?



When asked "How comfortable do you feel about your children bicycling with different bicycling facilities on residential/ neighborhood streets, without an adult?" Respondents indicated:

Figure B9: Comfort Levels about Children Biking Without an Adult

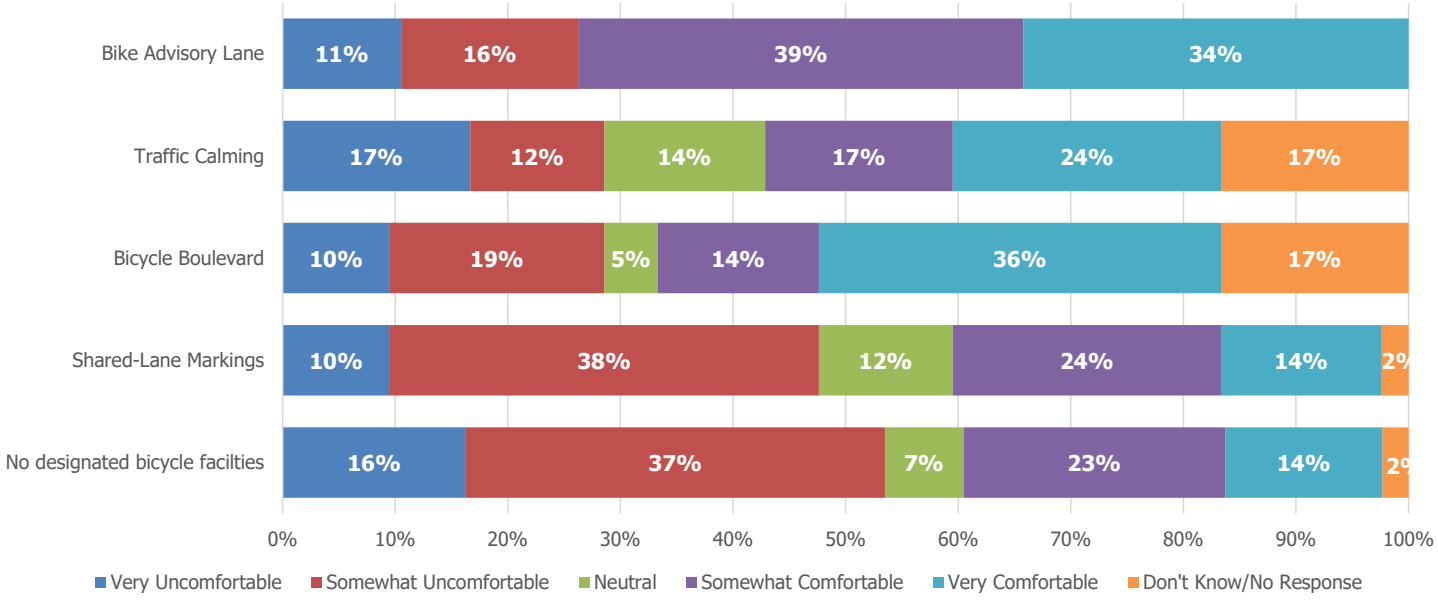


Additional Comments about Children Bicycling without an Adult

- My daughter can only ride on our property. We live in the country.
- My kids are a special case, but not having defined facilities makes it more difficult for us to let them roam.
- Some of my lack of comfortability with these type of bike lanes is due to the lack of experience we have using these types of lanes.

When asked "How comfortable do you feel about your children bicycling with different facilities on residential/ neighborhood streets, with an adult?" Respondents indicated:

Figure B10: Comfort Levels about Children Biking With an adult

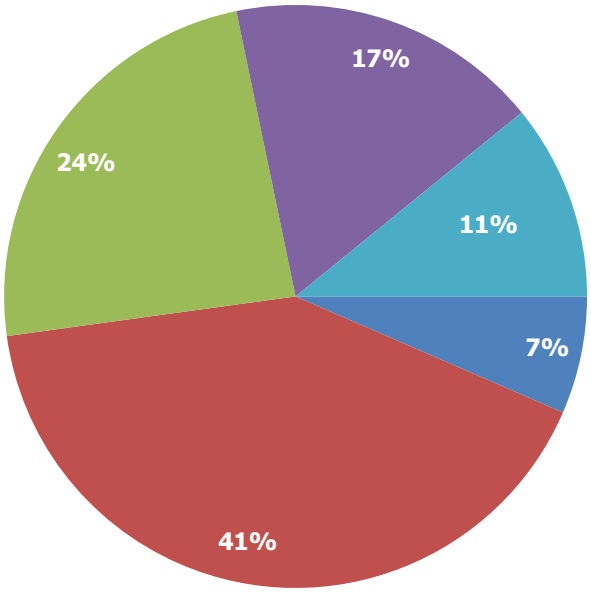


Additional Comments about Children Bicycling with an Adult

- I am more open to biking with my kids versus them biking on their own.
- No child should ever ride without an adult

When asked "What type of rider would you classify yourself as?" Respondents indicated:

Figure B11: Type of Bicycle Rider



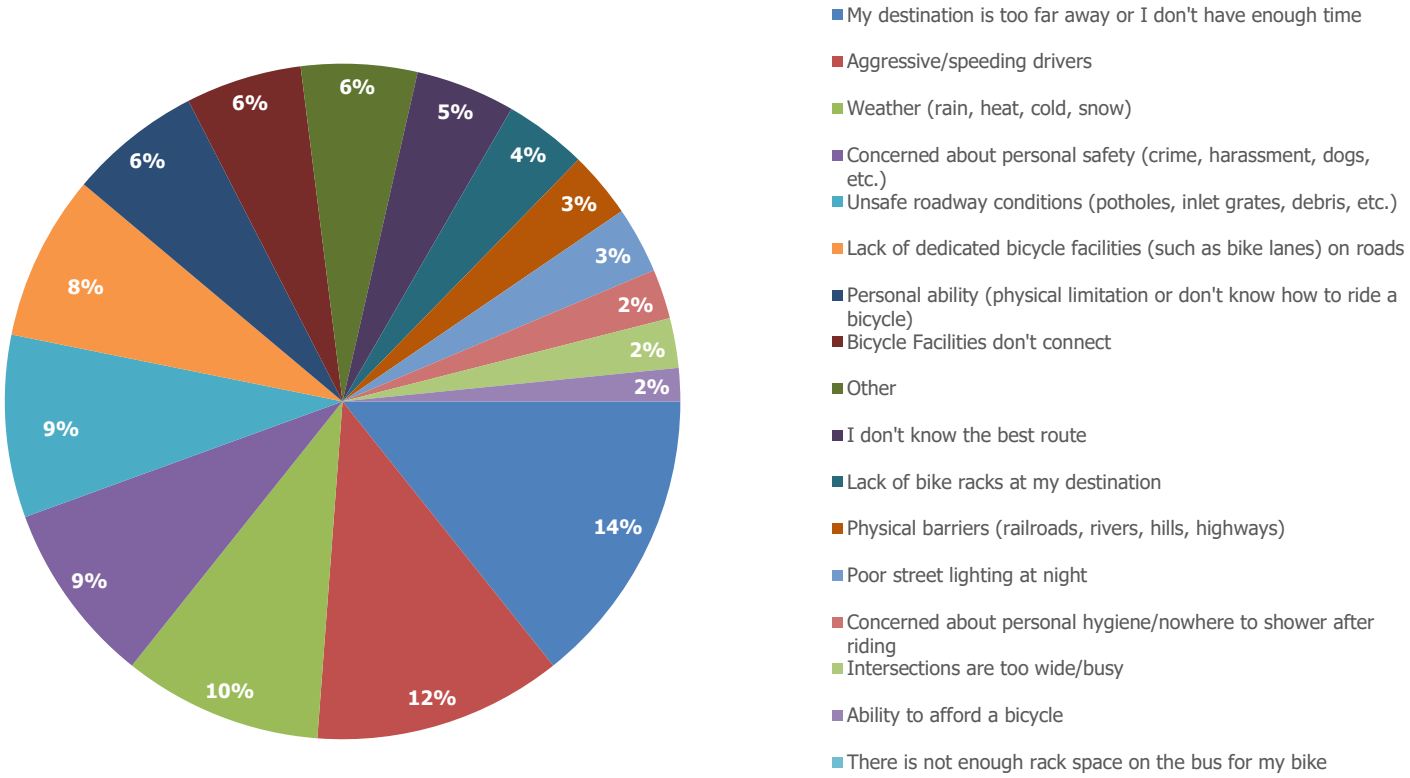
- I am an avid bicyclist and will bike pretty much anywhere, whether there are bike facilities or not.
- I enjoy bicycling and feel comfortable bicycling on streets with bike lanes or on minor streets with traffic calming/low traffic speeds/residential streets.
- I bicycle only in some places such as separated shared use paths (like the Burroughs Creek Trail) and would like to be able to bicycle more if the streets or facilities were more comfortable or I felt safer.
- I am not comfortable bicycling, but either do bike once in a while, such as when I am on vacation in an area where there is an easy bike path, or I would like to bike although I currently do not.
- I have zero interest in bicycling or am physically unable to ride a bike.

Number of Responses - 46

EUDORA, KS

When asked "What prevents yo from bicycling more? (Select all that apply)" Respondents indicated:

Figure B12: Reasons Not to Bicycle



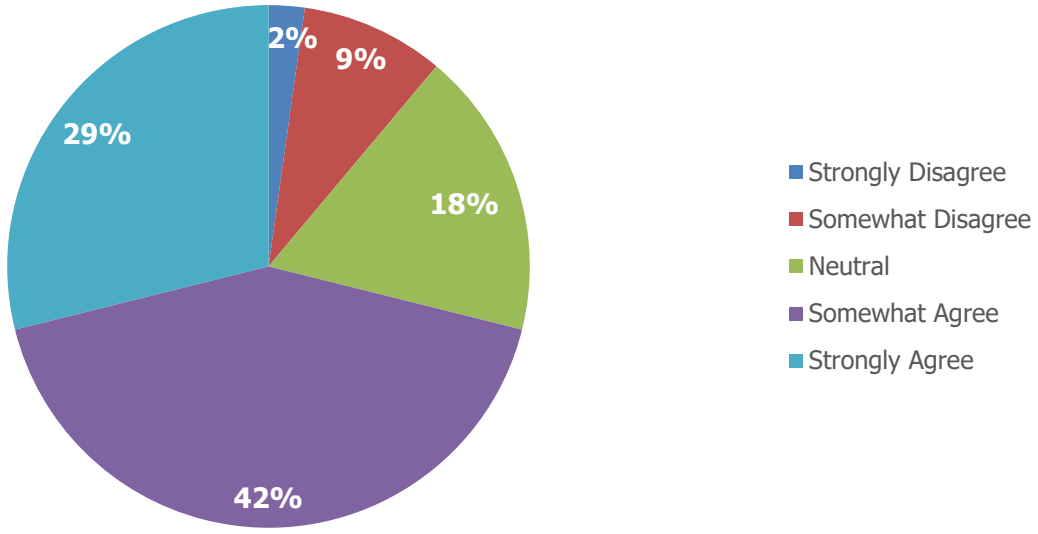
Number of Responses - 126

Other Reasons Not to Bicycle -

- Distance to dedicated bike trail.
- I need a decent bike
- I'm lazy
- Personal safety for me (people)
- Retired - balance problems (2)
- Uncomfortale

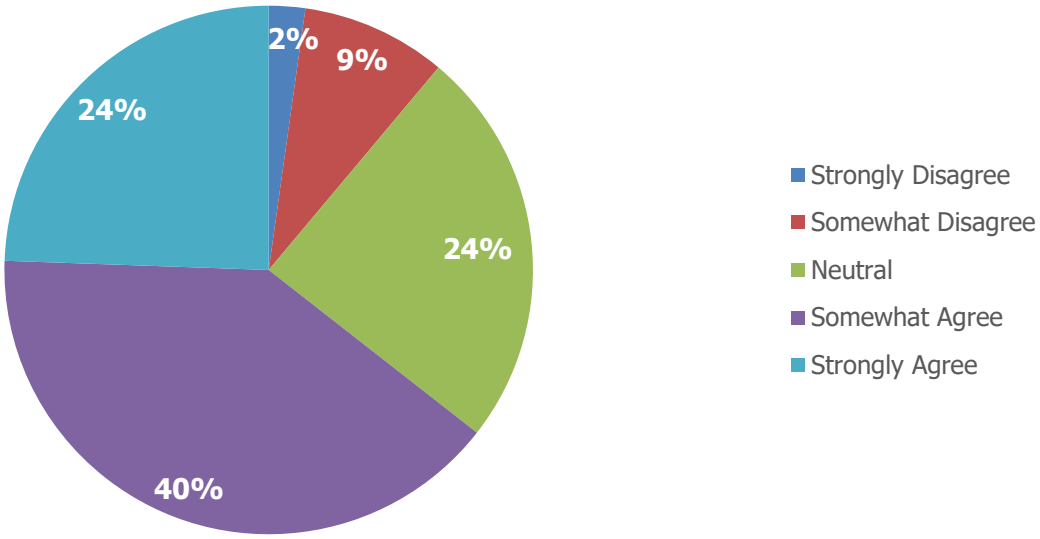
When asked "What is your level of agreement with the following statements?" Respondents indicated:

Figure B13: I would ride my bicycle more often if I felt I could do it safely



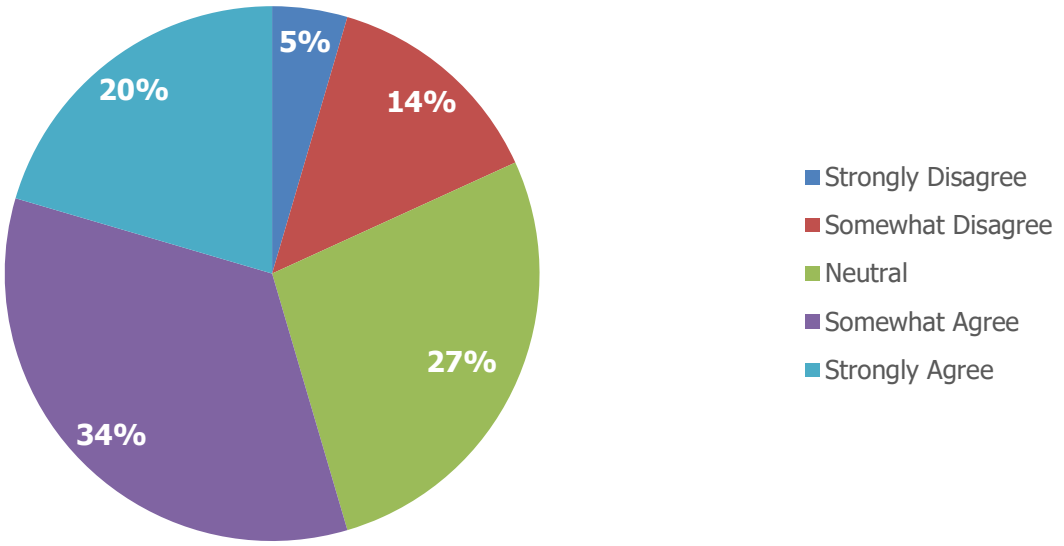
Number of Responses - 45

Figure B14: Lawrence & Douglas County's transportation network should equally prioritize the needs of people who bicycle with other travel modes



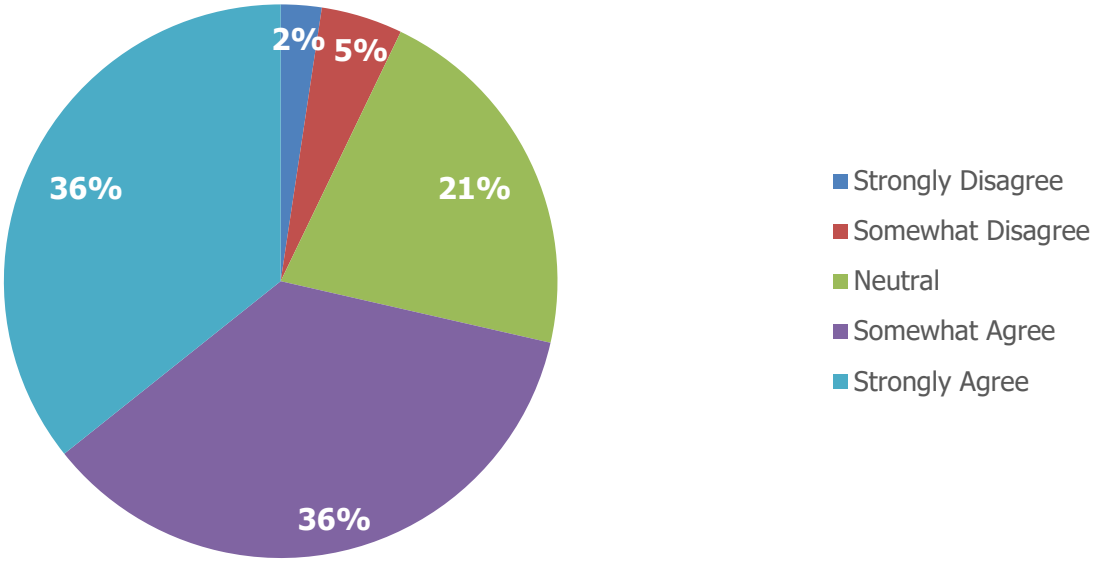
Number of Responses - 45

Figure B15: On-street bike lanes, buffered bike lanes, & protected bike lanes should be considered for more city roadways even if it means removing parking



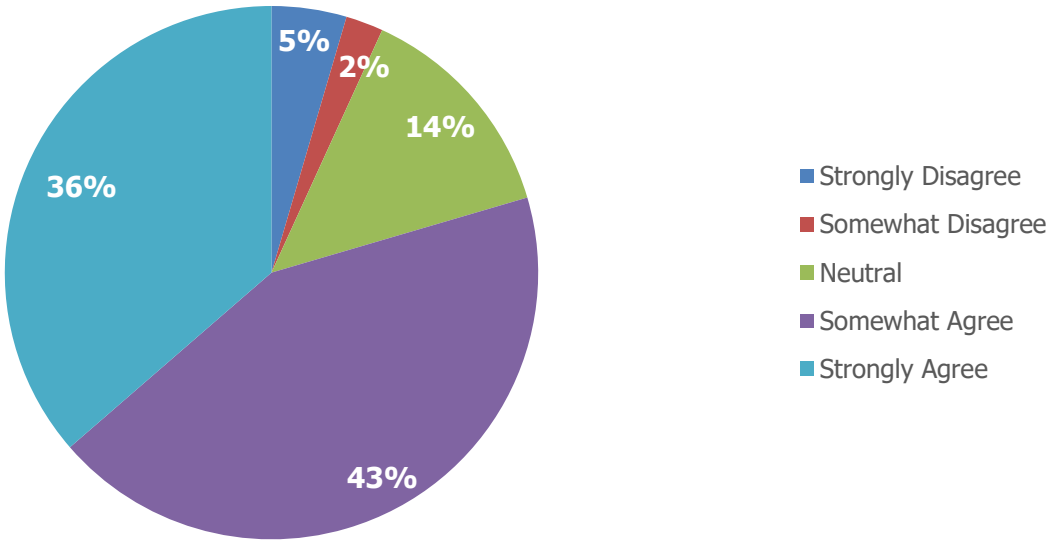
Number of Responses - 44

Figure B16: Providing safe bicycling alternatives for people who cannot or choose not to drive is critical



Number of Responses - 42

Figure B17: The bicycle network should provide options for people of all riding abilities



Number of Responses - 44

Anything else they want to share with us about bicycling in our community -

- 1055 is a dangerous road and I'd hate to see the day someone wrecks and kills someone because they race down baldwin hill and up it
- I'd like to see a path between eudora and lawrence
- If we can go on the sidewalks without breaking the law I would more instead.
- Retired from bicycling but in favor of safety.
- Retired from bicycling but in favor of safety.
- We have many bike trails around this city and county, keep the bikes off the streets and county roads. Safety hazard for all.

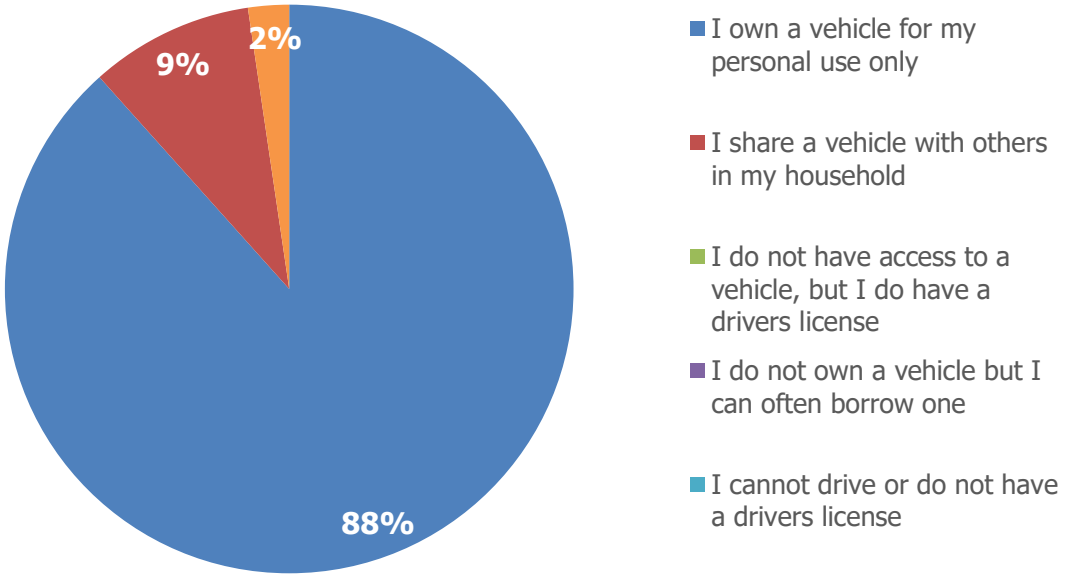
LECOMPTON, KS

BALDWIN CITY, KS

EUDORA, KS

When asked "Do you own or have access to a car/vehicle? (Select one)" Respondents indicated:

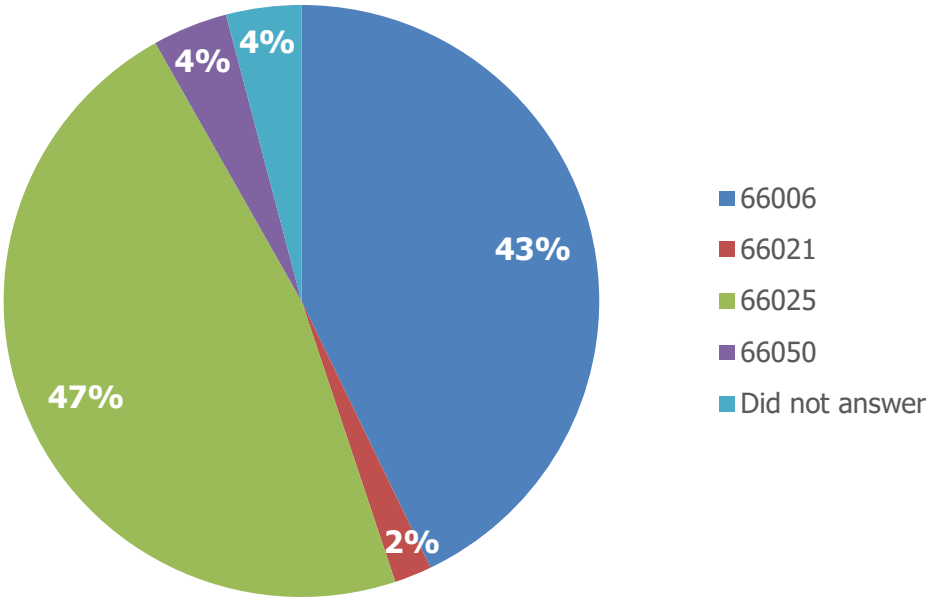
Figure B18: Car/vehicle Access



Number of Responses - 43

When asked "What is your zip code: Home?" Respondents indicated:

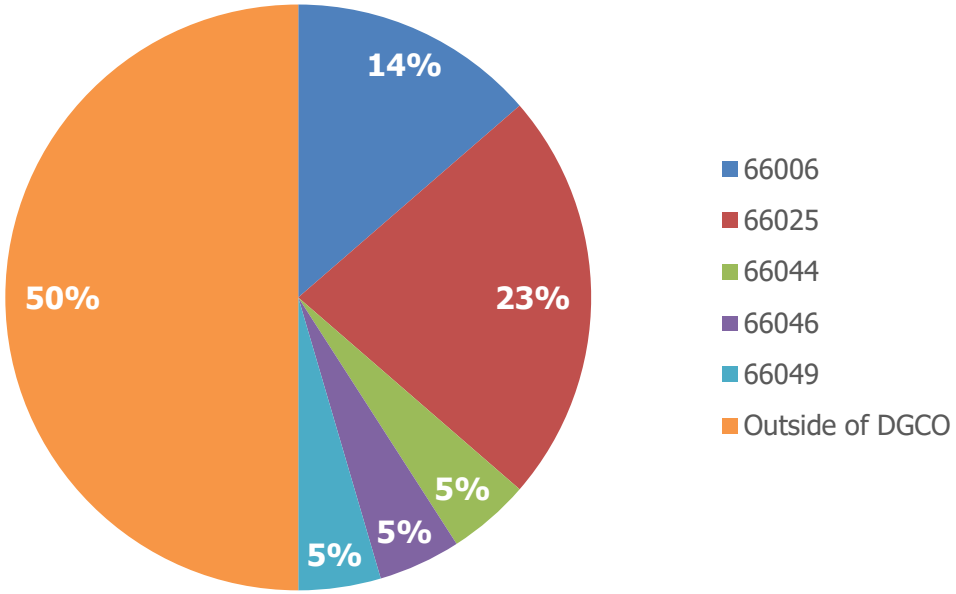
Figure B19: Home ZIP Code



Number of Responses - 49

When asked "What is your zip code: Work?" Respondents indicated:

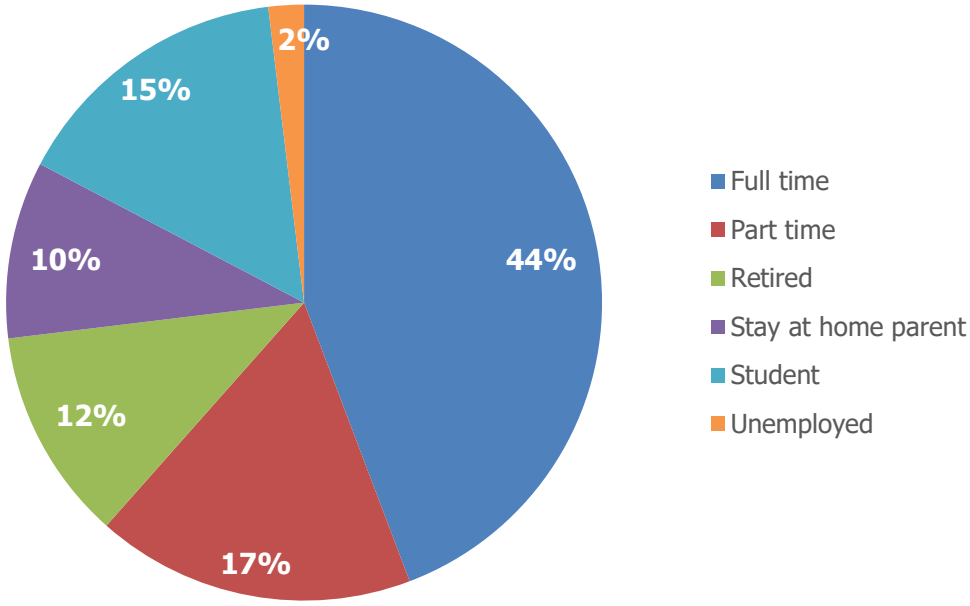
Figure B20: Work ZIP Code



Number of Responses - 22

When asked "What best describes your employment status? (Select all that apply.)" Respondents indicated:

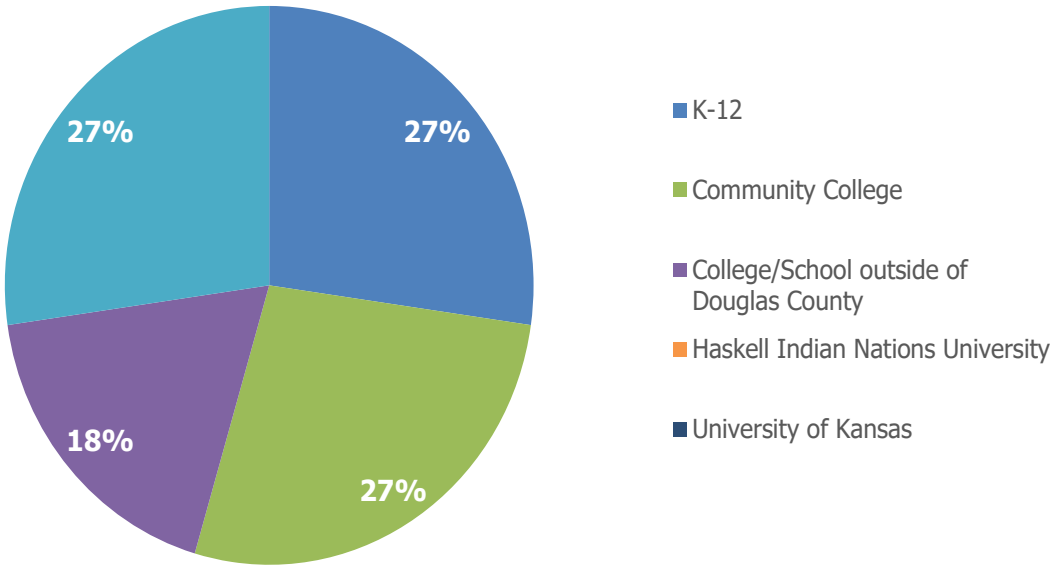
Figure B21: Employment Status



Number of Responses - 52

When asked "If you are a student, where do you go to school? (Select all that apply)" Respondents indicated:

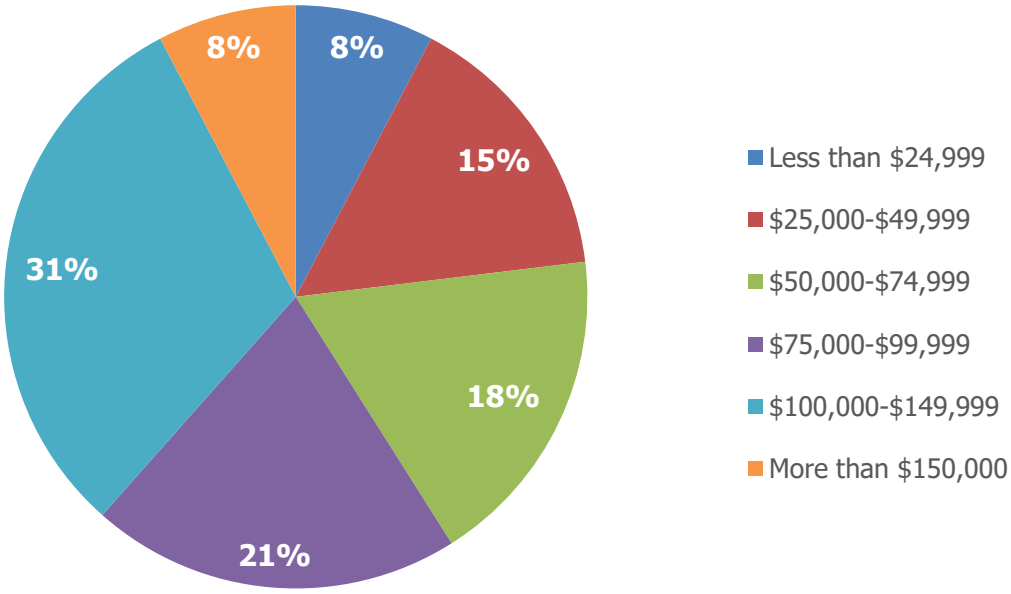
Figure B22: Schools



Number of Responses - 11

When asked "What is the approximate average household income? (Select one)" Respondents indicated:

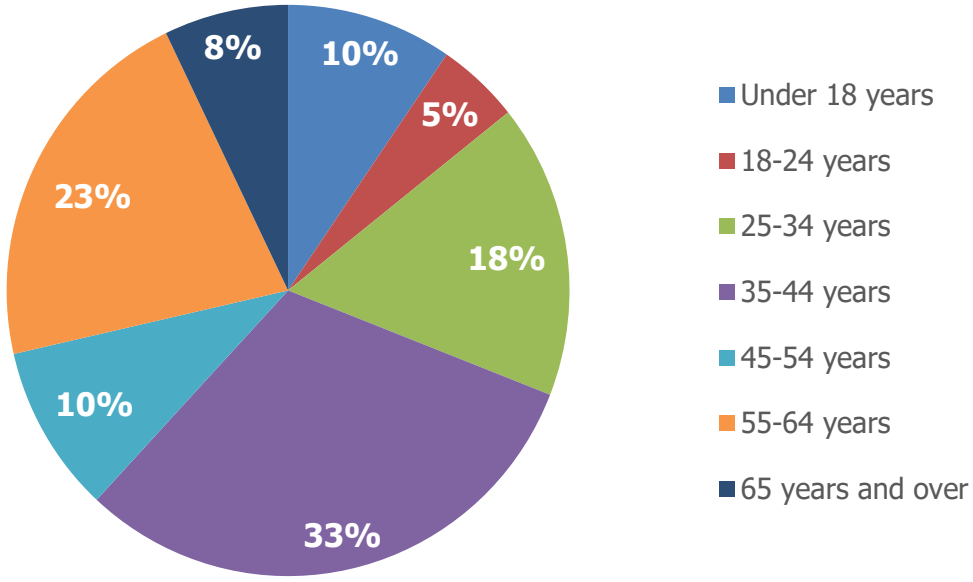
Figure B23: Income



Number of Responses - 39

When asked "What is your age? (Select one)" Respondents indicated:

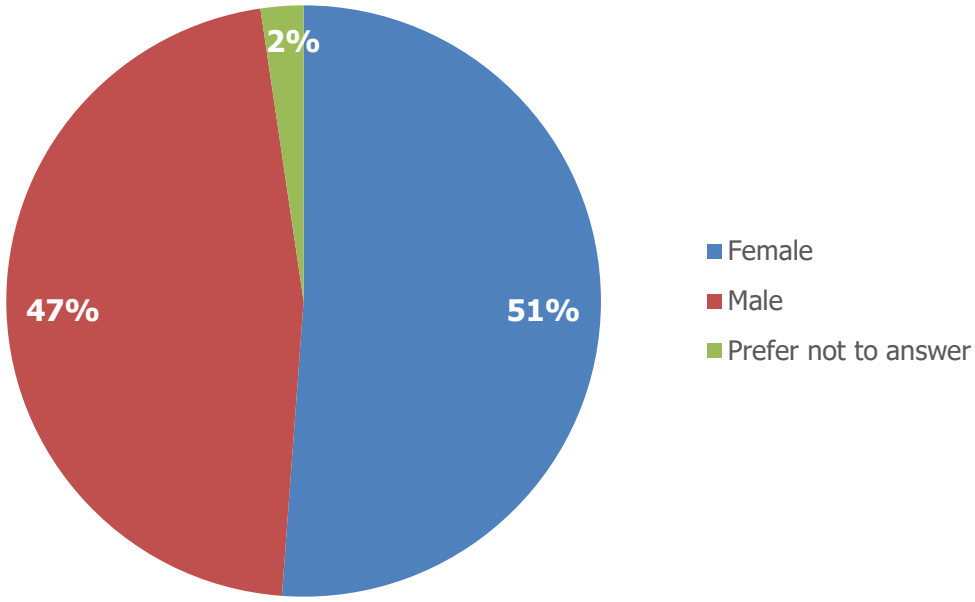
Figure B24: Age



Number of Responses - 39

When asked "What is your sex? (Select one)" Respondents indicated:

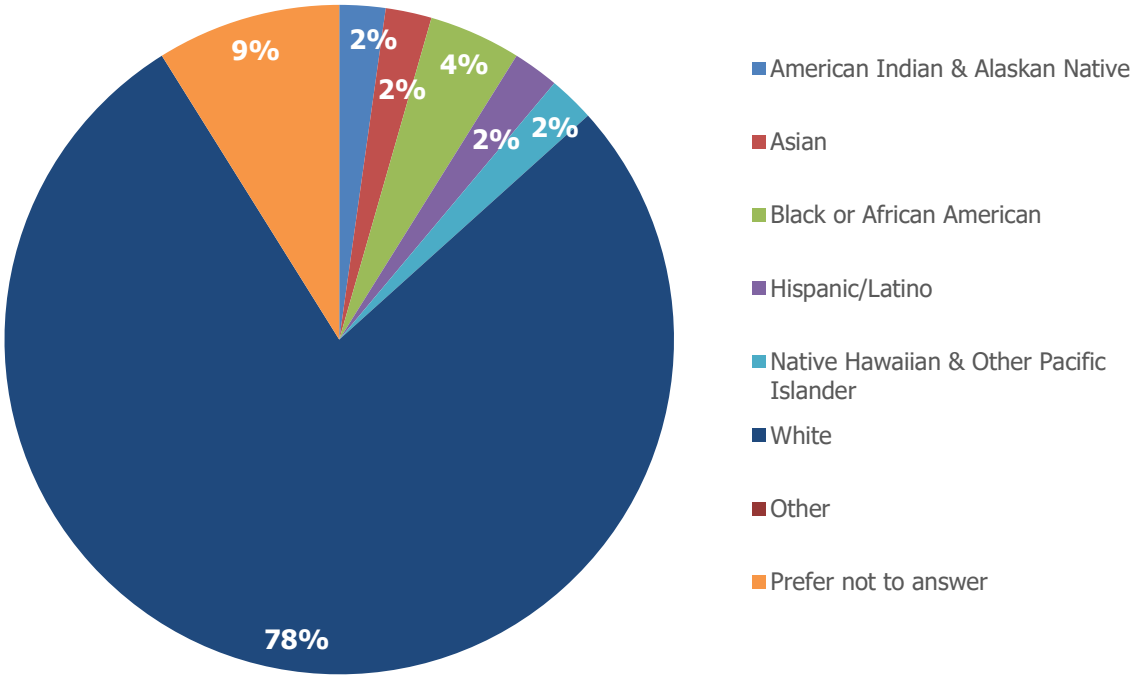
Figure B25: Sex



Number of Responses - 43

When asked "Which race/ethnicity best describes you? (Select all that apply)" Respondents indicated:

Figure B26: Race/Ethnicity



Number of Responses - 45

BALDWIN CITY, KS

Survey 1 Comparisons

When asked "How comfortable do you feel bicycling on different forms of bicycle facilities on commercial streets?" Respondents indicated:

Figure B27: All Respondents

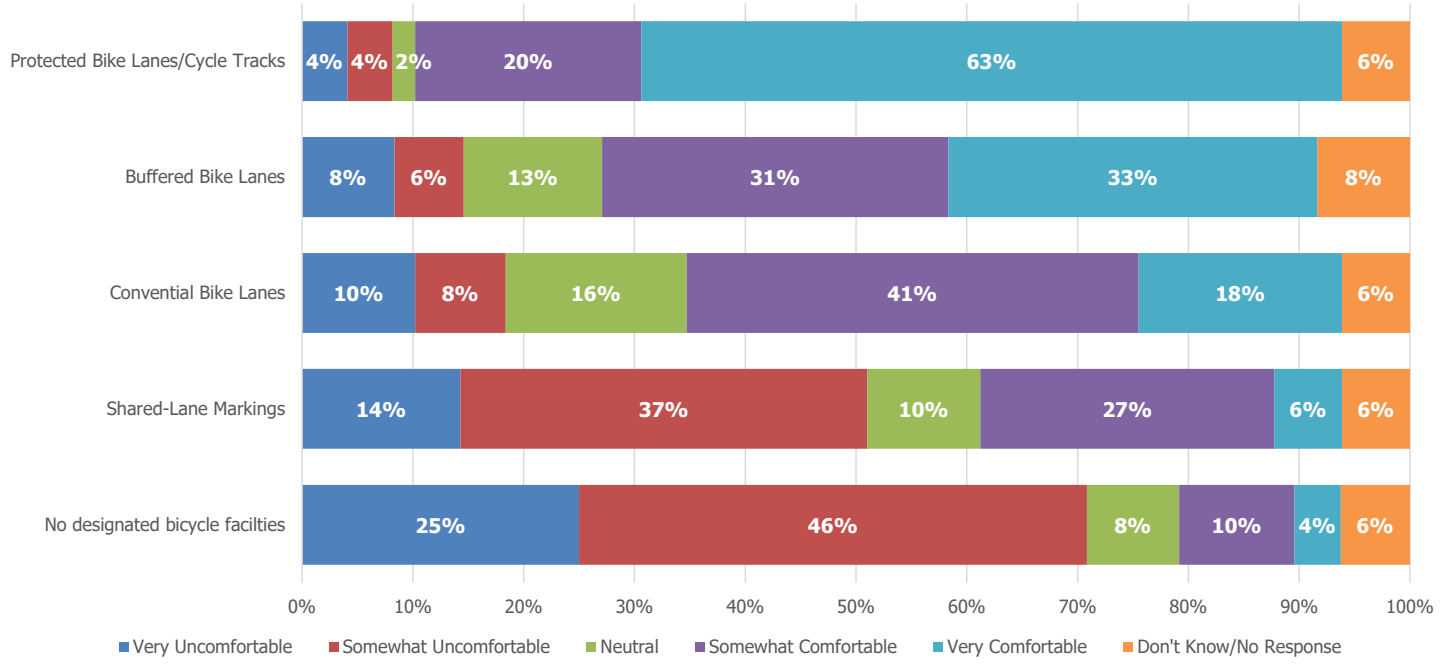
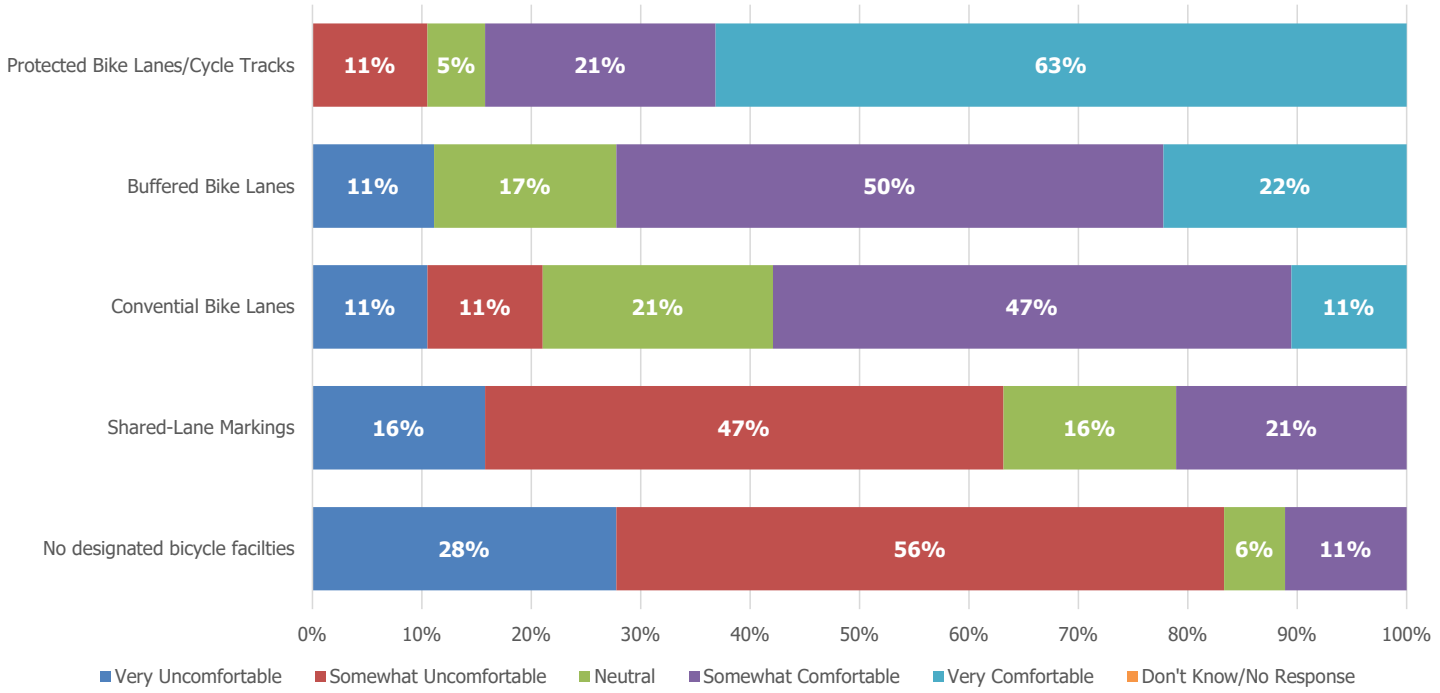


Figure B28: Concerned Cyclists*



* Concerned Cyclists self-identify as bicycling only on separated shared use paths, and would like to bike more if streets or facilities were more comfortable/safer, or are not comfortable bicycling, but would like to bicycle.

When asked "How comfortable do you feel bicycling on different forms of bicycle facilities on Residential/Neighborhood Streets?" Respondents indicated:

Figure B29: All Respondents

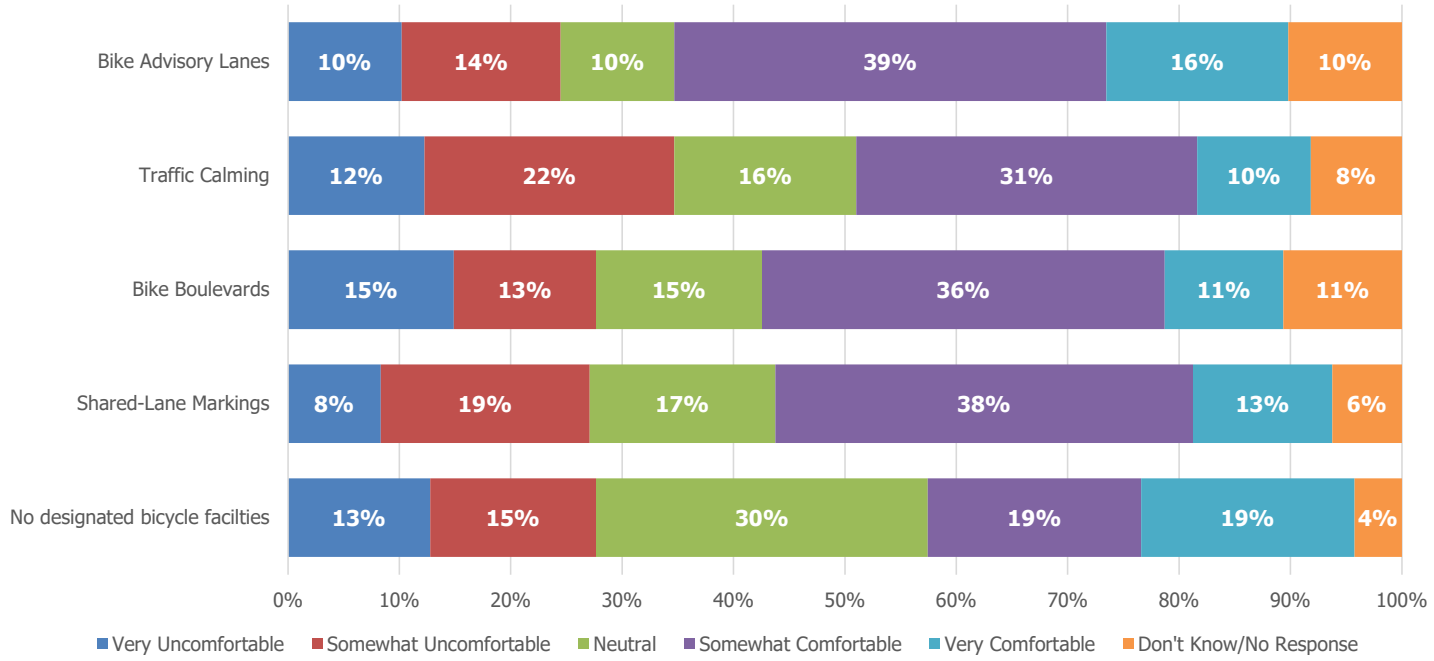
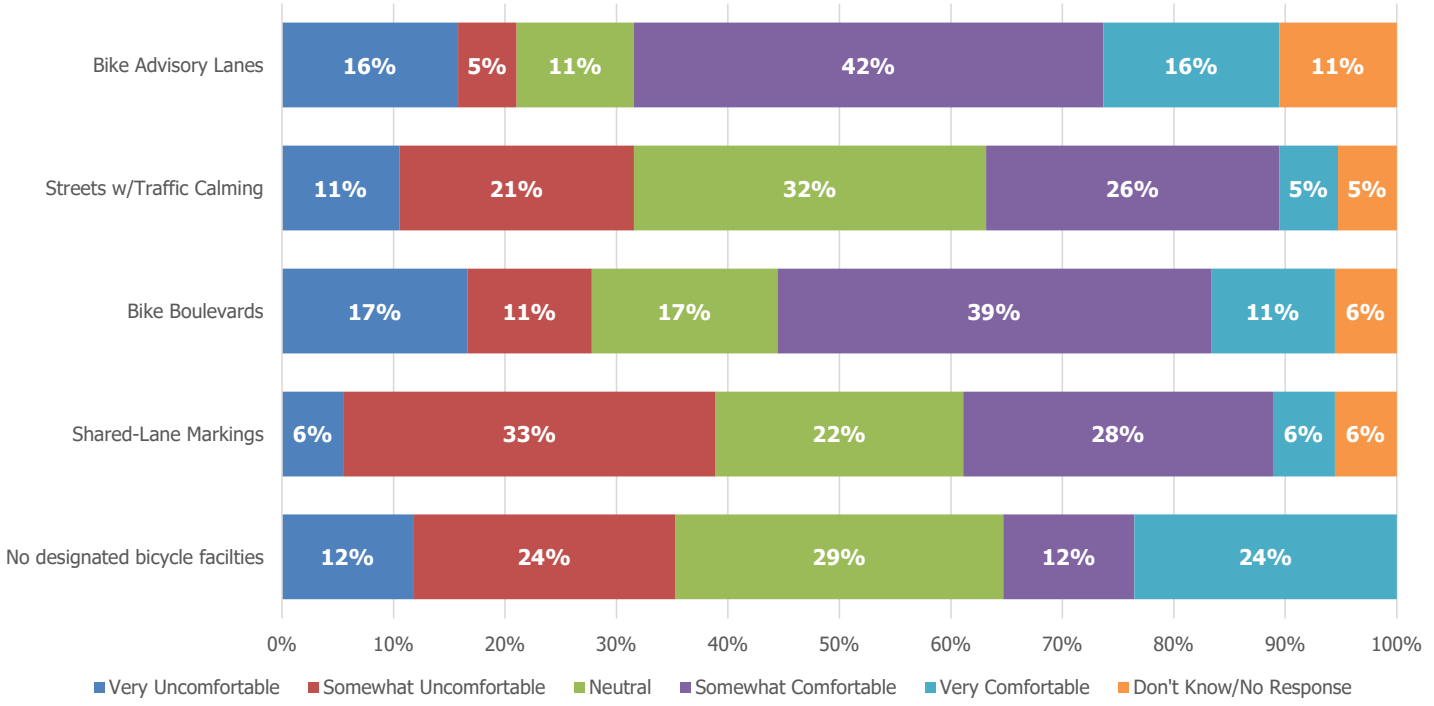


Figure B30: Concerned Cyclists*



* Concerned Cyclists self-identify as bicycling only on separated shared use paths, and would like to bike more if streets or facilities were more comfortable/safer, or are not comfortable bicycling, but would like to bicycle.

When asked "How comfortable do you feel bicycling on different types of bicycle facilities on Residential/Neighborhood Streets?" Respondents indicated:

Figure B31: Female

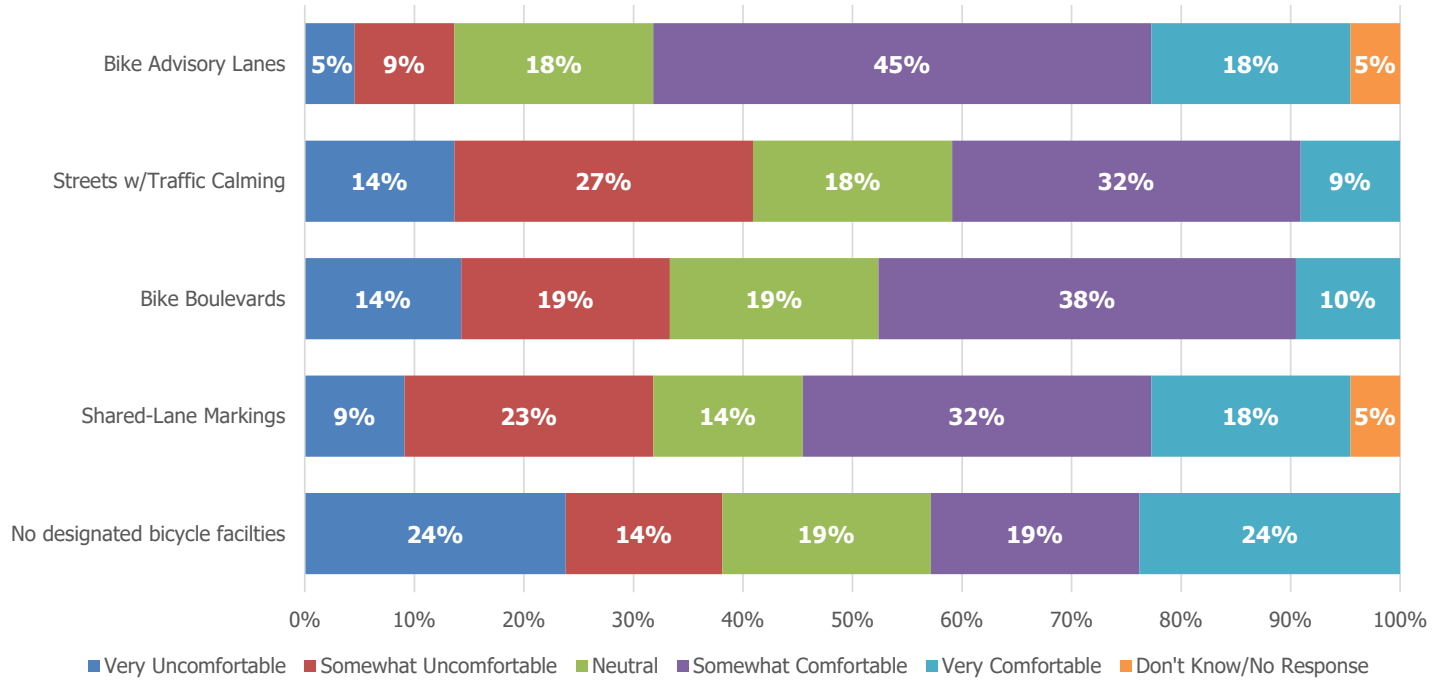
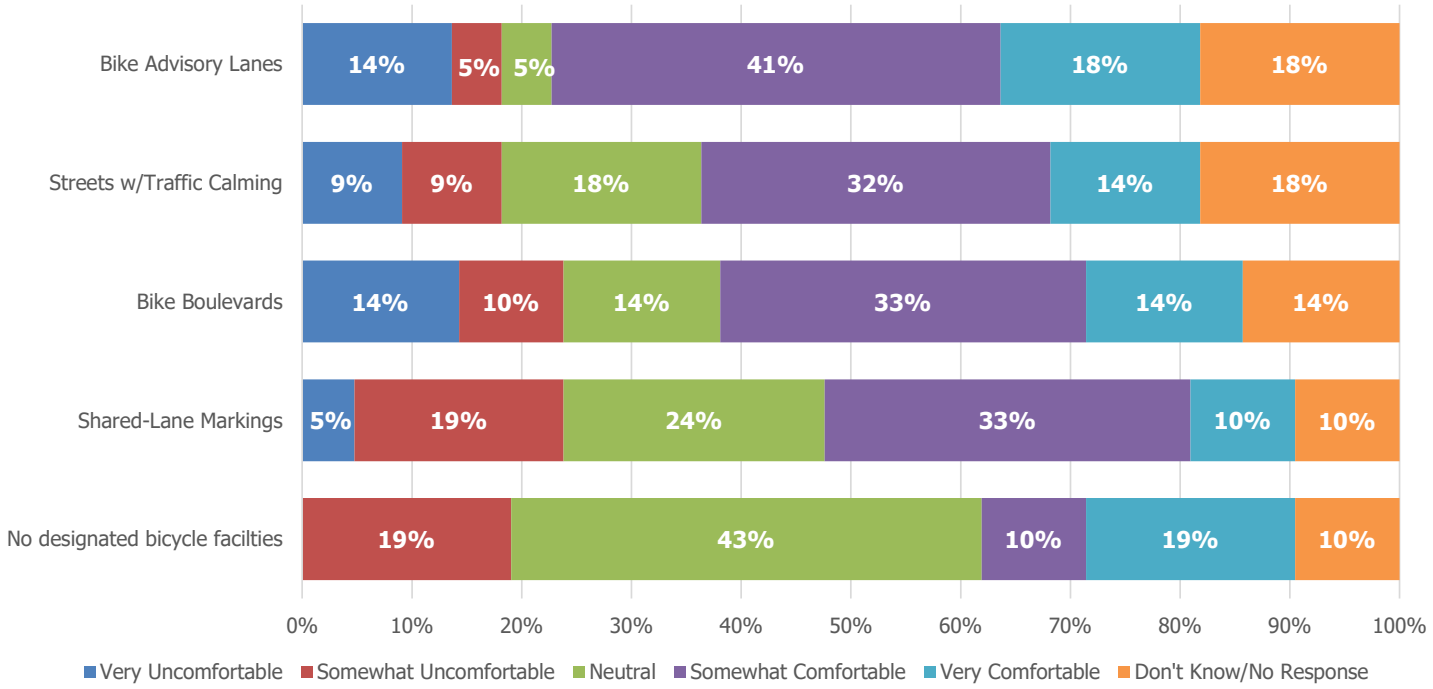


Figure B32: Male



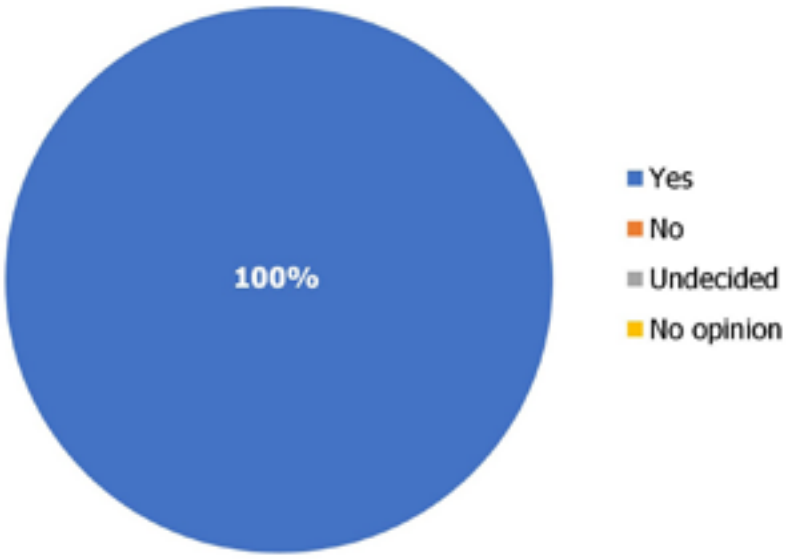
30-DAY PUBLIC COMMENT PERIOD COMMENTS

The draft Countywide Bike Plan was available for public comment May 6 - June 5, 2021 at https://lawrenceks.org/mpo/bicycle_planning and in paper copy at Lecompton City Hall, Baldwin City Public Library, Eudora City Hall, Lawrence Public Library, Lawrence City Hall Riverfront - Planning & Development Services Office. Twenty-eight people viewed the survey, but only three of them responded to our survey at ttps://lawrenceks.org/mpo/tellus. No comments were mailed to staff. The survey responses are listed below.

TELL US COMMENTS

When asked "Do you support the draft Countywide Bike Plan goals?" Respondents indicated:

Figure B33: Support



Number of Responses - 3

When asked "Do you have any other thoughts or comments about bicycling infrastructure, programs, projects, or amenities in Eudora, Baldwin City, Lecompton, or Unincorporated Douglas County?" Respondents indicated:

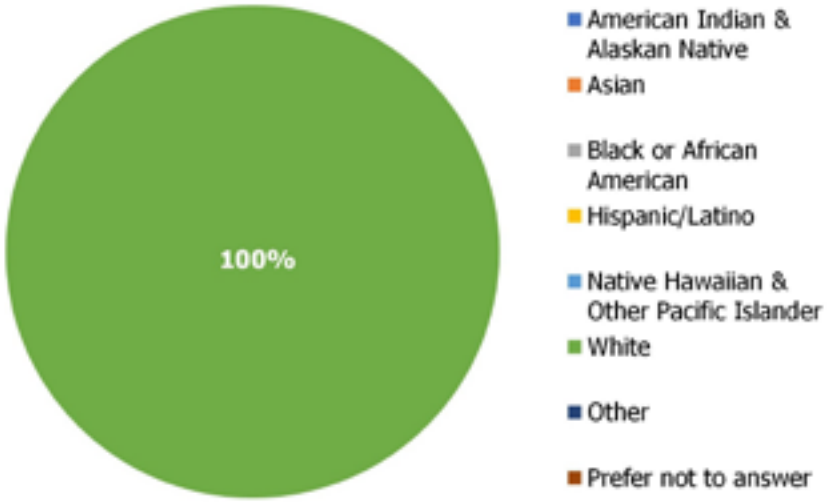
Number of Responses - 0

When asked "Are there any missing connections on the proposed future bikeway network(s)? (Please list specific route alignments or origins and destinations.)" Respondents indicated:

Number of Responses - 0

When asked "Which race/ethnicity best describes you? (Select all that apply)" Respondents indicated:

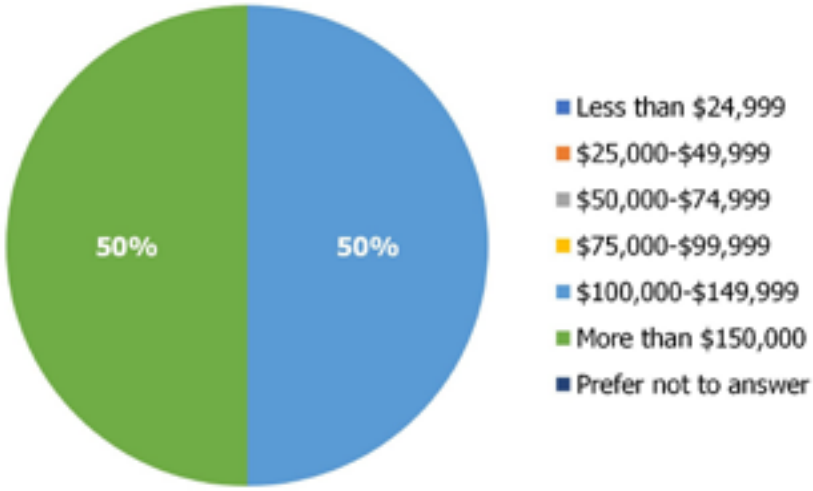
Figure B34: Race/Ethnicity



Number of Responses - 2

When asked "What is your household's approximate income for the current year? (Select one)" Respondents indicated:

Figure B35: Income



Number of Responses - 2

When asked, "What is your zip code (Home)?" Respondents indicated:

- 66047
- 66044

Number of Responses - 2

When asked, "What is your zip code (Work)? (If not applicable, leave blank.)" Respondents indicated:

- 66061

Number of Responses - 1

Appendix C: Policy and Program Toolbox

Becoming a truly bicycle friendly community requires more than engineering. Non-infrastructure policies and programs are necessary to achieve the goal of becoming more bicycle friendly. Responsibilities are included with the item if the tool is already occurring in Lawrence. These tools are not prioritized. The Action Plan displays the tools selected for implementation; however, tools not included in the Action Plan can be implemented.

Safe Routes to School

The Baldwin City and Eudora Safe Routes to School (SRTS) initiative is a collaborative effort between Lawrence-Douglas County Public Health, Baldwin City Public Schools, the City of Baldwin City, Eudora Public Schools, and the City of Eudora and the Lawrence-Douglas County Metropolitan Planning Organization to improve the health and wellbeing of children by enabling and encouraging them to safely walk and bicycle to school. The Safe Routes to School Plans were completed in 2020 and can be found at https://lawrenceks.org/safe-routes.

To truly create momentum around Safe Routes to School the program needs to encourage walking and bicycling. There are many ways to do so including: bicycle trains, Bike Lesson and Safety Training Program (BLAST), the crossing guard program, helmet & safety fairs, how to ride classes and bike clinics/rodeo, non-competitive bicycle-themed events, traffic garden, trips for kids local chapter, and youth bike clubs and teams.

Bicycle Train

Bike trains enable students to get to school while enjoying the outdoors and the company of other bicycle riders. Best suited for children in upper elementary and middle school grades, bike trains are led by adults - one at the front and one at the rear of the train - that accompany students as they bike to and from school. Bike trains can be a great way to instill a love of bicycling while developing life-long safety skills[1]. More information about developing a bike train can be found at http://www.walkbiketoschool.org/wp-content/uploads/2017/01/SRTS_BikeTrain_final.pdf

Lawrence Bicycle Education Safety Training (LBEST)

Lawrence Public Schools offers the Bicycle Lesson and Safety Training program to all fourth and fifth grade students as part of the physical education curriculum. In four classes, students learn about proper helmet fit, rules of the road, bicycle safety checks, road hazards and how to safely navigate through an intersection. Some students learn how to ride a bike. This curriculum could be shared with Baldwin City and Eudora.

LAWRENCE -DOUGLAS COUNTY
LBEST PROGRAM

Bike and Walk to School Day

The annual National Bike to School day occurs during early May. While the National Walk to School day happens in early October.

Crossing Guard Program

Adult crossing guards can lead to more parents feeling comfortable about their children walking or bicycling to school, and allow for expanded independence for children. The City of Baldwin City and Eudora funds and locates crossing guards. Crossing guards can be a quick solution to improve crossing conditions for difficult roads or intersections where engineering solutions may be out of the discussion.

Helmet & Safety Fair

Helmet fairs can be used to create awareness around bicycling and allows leaders and ambassadors to establish a

1 National Center for Safe Routes to School. (n.d.). Bicycling to School Together: A Bike Train Planning Guide. Retrieved November 12, 2018, from http://www.walkbiketoschool.org/wp-content/uploads/2017/01/SRTS_BikeTrain_final.pdf

presence in the community. A helmet fair is an event designed to distribute helmets to children that do not already own one, while providing accurate information on how to properly adjust the straps to fit accordingly. There is often simple safety instruction involved with the helmet distribution.

How to Ride Classes and Bike Clinics/Rodeos

Classes teaching children and adults how to ride a bicycle safely on road and on trails is necessary to encourage safe bicycling. Teaching families with toddlers and young children how to together also fosters a culture of bicycling. These classes could include basic "how to ride" information, as well as more detailed in-traffic, on-bike instruction and experiences sharing the road with motor vehicles. This course could be shared with City of Baldwin City and Eudora employees to promote commuting by bike.

Non-Competitive Bicycle-Themed Events

Develop a variety of fun, family friendly, social and non-competitive bicycle-themed events year-round, such as a bike-in movie festival, 4th of July bike parade, Halloween bike decoration competition, or a bike to the arts event. To be successful these events should be coordinated with schools, bicycle clubs, bike shops, and local bicycle advocacy groups. Appropriate safety measures such as road closures or police escorts need to be provided.

Traffic Gardens

Traffic gardens allow people to practice their bicycling skills in a controlled environment, which mimics real-life street conditions. Various traffic elements like stop signs, roundabouts, crosswalks, multi-lane roads, and more are utilized. A Traffic Garden can be developed using an empty parking lot, unused tennis courts, or other underused space. Once created, the Traffic Garden would be an important asset to the LBEST curriculum to put their teachings into practice.

Trips for Kids Local Chapter

The Trips for Kids program is an international nonprofit which aims to provide the opportunity for kids of all walks of life to have the opportunity to know the joy of riding a bike and the freedom to explore the natural world on two wheels. Kids are typically given the chance to trail ride for the first time and learn basic bicycle maintenance.

Youth Bike Clubs and Teams

Biking clubs can come in many forms. They can be part of an afterschool program or a separate clubs kids join. The Tulsa Bike Club meets weekly afterschool from late September to early May. Students who complete the program earn a bicycle and helmet. Each club is made up of roughly 20 students and five volunteers — this number includes faculty member(s). Equipment needed to run club activities, such as bicycles, helmets, safety vests, curriculum, drill supplies, maps, etc., along with adult-size bicycles, are provided to each participating school.

In the fall, students and adult volunteers meet weekly after school to ride bikes and work on cycling skills, life skills (confidence, respect, following rules, etc.) and other activities (for instance, STEM learning). And the spring semester is focused more on off-campus rides and experiences — for example, students may ride to a fire station, museum, park, restaurant or other nearby place of interest[2].

Youth bike teams can be road/cross racing, mountain bike racing, or velodrome teams. Both clubs and teams are to create a foundation of safe bicycling while instilling a love of bicycling in kids.

Education and Encouragement

Education is giving people of all ages and abilities the skills and confidence to ride and educating bicycle riders and drivers about the rules of the road. Encouragement is creating a strong bike culture that welcomes and celebrates bicycling. The two elements are strongly intertwined.

2 Bike Club. (n.d.). Retrieved November 13, 2018, from www.bikeclubtulsa.com

Adopt-A-Park/Trail/Street

Local clubs and organizations provide great volunteer services for maintaining and patrolling trails. This idea could be extended to follow tour routes or specified streets/sidewalks. A sign to recognize the club or organization could be posted as an incentive to sustain high quality volunteer service.

Association of Pedestrian and Bicycle Professionals Webinars (APBP)

The APBP publishes a range of webinars related to bicycle and pedestrian planning. The webinars are hosted by the Lawrence-Douglas County Metropolitan Planning Organization and can only be viewed on-site.

Beginner Bicycle Rides

The Beginners Ride is offered during the summer months (first Monday after Memorial Day through last Monday in August) for individuals new to cycling. This is approximately a 10-mile, 10-12 mph ride intended to promote safe riding in Lawrence area streets. The purpose of this ride is to help participants develop confident road cycling habits through brief (15-20 min.) instruction and a supportive weekly group ride. This Lawrence Bicycle Club ride is supported by local League of American Bicyclists Certified Instructors. Cyclists need to bring a bike, helmet and a water bottle. For more details, see the Beginners Ride Facebook page - https://www.facebook.com/groups/BeginnersRide.[3]

Bicycle Ambassador/Mentorship Program

A bicycle ambassadors/mentorship program is an important bicycle outreach and education component of a bicycle plan, as it promotes bicycle safety and awareness. City staff and other groups may volunteer to be ambassadors as well as recruiting community members to be ambassadors. Ambassadors host and attend programs, demonstrations, and activities at events, summer camps, and schools. Ambassadors also teach individuals about the best route for their needs. The most successful ambassador programs typically include adult and junior ambassador programs to reach the largest amount of users. Local bicycle shops are often involved.

Bicycle Friendly Business Program

The League of American Bicyclists provides criteria for local businesses to participate in the Bicycle Friendly Business program. Businesses are recognized for their efforts to encourage a more bicycle friendly efforts.

Bicycle Friendly Driver Program

The Bicycle Friendly Driver program, presented by the Lawrence Bicycle Club, is quick class designed to expand awareness on the ways in which motor vehicles are supposed to interact with bicycles. Topics include sharing the road/taking the lane, infrastructure, bicycle laws, common points of conflict/crashes. A short wrap-up exam is used to ensure that the messages are being relayed.

The City of Lawrence is creating a series of Bicycle Friendly Driver Videos. It would be beneficial to present this information to City of Baldwin City and Eudora staff, taxi drivers, school bus drivers, delivery drivers, and other groups. This information should also be incorporated into new driver education programs and for older drivers. AARP offers AARP Smart Driver Course, which is designed especially for drivers age 50 and older to refresh people on the rules of the road.[4]

Bicycle Registration

A bicycle registration program to alleviate any concerns regarding theft or vandalism by creating a system which identify and links stolen bikes to the proper owner. Typically bike serial numbers are used in the registration process. Baldwin City and Eudora do not currently have a bike registration program.

3 Lawrence Bike Club (n.d.). Weekly Rides. Retrieved November 13, 2018, from https://lawrencebicycleclub.org/index.php/weekly-rides

4 AARP Smart Driver Course: Lawrence Library. (n.d.). Retrieved November 12, 2018, from https://local.aarp.org/driver-safety/lawrence-library-lawrence-ks-b49642.html

Bicycle Rideability Map

A bicycle rideability map is a tool to help residents determine the best route for your skill level. The map varies from the future and existing bicycle facilities map, which is a comprehensive map used as a system planning tool. A new rideability map will be created as part of the ongoing bikeway plan update process. The maps are developed by the MPO Bicycle Advisory Committee (BAC).

Bicycling Lunch and Learn

Lunch and learn educational sessions can be offered quarterly or more or less often depending on needs. Lunch and learn topics can be focused on bicycle maintenance, bicycle skills, bicycle laws, or any other bicycle related topic. It may be a good venue to show the Bicycle Friendly Driver videos.

Bike-to-Work Day (Third Friday in May)

Bike-to-Work Day is an annual event held on the third Friday of May across the United States that promotes the bicycle as an option for commuting to work. Leading up to Bike-to-Work Day, national, regional, and local bicycle advocacy groups encourage people to try bicycle commuting as a healthy and safe alternative to driving by providing route information and tips for new bicycle commuters. On Bike-to-Work Day, these groups often organize bicycle-related events, and in some areas, pit stops along bicycle routes with snacks.

Car Free Day

Car free days are when communities close a road or portion of road to vehicular traffic for a specified day and utilize the space for bicycle and pedestrian activities. In addition to walking and bicycling, various events and workshops can be integrated into the day's activities. Such a program should be designed to encourage residents to think differently about their city streets, to improve physical activity, or to highlight the cultural and physical amenities of the city. In communities that don't have enough support to run a communitywide car free day, slight variations have been employed to generate similar outcomes. Instead of closing a roadway, car free days can consist of pledges for residents to find creative transportation solutions on one specific day of the week, repeated each week throughout the year. Rather than having a single day of communitywide events, communities can encourage people to leave the car at home on the specified day of week.

Community Challenge

Community challenges acknowledge that many residents simply cannot commute without a car, so the emphasis is shifted towards more broad, positive goals beyond simply "not to drive" and instead encourages residents to reach beyond their comfort zones and try active transportation options whenever possible. A community challenge should ask residents to track bike, walk, bus, and carpool miles throughout a specified timeframe. Participants can compete with one another throughout the duration of the challenge, and prizes can be made available for the most successful residents.

9TH ST. AND VERMONT ST., LAWRENCE, KS

Confident, Capable, Commuters Bike Class

This class is taught by instructors certified by the League of American Bicyclists, and is designed to be beneficial to all levels of riders. Participants will learn how to ride safely in traffic and on the sidewalk, basic bike maintenance, and group riding skills. This course consists of two class room sessions in the evenings and a Saturday morning outdoor on-bike session.

Create a Commuter Program

A Create a Commuter program provides low income individuals with a sturdy bicycle made for commuting, which includes fenders and a cargo rack. Bicycles are provided at no charge to recipients. In addition to the bicycle, program participants receive safety equipment, including a helmet, lock, air pump, and patch kit. Training is provided to teach the basics of safe riding, how to fix a flat, how to plan a safe route, safety checks, and basic diagnostics. The Portland, Oregon

Create a Commuter program requires participants to be at least 18 years old, not own a car, demonstrate financial need, and show a need for transportation. Participants are recruited, screened, and refereed to the program from human service agencies.[5]

Earth Day

Earth Day is a national awareness day on April 22nd each year and offers a discussion opportunity to focus on helping the environment. Efforts can be made to encourage people to help the environment by bicycling to destinations and staying out of their automobiles.

Education Campaign

Create an education campaign for drivers and bicycle riders about sharing the road, interacting safely, and the 3-foot passing law. Utilize the Lawrence in Gear videos prepared by the City of Lawrence.

End of Trip Amenities

Develop long-term bicycle parking standards and promote end-of-trip amenities, like locker rooms and showers to boost bike commuting in all weather. Providing end-of-trip facilities improves employee health as physical activity is incorporated into their routines, reduces parking costs, and creates a positive image for the business/organization.

League of American Bicyclists, League Certified Instructors

The League of American Bicyclists (LAB) has a national bicycle education program (Bike ED) that includes training to become certified League Cycling Instructors (LCI's). The training seminar focuses on teaching and demonstration techniques to use when instructing a Smart Cycling class, which LCI's are ideally equipped to host after becoming certified. The seminar emphasizes how to teach bicycle safety and skills to provide increased comfort and confidence for new and returning bicycle riders and youth. League instructors should be used to teach bicycle classes and support bicycle education throughout the community.

Mileage clubs

Online or community-based mileage club programs encourage bicycling and provide incentives for reaching mileage goals either individually or in groups. The National Bicycle Challenge is one example of a mileage club that has been successful, but there are many options available which can be custom tailored to suit anyone. Residents can either compete as part of a teams or independently.

Partner with Baker University Bicycle Related Programming

Baker University is located in Baldwin City. Students are required to live in university sponsored housing. The relatively compact campus lends itself well to bicycling. Bicycle related programing should be created in partnership with various community organizations, Baker University and the City to promote bicycling as a form of transportation.

Pre Drivers Education Camp

This camp introduces the rules of the road and teaches participants the skills needed to safely and effectively use their bike as a form of transportation. Each day kids learn and practice new skills before going on a group ride to a popular destination. Participants ride on sidewalks as well as roads and must provide their own bike and helmet.

Reward Safe Bicycling

Start a program to reward safe bicycling (by giving out gift certificates to bicycle riders that are "caught" following the law). Typically these programs are targeted towards kids wearing helmets. If a child is not wearing a helmet they are provided one, but if they are wearing a helmet they receive a reward.

5 Create A Commuter. (n.d.). Retrieved November 12, 2018, from http://webl.ctaa.org/webmodules/webarticles/articlefiles/Portland_TriMet.pdf

Share the Road: Rules of the Road (Website)

The City of Lawrence provides detailed information for drivers, bicycle riders, and pedestrians about how to safely interact along the shared roadway. The resources provided can be used as a guide for residents to more confidently understand the rules of the road and reach the intended destination more safely. The webpage includes links to instructional videos, basic bike repair and maintenance tips, and information on how to use a bicycles as safely as possible. This information could be incorporated into the City of Baldwin City, Eudora, and Douglas County websites.

Travel with Care Campaign

In the summer of 2016, Lawrence-Douglas County Public Health adopted a new and creative ad campaign to encourage physical activity and safety. The campaign, Travel with Care, is a national initiative through People for Bikes and coincides with the Public Health's Be Active Safe Routes initiative. The campaign not only encourages pedestrian-bicycle safety, but it also highlights everyday people who are bicycle riders, making it relatable and encouraging more local residents to bicycle.

L-DC HEALTH DEPARTMENT

Wayfinding System

Create wayfinding standards to direct bicycle riders to routes and/or depicting time and distance information. A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes. There are three general types of wayfinding signs:

- Confirmation – Indicates on a designated bikeway informing bicycle riders and drivers.
- Turn Signs – Indicates where a bikeway turns form one street onto another.
- Decision Signs – Marks the junction of two or more bikeways informing of key destinations along the routes.[6]

Enforcement

Enforcement is about ensuring roads are safe for all users - drivers, bicycle riders, & pedestrians. The primary way to achieve this is by slowing traffic down on streets and altering driver behavior to adhere to traffic ordinances.

Speed

There are many ways to reduce motor vehicle speeds. Including lowering residential speed limits, pace-car campaigns, and speed monitoring programs.

Lower Residential Speed Limit

Lower residential street speed limit from 30 mph to 20 mph. Lowering the speed limit of residential streets will greatly improve the safety of neighborhoods. The faster you drive the smaller field of vision you have and therefore see less. When you drive slower you have more time to see bicycle riders, pedestrians, and side road activity. Furthermore, when vehicles strike pedestrians and bicycle riders at higher speeds, they are more likely to be killed.[7]

Pace-Car Campaigns

Resident pace-car drivers agree to drive courteously, at or below the speed limit, and follow other traffic laws. Programs usually require interested residents to register as a pace car driver, sign a pledge to abide by the rules, and display a sticker on their vehicle.

6 Urban Bikeway Design Guide. (2014). National Association of City Transportation Officials. Bike Route Wayfinding Signage and Markings System. Retrieved November 12, 2018, from https://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/bike-route-wayfinding-signage-and-markings-system

7 Dwyer, E. (2015, September 08). Does Speed Matter? Retrieved November 12, 2018, from http://sdotblog.seattle.gov/2015/09/08/does-speed-matter

Speed Monitoring Program

A radar speed unit is placed in neighborhoods to alert drivers to their speed and allow City staff to collect speed data. Speed monitoring programs often have a limited long-term effectiveness in changing driver behavior but it can be useful for short-term behavior change.

Behavior

Altering driving behavior is sometimes accomplished by altering the built environment or enforcing laws to reinforce the importance to change behaviors.

3 Foot Passing Enforcement Device (BSMART)

Three-foot passing laws require drivers to give people on bikes at least that much clearance when passing them on the road, however such laws are extremely difficult to enforce. A new device (BSMART) helps give the law some teeth by allowing police officers to easily measure the distance that a driver provides when passing. With the device, a police officer rides along the roadway, constantly checking the passing distance of each vehicle. Another officer is located down the road, ready to pull over the driver and issue either a warning or a citation to the driver who does not obey the three foot passing law. This scenario allows for a high contact rate between residents and local law enforcement, which helps establish a more respected police presence.

Police Enforcement (Bicycle)

The police departments in Baldwin City and Eudora enforce local bicycle ordinances including prohibiting riding on the sidewalk in the central business district in both cities. Neither city has a bicycle patrol unit nor do they have bicycle registration. However, there is public support to provide more police enforcement to ensure bicycle riders and drivers are following the rules of the road and interacting properly.

Traffic Ticket Diversion Program

Create a traffic ticket diversion program. Road users given citations are offered an opportunity to waive violation fees by attending a bicycling education course.

Equity

There are two main concerns that relate to the essential elements of an equitable bicycle friendly community. The first challenge is spatial equity, which seeks to ensure resources, programming, infrastructure, and network amenities are equally distributed throughout the community in a way which ensures no exclusionary gaps exist. The second concern regarding equity pertains to a resident's ability to own and maintain a bicycle despite a wide range of setbacks, whether it be due to a financial constraint or physical barrier. A successful bicycle network must be appropriate and accessible for all ages and abilities. Many of the existing bicycle facilities are only suitable for extremely confident riders, which tend to be adult men, and exclude people who might otherwise ride. Poor or inadequate infrastructure – which has disproportionally impacted low-income communities and communities of color – forces people to choose between feeling safe and following the rules of the road, and induces wrong-way and sidewalk riding.

Bicycle Library

Bicycle libraries operate similarly to bike share programs, however they often provide bikes to residents free of charge. Bikes can be checked out for a specified amount of time, usually just a few hours, however long-term rental programs have been successful throughout the country in recent years. Bicycle libraries can be beneficial because they allow residents to test various bicycle types (cruiser, cycle, cargo) before making a purchase of their own, while ensuring a diverse range of applications for all users of the roadway.

Bike Share

A bike share program aims to get as many people on bikes as possible. Bike share programs are a great option for low income residents who are burdened by the high cost of transportation and for people who want to avoid the high

upfront costs associated with bicycle ownership. On the other hand, there are barriers such as smart phone ownership, options for unbanked residents, lessons on how to ride, which need to be considered.

Complete Streets Policy

Baldwin City and Eudora do not have Complete Streets policies. However, the City of Eudora develops sidewalks when properties are developed. Both Baldwin City and Eudora could adopt Complete Streets policies to formalize its concepts.

The MPO Policy Board passed a resolution in support of Complete Streets in September 2011.[8]

Non-Profit, Volunteer-Run Community Bike Shop and Earn-a-Bike Program

Lawrence Unchained is a local non-profit, volunteer-run community bike shop in Lawrence that works towards the goal of promoting self-reliance, sustainability, and healthful living throughout the community. The group recycles, repurposes, and distributes used bicycles and advocates for improved bicycle facilities along the transportation network. Additionally, Lawrence Unchained offers an Earn-A-Bike program, which offers volunteers access to a free bicycle after completion of 10 hours of community service towards a bicycle related project.[9]

Evaluation

There are two aspects to evaluation. The first is data collection and analysis of implementation outcomes over time. The second includes the national evaluation programs to compare Baldwin City and Eudora to other communities.

Collect Bicycle Rider and Pedestrian Counts

The MPO manually collects bicycle rider and pedestrian counts annually utilizing the National Bicycle & Pedestrian Documentation Project (NBPDP) methodology.[10] The project aims to establish a consistent methodology for counting and surveying bicyclists and pedestrians and develop a national database of bicycle and pedestrian activity. The Institute of Transportation Engineers (ITE) and transportation professionals nationwide have helped to develop the methodology, which requires the following features:

- Consistent days and times
- Consistent methods and materials, including training of volunteers
- Centralized data collection and analysis practices

Baldwin City and Eudora Bicycle and Pedestrian count locations were developed consistent with the methodology developed for the NBPDP by Alta Planning and based on the following criteria:

- Representative locations throughout the city
- Bicycle and pedestrian activity areas or corridors (downtowns, near schools, parks, etc.)
- Locations near proposed major bicycle or pedestrian improvements
- Key corridors that can be used to gauge the impacts of future improvements
- Places where counts have been conducted historically
- Locations where collisions between motor vehicles and bicycles and/or pedestrians are more prevalent

A screen line was established for all locations; when a bicycle rider or pedestrian passed the screen line, they were counted. Counts are conducted during three two-hour time slots. Dates for conducting counts are chosen based on the National Bicycle and Pedestrian Documentation Project's recommended September count weeks. This data collection effort should be expanded to incorporate automated counters.

8 https://assets.lawrenceks.org/pds/planning/documents/MPOResolution.pdf
9 Earn A Bike. (n.d.). Retrieved November 12, 2018, from http://www.lawrenceunchained.com/earn-a-bike
10 National Bicycle and Pedestrian Documentation Project. (2016). Retrieved November 13, 2018, from http://bikepeddocumentation.org

Collect Parked Biking Counts

Evaluating the number of parked bicycles located at schools and transit stops is valuable to determine if enough bike parking exists.

Data Driven Safety Improvements

The MPO developed a Crash Analysis and Countermeasure Identification Study, which identified 12 locations where crash history shows the site has a potential for safety improvements and merits further investigation. The report provided countermeasures for each location based on a field assessment. A specific analysis and plan which has strategies to reduce bicycle crashes and fatalities may be beneficial. Example information available at https://safety.fhwa.dot.gov/tsp/

League of American Bicyclists - Bicycle Friendly Community℠

https://bikeleague.org/community

The League of American Bicyclists awards communities that have made significant efforts towards becoming more bicycle friendly. Lawrence has been a Bronze Bicycle Friendly Community since 2004. Bronze is the lowest recognition out of five levels of bicycle friendliness; it indicates preliminary efforts to create the safest network possible. The designation takes into consideration engineering, education, encouragement, enforcement, evaluation and planning, with key goal outcomes including maximizing commuter ridership, and minimizing the number of crashes and fatalities. The only Douglas County jurisdiction to currently have a score is Lawrence.

Places for Bikes City Rating

https://peopleforbikes.org/placesforbikes/city-rating-system

Places for Bikes offers a data-driven approach to focus on quickly building better bike infrastructure. In order to qualify for a Places for Bikes rating, communities must address and improve the following: ridership, safety, network, reach, and acceleration. The only Douglas County jurisdiction to currently have a score is Lawrence.

STAR Communities/LEED for Cities & Communities program

http://www.starcommunities.org/about/our-communities

The STAR Community Rating System works to evaluate, improve, and certify sustainable communities by providing a clear, data-driven approach to assessing communities' sustainability efforts. The STAR framework integrates economic, environmental, and social aspects of sustainability in order to provide a sustainability rating. The only Douglas County jurisdiction to currently have a score is Lawrence.

Potential Strategies

Each jurisdictions' action plans found in the main part of this plan contains specific strategies currently applicable to the entity. However, additional strategies exist to implement the policies and tools. These are listed below:

Education and Enforcement

- Implement the Safe Routes to School (SRTS) programs improve education and encouragement strategies for walking and bicycling to school, and expanding programing for learning safe traveling behaviors for walking, biking, and driving.
    - Obtain a bike fleet and teach Bike Education Safety Training (LBEST), implement policies that ensure walking or biking to school is feasible and encouraged, host walk and bike to school days, and others listed in the Baldwin City and Eudora Safe Routes to School Plans located at https://lawrenceks.org/safe-routes.
- Enforce the rules of the road for bicycle riders and drivers to improve the safety for all road users. Utilize all technology available including the 3 ft passing enforcement device and speed monitoring devices to enforce regulations consistently.
- Develop a bicycle friendly driver education program and work to incorporate the curriculum into driver training.

- Promote the Lawrence-Douglas County MPO produced Rideability Map to assist bicycle riders in choosing routes.
- Support programs, like the Bicycle Friendly Businesses, community bike events, and weekly club rides, which increase access to bicycles, provides education about proper riding behaviors, and promotes a bicycling culture.

Engineering

- Establish data driven processes to support decision-making including asset management, conducting multimodal counts (active users and parked bikes), and crash report analysis.
- Construct and install bikeways, consistent with the bikeway plan during public and private roadway construction, reconstruction, maintenance and standalone projects. Pavement markings should be required when roads are resurfaced, where appropriate, based on the width of the street. Include wayfinding with bikeway projects.
- Evaluate shared streets to determine the appropriate type of bikeway— bike boulevards, bike advisory lanes, or Shared-Lane Markings.
- Draft and adopt a complete streets policy.
- Continue to plan and budget to incorporate consideration for bicycle riders in street maintenance. Street maintenance includes: the general upkeep of pavement markings, concrete or asphalt condition, flex posts replacement, signage, and other maintenance elements; and maintaining operable bikeways cleared of debris and leaves, sand, snow, and ice.
- Modify development code/adopt design policies including street standards to support bicycle friendliness, end-of-trip amenities and bike parking. Apply regulations to retrofit existing developments. Evaluate street standards to determine if streets are too narrow to support on-street parking. Consider lowering the local speed limit to improve safety.
- Continue to pursue state and grant funding to install bikeways and crossing improvements.
- Improve the crossing at highways.
- Develop a plan to maintain bikeways. Bikeway maintenance includes: the general upkeep of pavement markings, concrete or asphalt condition, flex posts replacement, signage, and other maintenance elements; and maintaining operable bikeways cleared of debris and leaves, sand, snow, and ice.
- Plan and install 3 feet passing law education signs.

Evaluation

- Collect data to develop counts and participation data (including SRTS travel tally data, manual and automatic bicycle and pedestrian counts).
- Track plan performance through plan specific performance measures and measures from Transportation 2040.

Appendix D: Plan and Policy Review

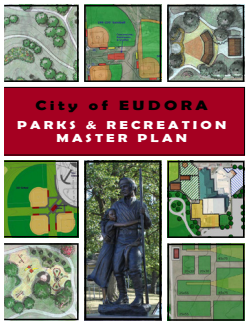
Since the last Bikeway Plan was completed in 2014 several planning efforts have been completed relating to bicycling.

Metropolitan Transportation Plan
http://assets.lawrenceks.org/assets/mpo/T2040/T2040.pdf

Transportation 2040 identifies future transportation needs, investments, and improvement strategies for all forms of transportation (automobile, public transit, bicycle, pedestrian, etc.) necessary to meet the needs of the region through 2040. Transportation 2040 was approved in March 2018.

Lawrence – Douglas Countywide Bikeway System Plan
https://assets.lawrenceks.org/assets/mpo/study/reports/bike.pdf

The Countywide Bikeway System Plan was approved in March 2014. The Plan details the existing and planned countywide bikeway network. The plan lacks design options, established metrics, project prioritization, and needs stronger E's. The new plan will address all of these.

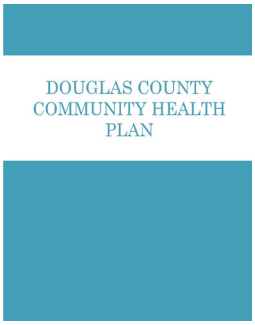


Eudora Parks and Recreation Master Plan
https://www.cityofeudoraks.gov/DocumentCenter/View/221/Eudora-Parks-and-Recreation-Master-Plan?bidId=

The Eudora Parks and Recreation Master Plan was completed in January 2012. The plan developed a trails system plan, concept plans for individual parks and recreation complexes, probable project costs, and prioritization and implementation for parks and bikeway facilities.

Baldwin City Parks and Recreation Master Plan
https://www.baldwincity.org/DocumentCenter/View/80/Parks-and-Recreation-Master-Plan-PDF?bidId=

The Baldwin City Parks and Recreation Master Plan was completed in April 2010. The plan proposed a community-wide trail system, inventoried existing parks and recreation facilities, provided specific concepts for parks.



Douglas County Community Health Plan

https://ldchealth.org/DocumentCenter/View/2440/2018-2023-Douglas-County-Community-Health-Plan-262019-update?bidId=

The 2018-2023 Douglas County Community Health Plan was approved in October 2018. The plan examines health equity and discrimination through the lenses of behavioral health, food security and healthy built environment, safe and affordable housing, and poverty and jobs. These interests were prioritized in the 2017 Douglas County Community Health Assessment.

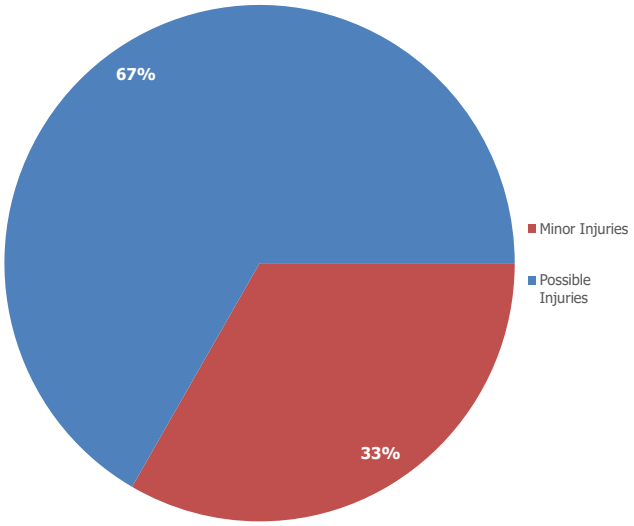
Appendix E: Crash Analysis

Bicycle Crashes

Crashes are a visible indication of safety. The Kansas Department of Transportation (KDOT) collects traffic crashes that occur on public roadways involving property damage of at least $1,000 or an injury or fatality on the Kansas Motor Vehicle Accident Report Form. This includes crashes between motor vehicles and bicycle riders. The Cities of Eudora, Baldwin City, Douglas County, and Kansas Highway Patrol reports crashes to KDOT. Four bicycle related crashes occurred in Douglas County (excluding Lawrence) between 2015 and 2019. This equates to 0.1% of all crashes occurring in Douglas County during 2015 to 2019. While this number is extremely low providing for safe bicycling conditions is important as bicycle riders are more vulnerable roads users and have a higher chance of being injured if there is a collision. Further bicycle related crashes are underreported. See the pull out box on the next page for types of crashes historically not reported.

Figure E.1 displays a majority of the crashes resulted in injuries. Bicycle riders are more vulnerable roads users and have a higher chance of being injured if there is a collision.

Figure E.1 : Severity of Bicycle Rider Incidents (2015-2019)



Source: Kansas Department of Transportation (2015-2019)

The word "crash" may be new to some people as a way to describe the event in which a bicycle rider collides with a motor vehicle, in a way that can result in bodily harm and/or property damage. Historically, these events were called accidents. The term accident implies heavy doses of chance, unknown causes, and the connotation that nothing can be done to prevent them. Crashes are preventable. Bicycle rider crashes are not random events. They fall into a pattern of recurring crash types and occur because the parties involved make mistakes. The mistakes can be identified and counteracted through a combination of education,

Several types of crashes according to BikeLaw.com are generally not reported.

"No contact" crashes – Crashes where a car runs a bicycle rider off the road, turns in front of or next to a bicycle rider and the bicycle rider takes an evasive action and crashes

"Minor" bodily injury crashes – Crashes were a bicycle rider is not transported to the hospital from the scene; crashes where the cyclist or officer does not immediately identify a significant head injury; crashes where bicycle rider goes into "superman" or "superwoman" mode and reports being okay, when s/he is not and needs to be checked out

"Stationary" motor vehicle crashes – "Dooring" crashes and crashes where bicycle rider hits parked—or allegedly parked—motor vehicle

Animal-related crashes – Unleashed dog runs in front of bicycle rider or attacks bicycle rider; deer, squirrel and other wild animal crashes

Work zone crashes – Crashes caused by unmarked hazards in a work zone and/or failure to warn of upcoming work zone hazards

Surface condition crashes – Crashes caused by potholes, sand, gravel, etc.

"Criminal" or "intentional" crashes – Bicycle rider harassment that results in a crash

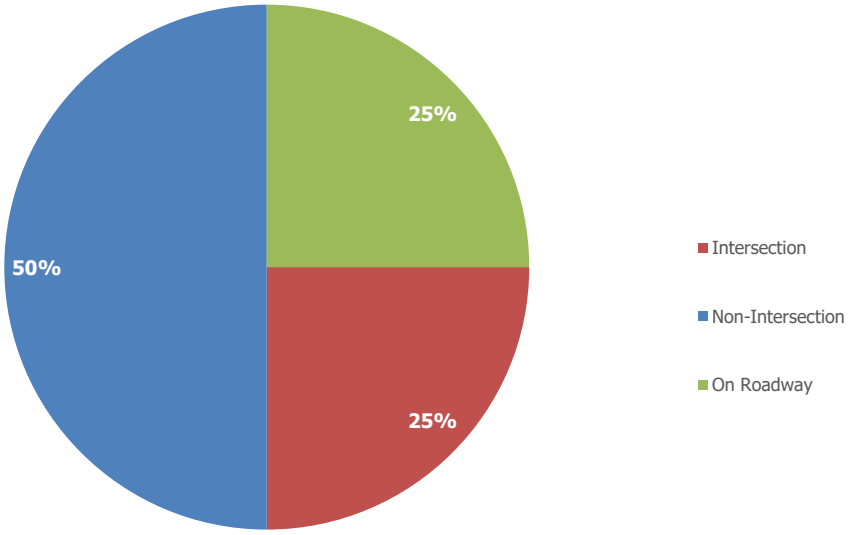
"Hit" and run crashes – Both contact and no contact "hit" and runs, meaning sometimes the motor vehicle actually hits the bicycle rider and leaves and sometimes the mv causes the bicycle rider to be run off the roadway without actually colliding with the bicycle rider and then leaves

"Mechanical" and/or user error crashes – Brakes don't work; bicycle rider loses control of bike

skill development, engineering, and enforcement measures that can substantially reduce crash occurrences. There is a continuing need to establish the mindset that bicycle riders are worthy and viable users of our transportation system.

KDOT reported bicycle-motor vehicle crashes were evaluated to determine if the crashes were on bikeways or not (Figure E.2). 50% of the crashes were not located at intersections.

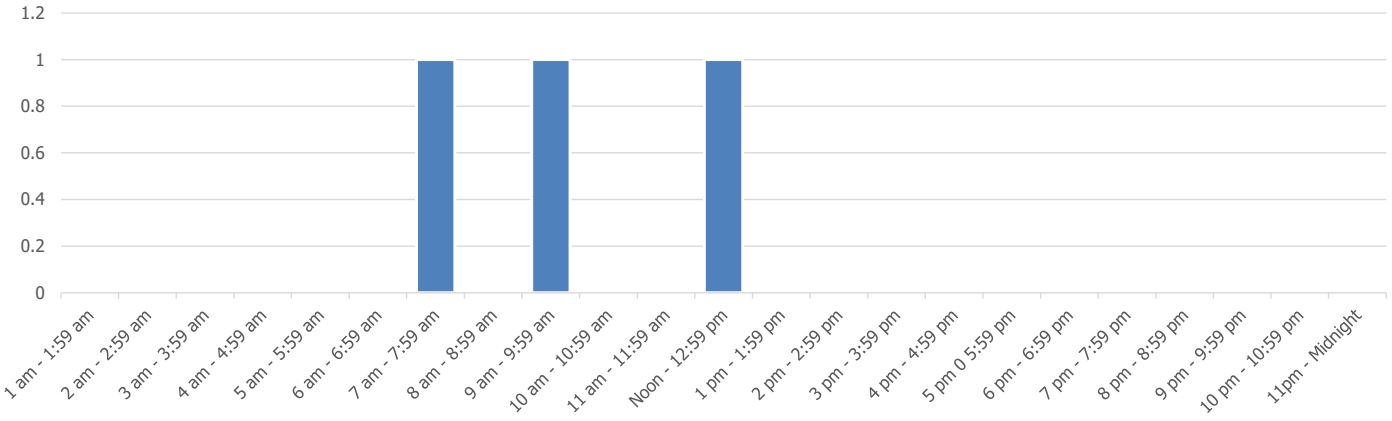
Figure E.2 : Location of Bicycle Rider Crashes (2015-2019)



Source: Kansas Department of Transportation (2015-2019)

The time of day and year plays a part in visibility of bicycle riders and was evaluated to determine if there were any common elements. Figure E.3 shows peak travel times in the morning and at lunch accounted for the largest proportion of bicycle rider crashes and should be the focus of enforcement and other activities. This does not suggest these are the most dangerous times to bicycle, rather these periods likely align with the highest rate of bicycle trips.

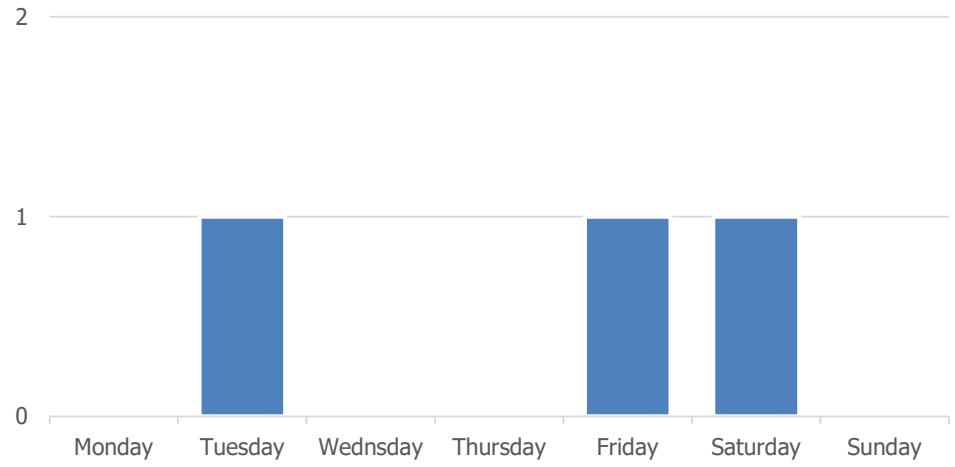
Figure E.3 : Individuals Involved in Bicycle Crashes by Time of Day (2015-2019)



Source: Kansas Department of Transportation (2015-2019)

Figure E.4 shows Tuesday, Friday, and Saturday have the highest number of bicycle rider incidents.

Figure E.4 : Bicycle Rider Incidents by Day of the Week (2015-2019)

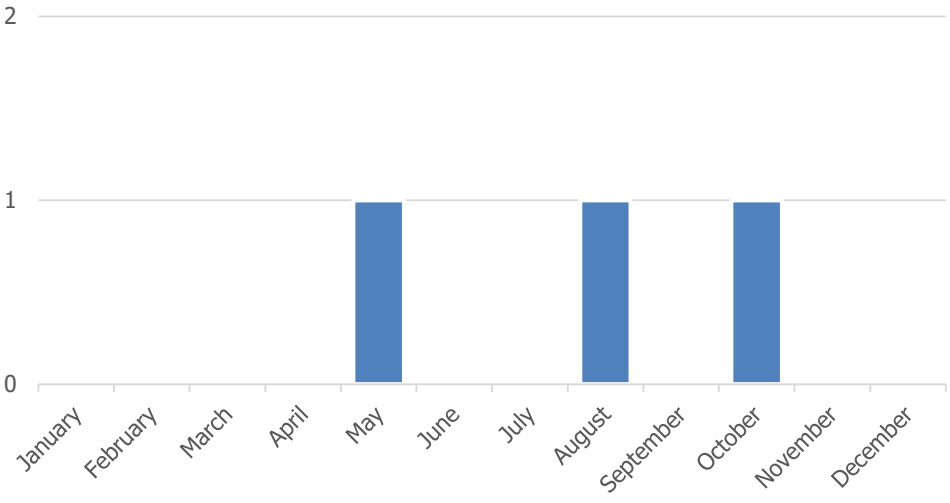


Source: Kansas Department of Transportation (2015-2019)

LAWRENCE, KS

Figure E.5 demonstrates the months of May, August, and October had the highest number of bicycle rider incidents. Summer riding is not inherently more dangerous, but the greater number of bicycle riders likely leads to a greater frequency of crashes.

Figure E.5 : Bicycle Rider Incidents by Month of the Year (2015-2019)



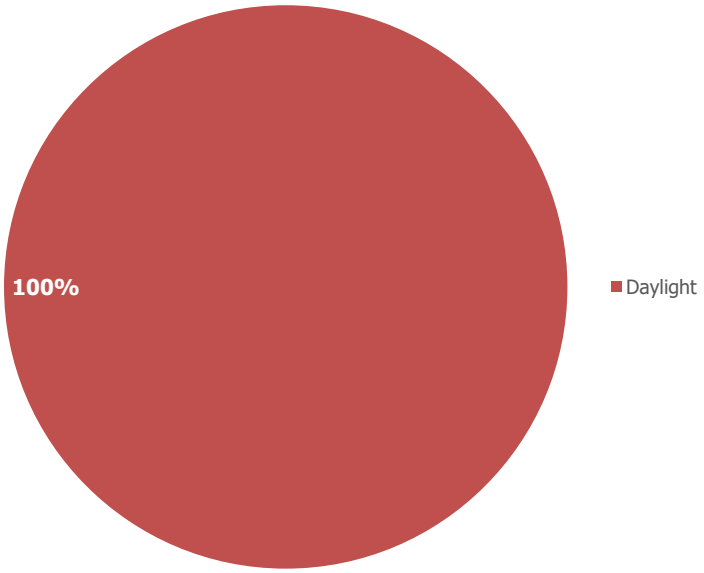
Source: Kansas Department of Transportation (2015-2019)

EUDORA, KS

LAWRENCE, KS

Figure E.6 shows the all bicycle rider incidents occurred in Daylight.

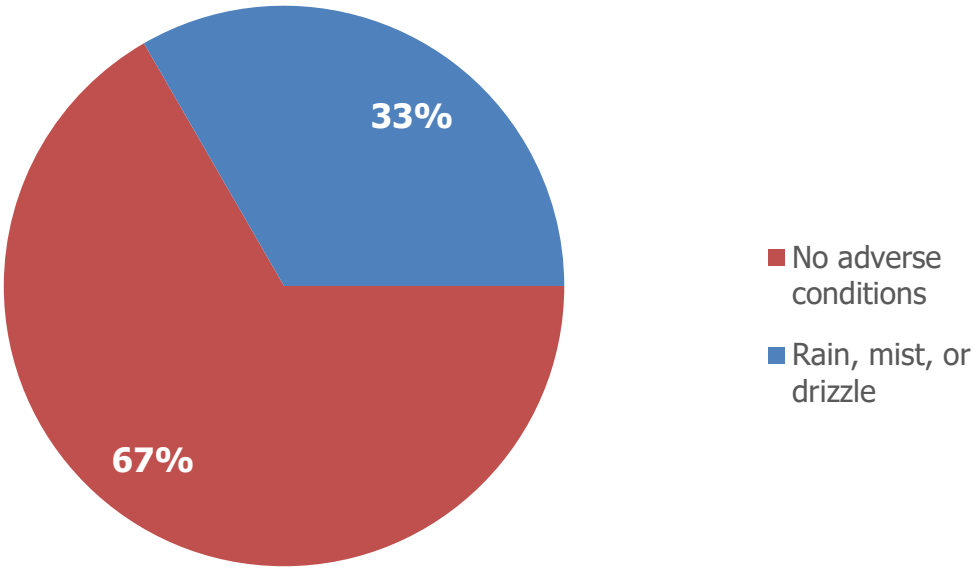
Figure E.6 : Number of Bicycle Rider Incidents by Light Conditions (2015-2019)



Source: Kansas Department of Transportation (2015-2019)

Figure E.7 demonstrates 67% of crashes occur in clear weather conditions. Rain, mist, and drizzle only accounted for 33% of the crashes. Since the majority of bicycle rider crash incidents occurred in clear weather conditions, this suggests inclement weather had very little effect on the likelihood of a bicycle rider crashes.

Figure E.7 : Number of Bicycle Rider Incidents by Weather Conditions (2015-2019)



Source: Kansas Department of Transportation (2015-2019)

All of the crashes with data were located near roadways with a posted speed limit of 30 mph or higher (Figure E.8). An important consideration about this data is there is some level of discrepancy within the mapped data. The crash many not have been recorded in the exact location the crash occurred. Thus the crash may not have occurred on the higher speed road, rather it may have been on a slower speed road which intersects the higher speed one. However, in general crashes occurring on higher speed roads is not surprising because the speed of a roadway limits the driver's field of vision. The field of vision is the amount of space a person can view while driving down the road. The faster you drive the less you can view (Figure E.9). Thus faster speeds lead to more crashes as drivers are not able to view bicycle riders (and pedestrians) soon enough to avoid a crash. According to the AAA Foundation for Traffic Safety the average risk for death of a pedestrian increases as the speed of the vehicle increases (Table E.1). This report evaluated pedestrians, but it can be extrapolated that the data is also applicable to bicycle riders since bicycle riders are vulnerable users like pedestrians.[1]

1 Tefft, B.C. (2011). Impact Speed and a Pedestrian's Risk of Severe Injury or Death. AAA Foundation for Traffic Safety. Accessed on March 26, 2019 from https://aaafoundation.org/impact-speed-pedestrians-risk-severe-injury-death/

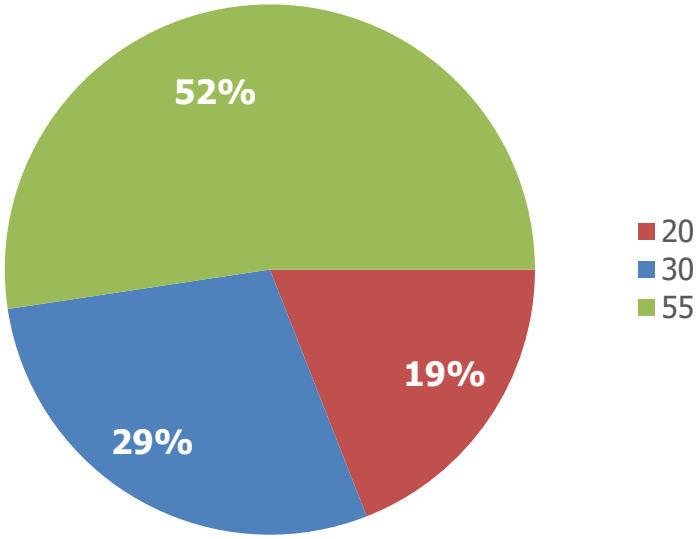
Table E.1 : Average Risk of Pedestrian Severe Injury or Death Based on Vehicle Miles per Hour

	Severe Injury	Death
10%	16 mph	23 mph
25%	23 mph	32 mph
50%	31 mph	42 mph
75%	39 mph	50 mph
90%	46 mph	58 mph

Source: AAA Foundation for Traffic Safety. Impact Speed and a Pedestrian's Risk of Severe Injury or Death.

*Note: Risks vary significantly by age. For example, the average risk of severe injury or death for a 70-year-old pedestrian struck by a car traveling at 25 mph is similar to the risk for a 30-year-old pedestrian struck at 35 mph.

Figure E.8 : Road Speed of Bicycle Rider Crashes (2015-2019)

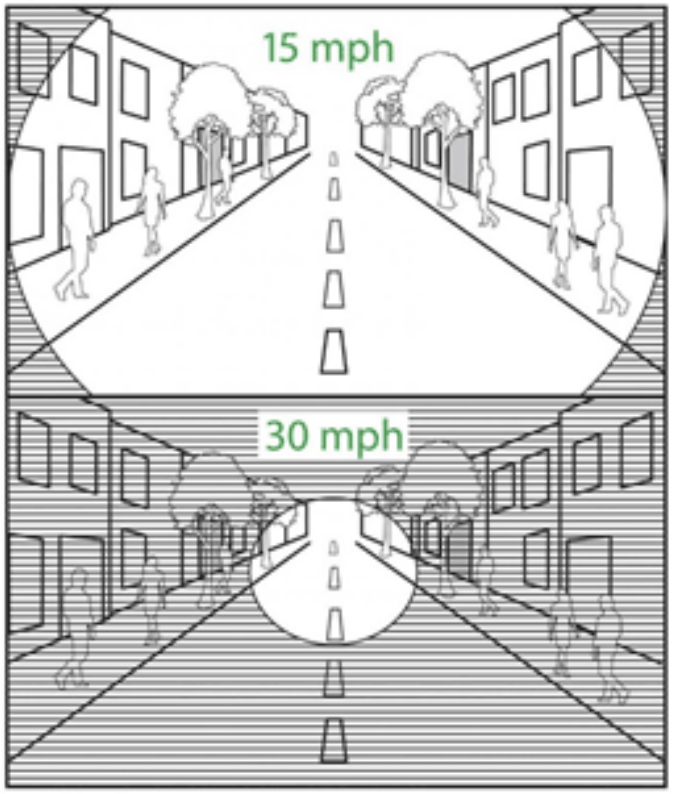


Source: Kansas Department of Transportation (2015-2019)

BALDWIN CITY, KS

Unfortunately the current data provided by KDOT does not include user behavior, so we are unable to evaluate the human contributing factor to the crashes (e.g. was there a failure to yield or stop by either the bicycle rider or driver). Improving shoulders to meet the minimum shoulder width should improve safety for recovery of all users. Further analysis is needed. This review of bicycle crashes only provides a baseline of crash information. This data should be reviewed and evaluated in future years.

Figure E.9 : Field of Vision Based on Speed of Vehicle



Institute of Transportation Engineers. (n.d.) Speed as a Safety Problem. Accessed on March 27, 2019 from https://www.ite.org/technical-resources/topics/speed-management-for-safety/speed-as-a-safety-problem/ Original Source: Walkable City Rules, https://islandpress.org/book/walkable-city-rules