2017

JUNCTION CITY
BICYCLE MASTER PLAN

Flint Hills MPO

WILSON & COMPANY

Table of Contents

1.0 Introduction 1-1

1.1 Previous Plans 1-2

2.0 Existing Transportation System 2-1

2.1 Traffic Volume 2-1
2.2 Vehicular Speed 2-3
2.3 Travel Lanes 2-5
2.4 Parking 2-5
2.5 Existing Trail Facilities 2-7
2.6 Land Use Activity Attractors 2-9
2.7 Existing Multimodal Network 2-15

3.0 Bicycle Accommodation 3-1

3.1 Share the Road 3-1
3.2 Bicycle Lane 3-3
3.3 Cycle Track 3-6
3.4 Bicycle Boulevard 3-7
3.5 Multi-use Path 3-7
3.6 Bicycle Facility Tradeoffs 3-9

4.0 Bicycle Facility Opportunities 4-1

4.1 Methodology 4-1
4.2 Recommended Bicycle Facility Application 4-3
4.3 Bicycle Facility Phasing Strategy 4-5
4.4 Multimodal Connectivity 4-7

5.0 Conclusion 5-1

*Appendix A – Chestnut Road & I-70 Frontage – Bicycle Facility Design **A-1***

*Appendix B – Madison St & Jackson St – Bicycle Facility Design **B-1***

*Appendix C – Eisenhower Drive & 8th Street – Bicycle Facility Design **C-1***

List of Figures

Figure 1-1 | Junction City in Regional Context 1-1
Figure 2-1 | Existing Traffic Volume 2-2
Figure 2-3 | Existing Speed Limits 2-4
Figure 2-4 | Existing Configuration of Travel Lanes 2-6
Figure 2-5 | Existing On-Street Parking Availability 2-7
Figure 2-6 | Milford State Park 2-8
Figure 2-7 | Existing Trail Facilities 2-9
Figure 2-8 | Activity Attractors 2-11
Figure 2-9 | Schools and Existing Sidewalk Network 2-12
Figure 2-10 | Existing Public Parks 2-14
Figure 2-11 | Existing Fixed-Route Transit System 2-16
Figure 2-12 | Existing Transit Stops and Sidewalk Connection Ratings 2-19
Figure 3-1 | Share the Road Facility Types 3-2
Figure 3-2 | Recommended Share the Road Pavement Marking and Signage 3-2
Figure 3-3 | Bicycle Lane Facility Types 3-4
Figure 3-4 | Standard Vehicle Widths 3-5
Figure 3-5 | Recommended Bicycle Lane Pavement Marking and Signage 3-6
Figure 3-6 | Multi-use Path 3-8
Figure 3-7 | Recommended Multi-use Path Signage 3-8
Figure 3-8 | Recommended Multi-use Path Intersection Marking 3-8
Figure 3-9 | Facility Type Comparison 3-9
Figure 4-1 | Bikeability Factors 4-1
Figure 4-2 | Recommended Bicycle Facility Application 4-5
Figure 4-3 | Bicycle Facility Phasing Strategy 4-7
Figure 4-4 | Recommended Multimodal Connectivity 4-8

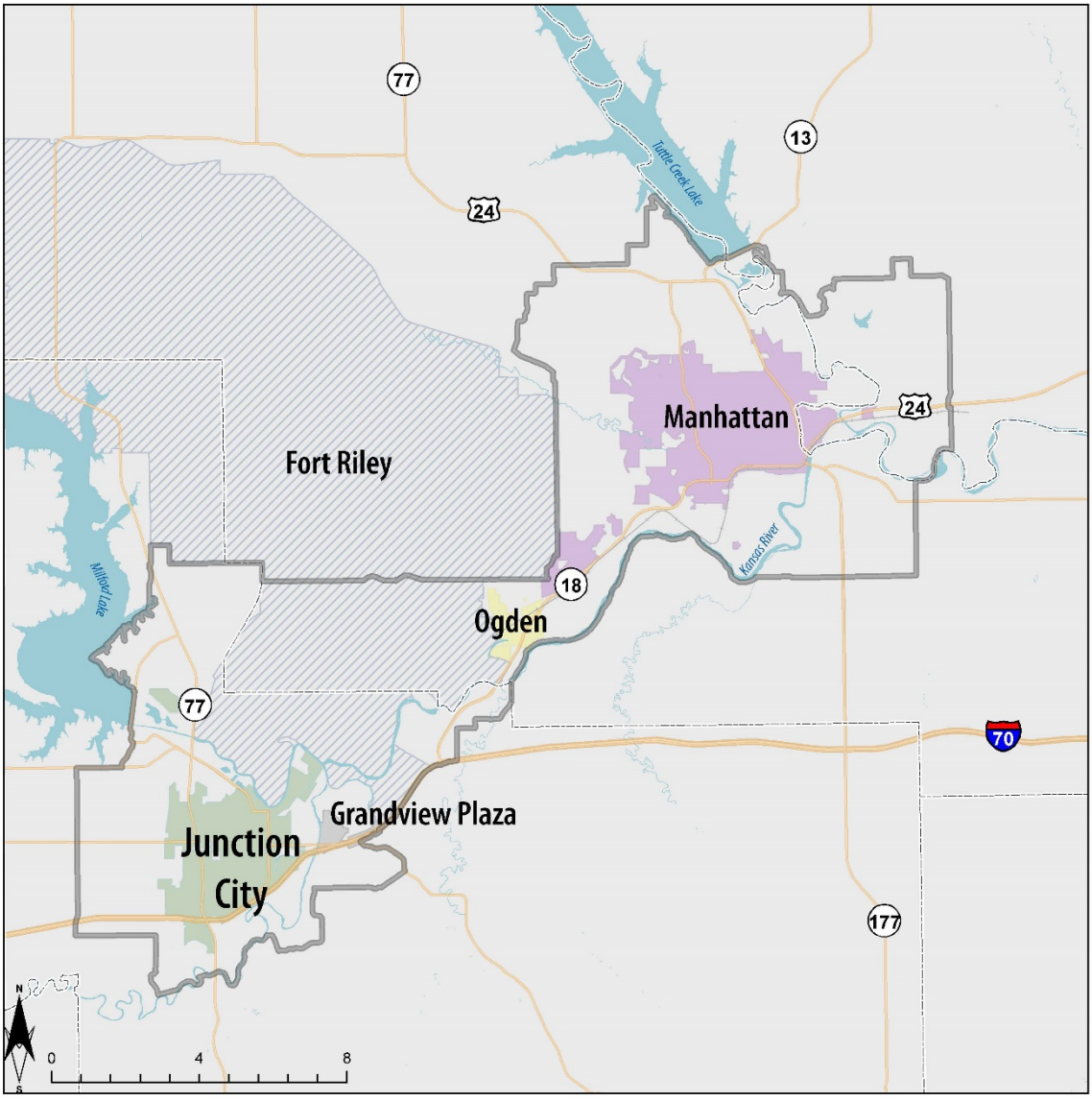
List of Tables

Table 1-1 | Previous Plans in the Flint Hills Region 1-2
Table 2-1 | Transit Stop Field Inventory 2-17

1.0 INTRODUCTION

The Flint Hills Metropolitan Planning Organization (FHMPO), which encompasses the cities of Manhattan, Junction City, Ogden, Grandview Plaza, and portions of Fort Riley, is conducting a regional multimodal plan with the goal of improving walkability, bicycling, and transit connectivity within the region (Figure 1-1). The *Junction City Bicycle Master Plan* documents previous planning efforts within the region, analyzes the overall transportation system, identifies key destinations, documents the existing bicycling facilities and condition of these facilities, and identifies opportunities to integrate and accommodate bicycles and pedestrians safely within the public right-of-way.

Figure 1-1 | Junction City in Regional Context



1.1 Previous Plans

Progress has been made over the past decade within the FHMPO region to promote pedestrian and bicycle mobility. Understanding these previous planning efforts helps to focus further planning and implementation strategies. The municipal and regional plans identified in Table 1-1 have been developed over the past several years and provide a foundation for the changing needs in the region. Throughout the previous plans, emphasis has been placed on connecting Junction City's bicycle and transit facilities to the larger Flint Hills planning area. Specifically, the *Junction City Comprehensive Plan* (2016) and *the Flint Hills Transportation Plan* 2040 (2016) emphasized connecting Junction City bicycle and transit facilities. This goal of integration between modes is being carried forward with the *Flint Hills Multimodal Integration Plan*. As part of the *Multimodal Integration Plan*, the *Junction City Bicycle Master Plan* seeks to establish a network strategy of bicycle facilities in Junction City to enable multimodal transportation throughout the region.

Table 1-1 | Previous Plans in the Flint Hills Region

Plan References		
Agency	**Plan Name**	**Plan Year Completed**
Flint Hills Metropolitan Planning Organization	Flint Hills Metropolitan Transportation Plan 2040	2016
Junction City, KS & Geary County, KS	Junction City/Geary County Comprehensive Plan	2016
Flint Hills Transportation Agency	Junction City/Grandview Plaza Fixed Route Feasibility Study	2015
KDOT, City of Manhattan, KS, City of Ogden, KS, & Riley County, KS	Eureka Valley/ Highway K-18 Corridor Plan	2013
Riley County, KS	Vision 2025: Comprehensive Plan for Riley County, KS	2009

2.0 EXISTING TRANSPORTATION SYSTEM

Junction City and the FHMPO provided the study team with an extensive GIS dataset, enabling an in-depth evaluation of the existing physical conditions associated with bicycle and pedestrian travel within the city limits. The arterial and collector roadway network within the city was analyzed based on the following criteria:

- Traffic Volume
- Speed Limits
- Travel Lanes
- Parking
- Road and Lane Widths
- Attractors and Generators
- Traffic Control
- Physical Barriers
- Transit Routes
- Land use

2.1 TRAFFIC VOLUME

Traffic volume is a significant factor in determining the potential bicycle facility application and facility type. According to the Oregon Department of Transportation, roads with fewer than 5,000 vehicles per day (VPD) can support most bicycle facilities without a buffer or dedicated facility. Roads with traffic volumes exceeding 5,000 VPD may still provide safe bicycling activity space with lower speeds but are encouraged to have additional buffered protection. Share the road facilities are generally not recommended for roads with traffic volumes exceeding 5,000 VPD with speeds greater than 35 MPH, unless there it is a wide paved shoulder without obstructions or pavement seams. On higher volume roads, bicycle lanes or buffered bicycle lanes are highly recommended if integrated on roadway facilities with adequate space. Figure 2-1 shows the distribution of traffic volumes within Junction City.

Figure 2-1 | Existing Traffic Volume

2.2 VEHICULAR SPEED

Similar to traffic volume, speed plays a significant factor in determining the application potential and type of bicycle facility. Generally, roads with a speed limit greater than 35 MPH or those with hilly terrain are not recommended for on-street shared bicycle facilities due to speed differentials. Roads with a speed limit of 35 MPH or less have a more preferable application potential for most bicycle facility types. Figure 2-2 illustrates how an increased vehicular speed consequently affects peripheral vision of the driver.

Three speed breakpoints were examined to understand area opportunities and constraints:

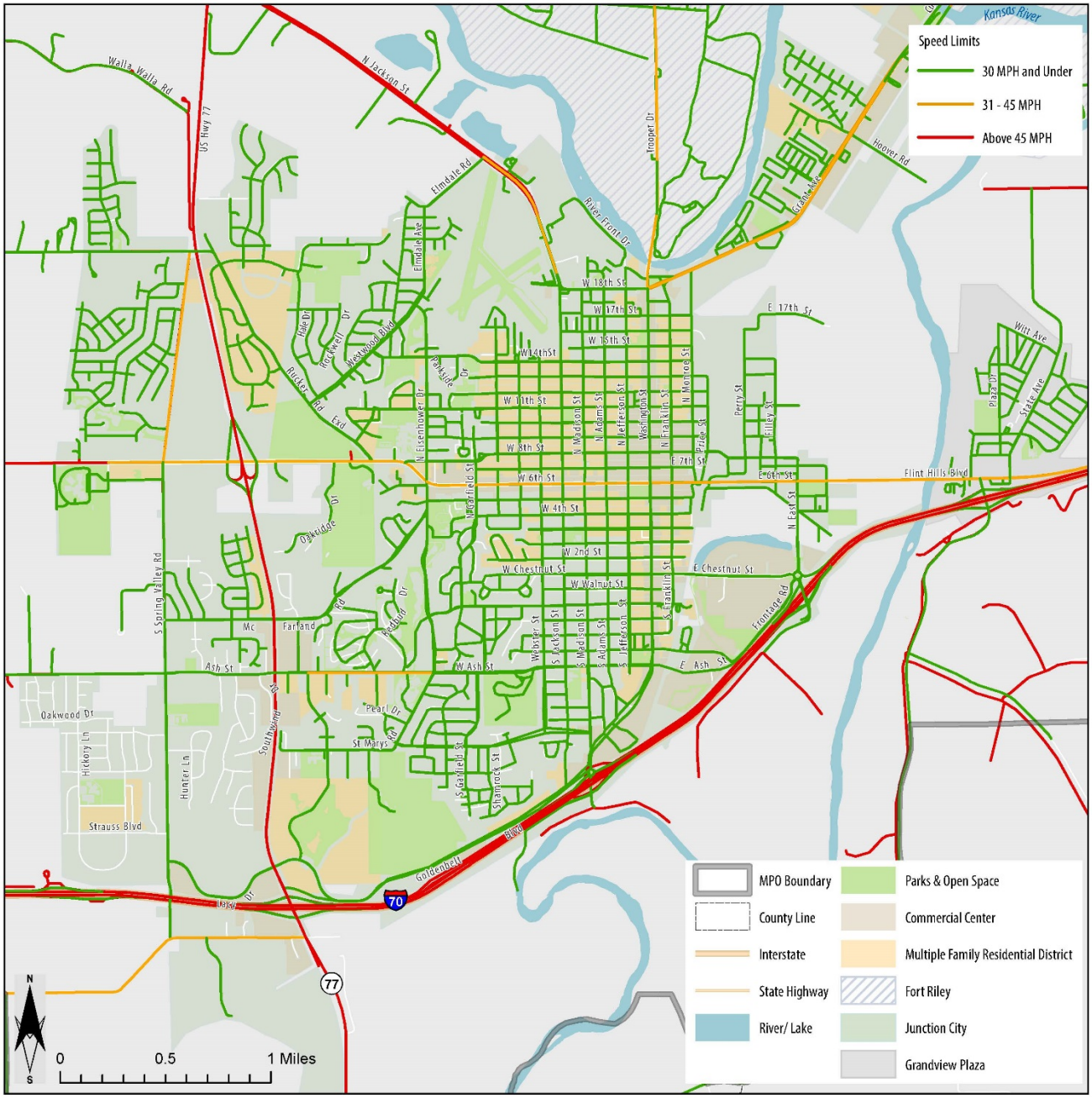
- Speeds less than or equal to 30 MPH;
- 31 to 45 MPH; and
- Speeds greater than 45 MPH.

The majority of arterial and collector streets within Junction City have speed limits at or below 30 MPH and are concentrated predominantly around the downtown area (Figure 2-3). The downtown area can be defined by the intersection of the commercial corridor of Washington Street and 6th Street, expanding radially for approximately one mile. Streets along the outer periphery of the city have higher speed limits, in particular Highway 18, Highway 77, and N. Jackson Street. Other than Highway 18, W 6th Street provides the most direct east-west connection within Junction City; however, the posted speed limit is 45 MPH, which poses safety concerns to on-street bicycle use.

Figure 2-2 | Tunnel Vision

Source: Wilson & Company

Figure 2-3 | Existing Speed Limits



2.3 TRAVEL LANES

Travel lane characteristics, in conjunction with traffic volume and speed, play a key role in the application potential of bicycle facilities. Two-lane roads generally have less capacity to carry large volumes of traffic; however, this is not to suggest that all two-lane roads would be the only roadways recommended for bicycle facilities. Figure 2-4 illustrates the number of travel lanes for the arterial and collector streets throughout the city. Junction City mainly consists of two-lane roads, often with on-street parking; although several four-lane roads exist throughout the city, carrying large volumes of traffic. The four-lane roads to the north of 6th Street consist of, Grant Avenue, 18th Street, Highway 57, as well as Washington Street and Jackson Street. South of 6th Street, the four-lane roads consist of, Eisenhower Drive, Chestnut Street (near Walmart), and a portion of Washington Street. Other four-lane roads include, US Highway 77 and the commercial corridor of 6th Street/Flint Hills Boulevard.

2.4 PARKING

On-street parking conditions influence the safety and acceptance of on-street bicycle facilities. The various parking types, specifically parallel, diagonal, and back-in diagonal parking, provide different tradeoffs in relation to on-street bicycle facilities. Separated bicycle facilities involve a buffer of space between a vehicle and bicycle lane and are typically delineated by either paint, landscaping, a raised curb, or some other physical barrier of protection. Figure 2-5 delineates the existing locations of on-street parking and what type of parking type is allowed. Junction City's downtown area contains nearly a mile of diagonal parking, specifically along Washington Street and Jefferson Street. Diagonal parking hinders the visibility of the driver as one backs out of a parking space, causing bicyclists to be in a vulnerable position; however, diagonal parking can interact safely with a bicycle facility if and when the parking is back-in or a significant buffer exists between the parking space and bicycle facility (minimum of 2 feet). On the other hand, parallel parking can create door conflicts between bicyclists and vehicles if no buffer exists. Parallel parking can safely accommodate most bicycle facility types when buffer space is provided between the bicycle facility and parking space. Parallel parking exists on many of the residential gridiron streets in central Junction City. In particular, 8th Street, 11th Street, 14th Street, Jefferson Street, portions of Franklin Street, and Washington Street accommodate on-street parallel parking. Higher volume roads such as 6th Street, 18th Street, Ash Street, and portions of Washington Street, Jackson Street, and Eisenhower Drive all contain areas with no on-street parking due to traffic high speeds and volumes.

Figure 2-4 | Existing Configuration of Travel Lanes

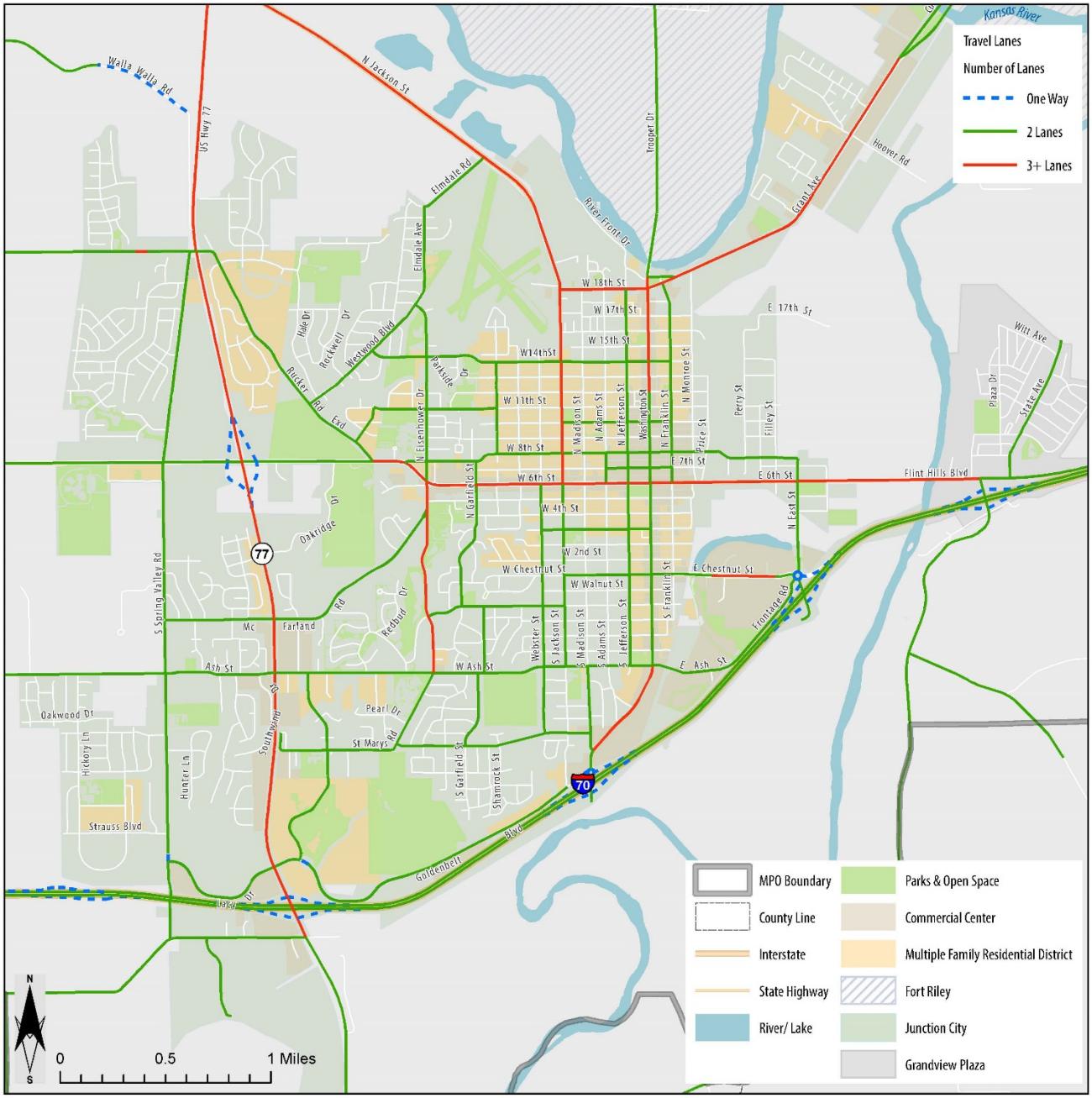
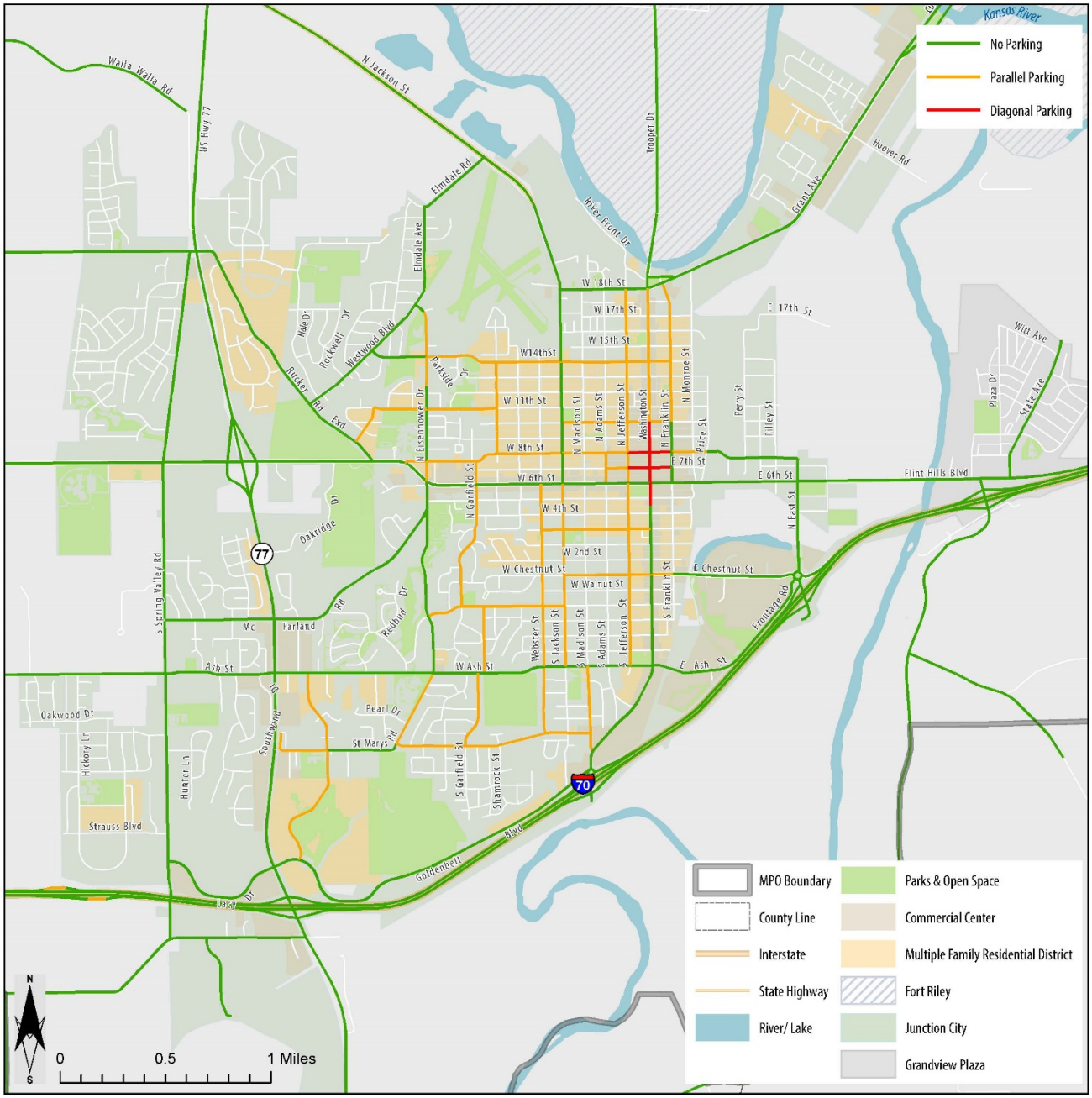


Figure 2-5 | Existing On-Street Parking Availability



2.5 EXISTING TRAIL FACILITIES

There are several designated bike trails within and around Junction City. Figure 2-7 shows the location of existing trails. The River Walk Trail follows the north side of the Republic River from Washington Street to Milford Lake (Figure 2-6). Milford Lake is a 19,000 acre state park owned by the Kansas Department of Wildlife and Parks, and has miles of hiking, biking, and off-road

trails that surround the lake. Additionally, an off-street multi-use trail parallels Jackson Street between the Junction City Airport and the Republic River. Two other trails, located at South Park, circle two baseball diamonds. Just to the west is the Bluffs Park Trail, which loops around a small lake on a hill. Wetland Trail is a small section of nature trail off of Ash Street behind the Walmart on the east side of the city. Riverwalk Landing Trail loops around a small lake used by the commercial boat store near I-70. There are two trails which pass near Homers Pond near Ash Street and Eisenhower Drive that connect to pedestrian facilities along Eisenhower Drive. Junction City currently has no existing on-street bicycle facilities.

Figure 2-6 | Milford State Park

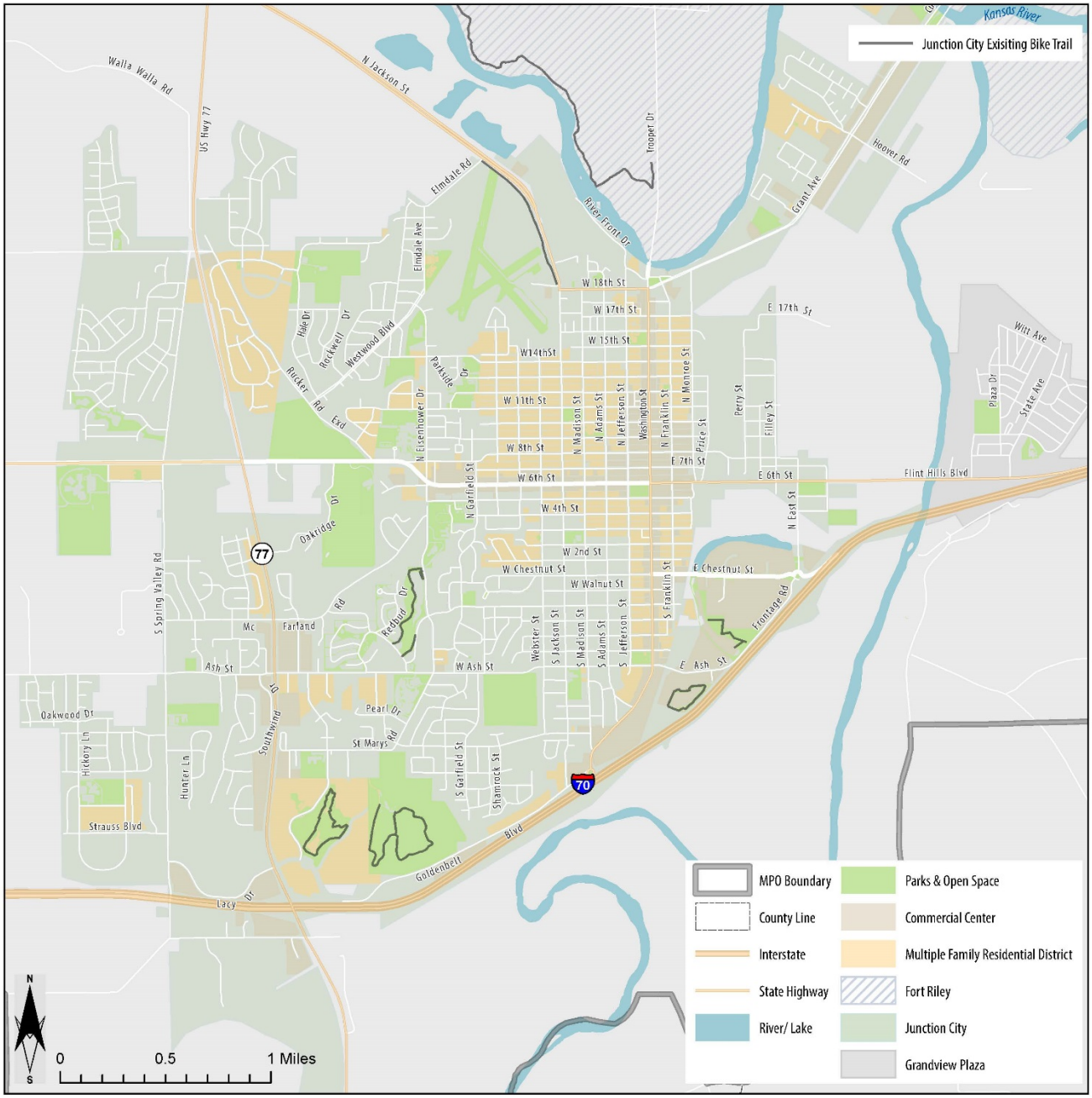
Previously Planned Bicycle Facilities

Junction City's Comprehensive Plan, dated November 2016, presented a high-level overview of recommended bicycle and pedestrian facilities. Being that the document is to serve as a long-range approach to planning, the Comprehensive Plan didn't discuss the type of facilities that should be considered for specific roadways.

In February of 2016, the Flint Hills MPO adopted the region's first long-range transportation plan, the Flint Hills Transportation Plan (FHTP). The FHTP identified a bicycle network that was categorized by whether the identified segment served as a regional, city, or neighborhood connection. Like the Comprehensive Plan, the FHTP did not identify what type of facility for each segment.

After the completion of the Flint Hills Transportation Plan, it was acknowledged that a more specific bicycle-related plan needed to be developed to help guide infrastructure developments in Junction City. This opportunity presented itself with the creation of the Multimodal Integration Plan, which identified a Junction City Bicycle Master Plan as a priority.

Figure 2-7 | Existing Trail Facilities



2.6 LAND USE ACTIVITY ATTRACTORS

Land use activity attractors are destinations where concentrations of commercial and/or institutional land uses generate activity. These include existing and future land use designations of public/institutional, commercial/retail, and multi-family residential. Examples of activity attractors in Junction City include the corridors of Washington Street, Chestnut Street, and the

6th Street, as well as the library, schools, and parks. High traffic related to pedestrians, retail, office, and commercial use all contribute to generating activity.

ATTRACTORS IN JUNCTION CITY

Figure 2-8 depicts where the current activity attractors are located within Junction City. The blue/purple color is associated with areas having a high density of attractors, whereas yellow areas have little to no attractors. Bicycle facilities have the greatest impact when put near areas with high attractor scores. Conversely, bicycle facilities placed in yellow areas with a low attractor score will be less successful for facilitating overall connectivity within Junction City.

SCHOOLS

Figure 2-9 depicts the schools in Junction City as well as the existing sidewalk network. With no existing bicycle facilities, young riders will often choose to ride on the sidewalk alongside pedestrian users. A successful multimodal network prioritizes safe and convenient access to schools via all travel modes. Furthermore, school connectivity is an excellent way to promote use of both the bicycle and pedestrian network. By designating appropriate shared or separated bicycle facilities that connect schools to residential neighborhoods or multi-family developments, the City can address multimodal transportation in a meaningful way that encourages a healthy and active community. Identifying sidewalk improvement areas or 'gaps' in the sidewalk network in relation to schools should be a priority.

The schools in Junction City benefit from the connectivity of the city's grid street system, which provides great accessibility to public and institutional facilities. Half of the schools are concentrated within this grid street system, which makes connecting future bicycle and pedestrian facilities to destinations convenient. The other schools are aligned with Eisenhower Drive, which runs north-south through the geographic center of town. Eisenhower Drive is a transitional edge between different eras of road design within Junction City. To the east of Eisenhower Drive streets follow a rectilinear grid pattern, whereas to the west, many streets follow the contours of the landscape and contain cul-de-sacs. The result is that many east-west roads do not intersect at Eisenhower Drive and when crossing the road, it is necessary to travel along Eisenhower Drive to continue east-west travel, heightening the need for adequate bicycle and pedestrian facilities along Eisenhower Drive.

Figure 2-8 | Activity Attractors

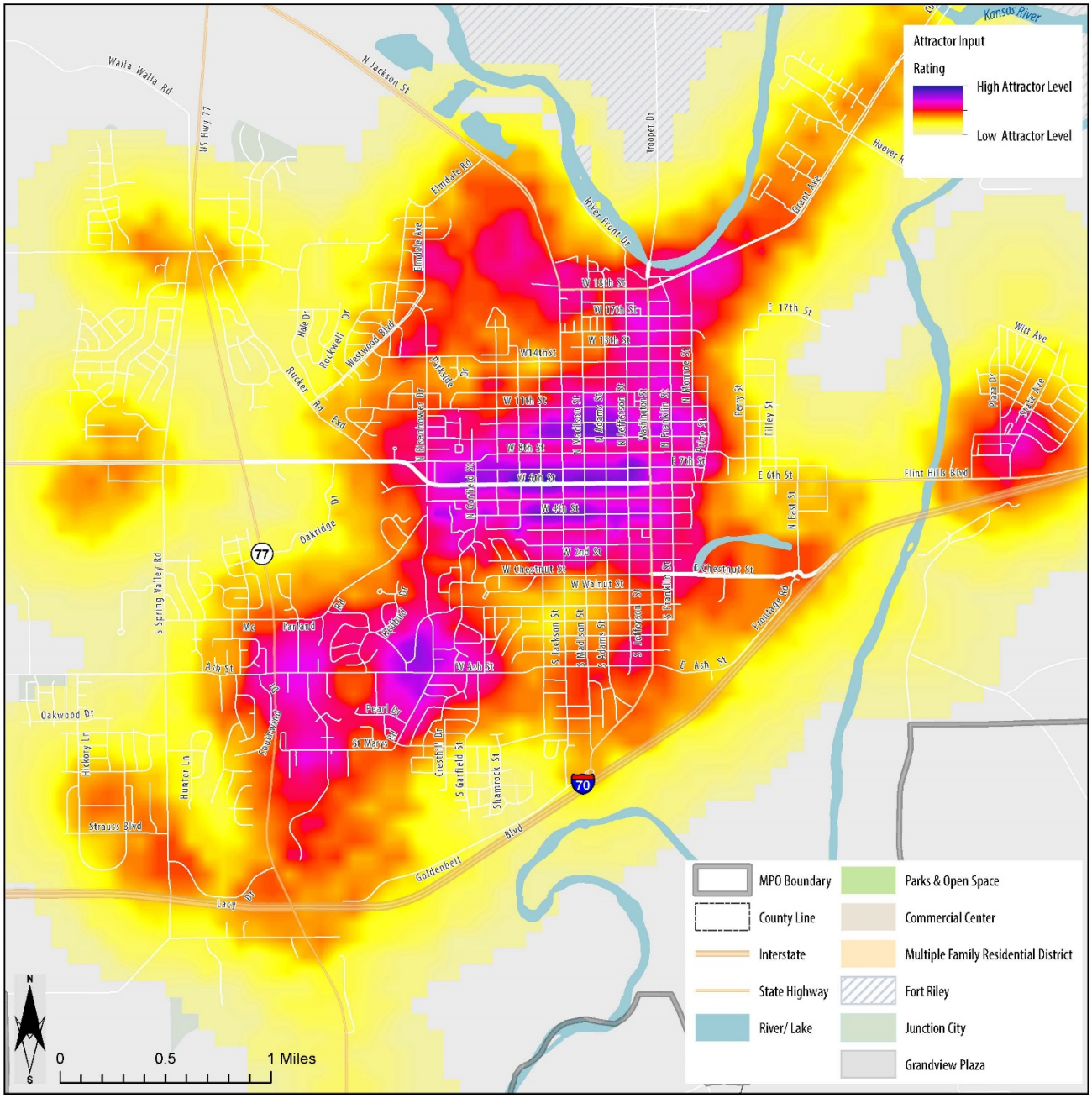
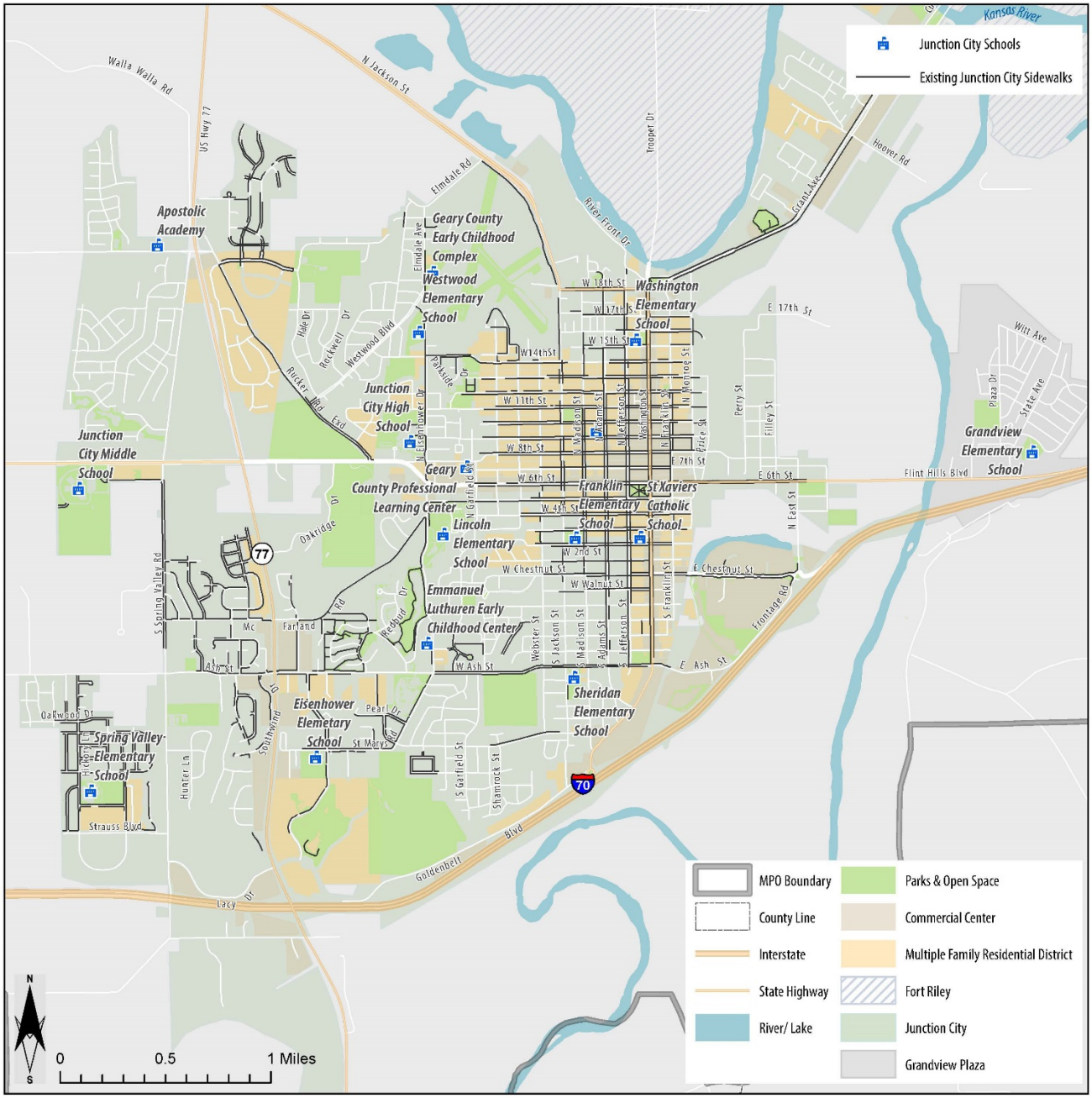


Figure 2-9 | Schools and Existing Sidewalk Network

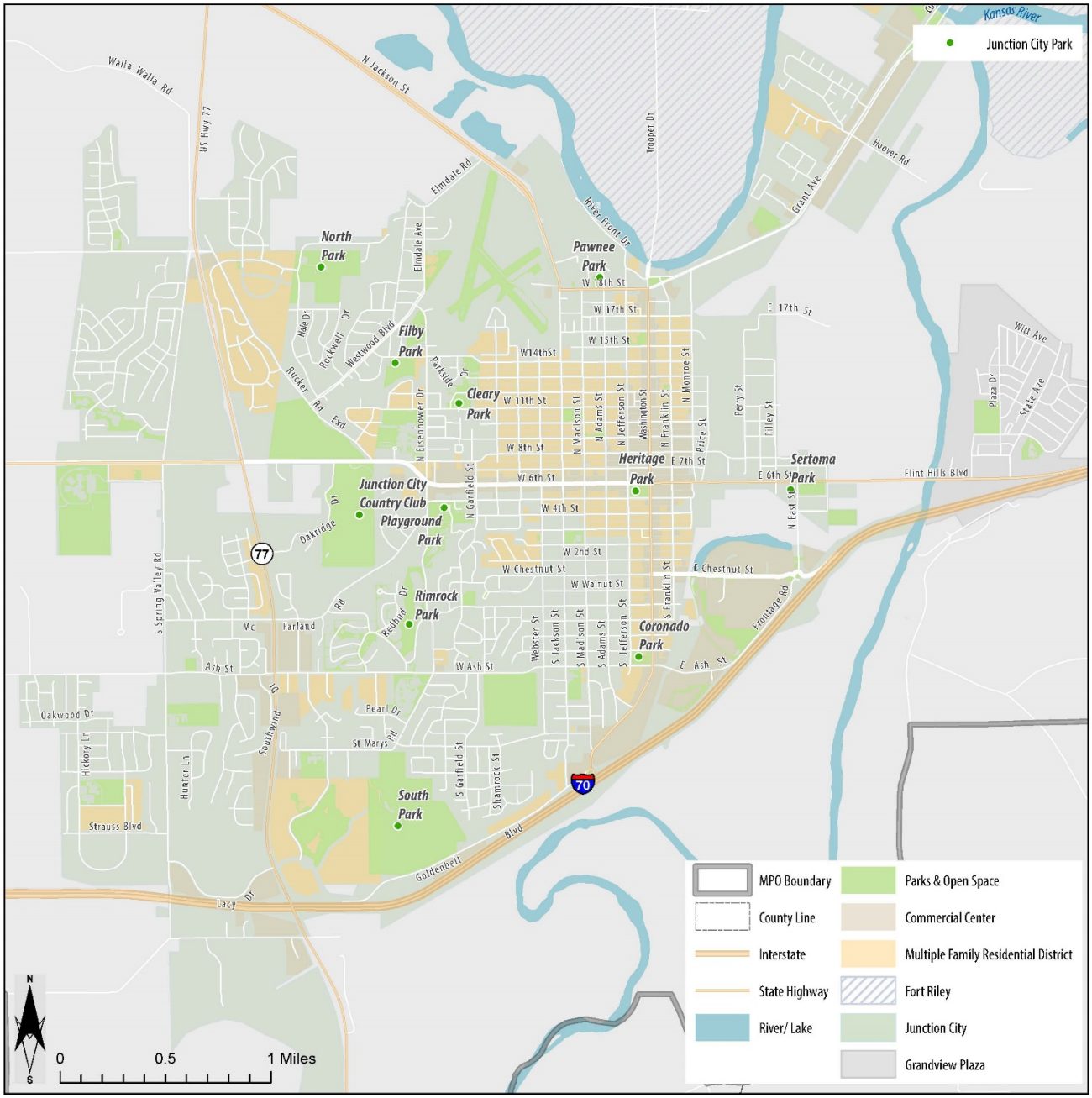


RECREATION

As depicted in Figure 2-10, there are 18 public parks throughout the city, serving three different levels; regional, community, and neighborhood. To the north-west, Milford State Park offers camping, fishing, and multiple trails that can be accessed from Junction City by the River Walk Trail. Heritage Park, Hammond Family Park, Cleary Park, and Rathert Stadium are community level parks that serve all users of Junction City and provide amenities that make them distinct destinations for locals and neighboring communities alike. The remainder of the park system is comprised of varying scales of neighborhoods parks, which range from small pocket parks to entire city blocks. These parks serve smaller populations on a neighborhood scale.

Heritage Park –

Figure 2-10 | Existing Public Parks



2.7 EXISTING MULTIMODAL NETWORK

As part of the development of the *Junction City Bicycle Master Plan*, other modes of transportation were analyzed and considered.

BICYCLE FACILITIES

Bicycle and pedestrian facilities, when connected to recreational amenities, act as an extension of the recreational system. Therefore, connecting parks and other recreational facilities via bicycle and pedestrian facilities is a way to encourage residents to explore the entire recreational system. While Junction City has identified a bicycle network, there are currently no dedicated bicycle facilities in the city. This requires bicyclists to ride on either recreational trails, sidewalks, or on the road with no signage or separation from vehicles. With no dedicated bicycle routes or lanes, Junction City lacks a complete multimodal network.

TRANSIT INTEGRATION

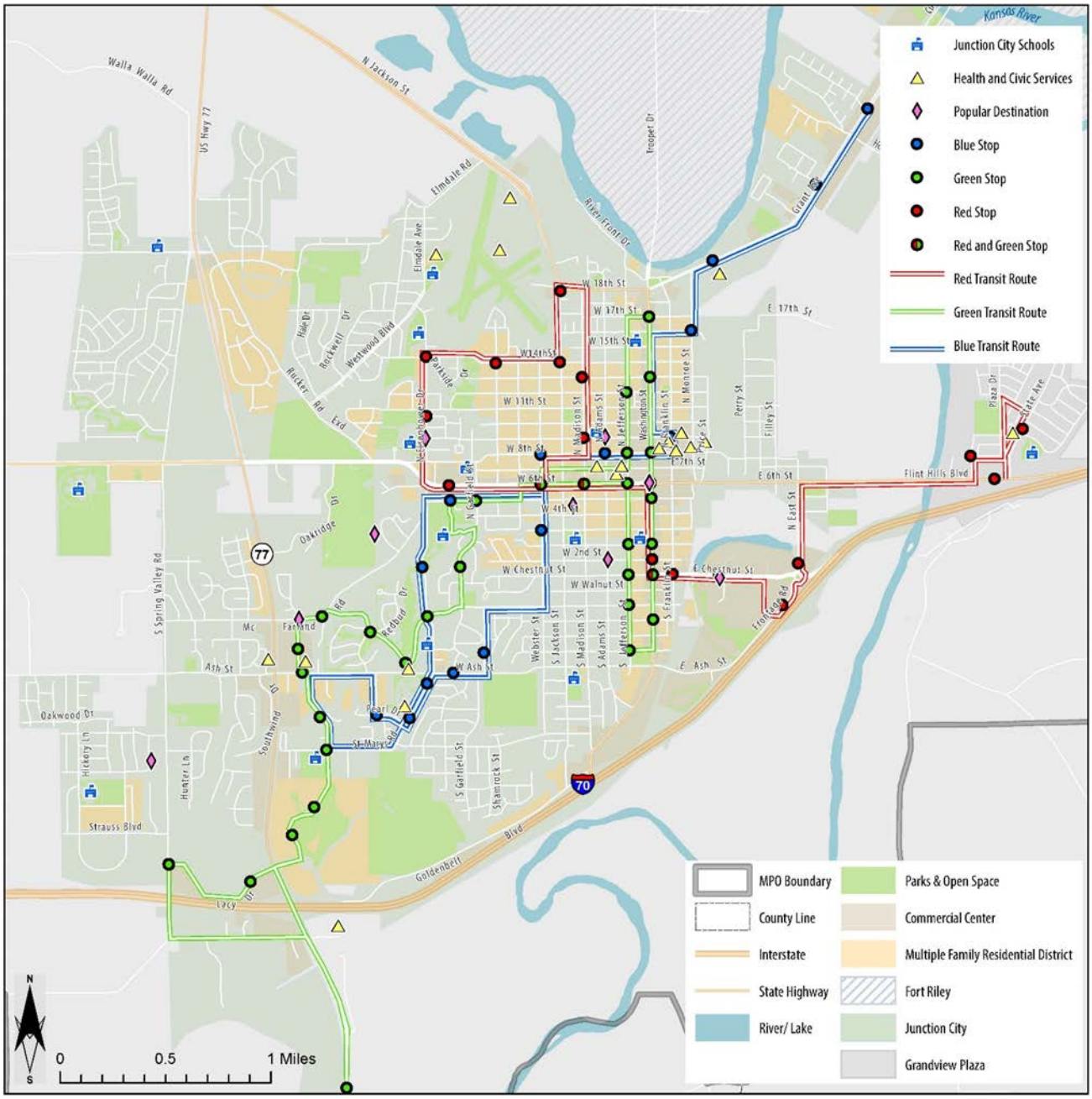
Junction City implemented the first fixed-route transit system in May 2016. A successful transit system is crucial to a stable economic program that serves social needs while supporting and promoting employer needs. Successful transit systems require continual investment that focus on integrating transit into the community framework. As neighborhoods are built, employment centers created, and roadways are improved, transit accessibility improvements can be incorporated to strengthen connections between origins, transit facilities, and destinations. Despite how transit patrons primarily arrive at a transit stop, all are pedestrians at some point in their trip, which illustrates how pedestrian, bicycle, and transit networks all support each other. A robust pedestrian and bicycle network serves as an important extension of any transit system.

The Flint Hills Area Transportation Agency (FHATA), often referred to as aTa Bus, is a transit service that has been operational since 1976. FHATA primarily operates fixed-route service in Manhattan and Junction City, providing complimentary paratransit service for eligible passengers. Until the implementation of fixed-routes in Junction City, aTa Bus relied solely of demand-response services to serve the needs of patrons in the city. Demand-response is still provided by FHATA throughout the three-county region.

Fixed route service in Junction City is illustrated in Figure 2-11 and includes the following routes:

- *Red Route*: primarily serves areas north of downtown and Grandview Plaza.
- *Blue Route*: primarily serves areas in central Junction City and north-east Junction City.
- *Green Route*: primarily serves areas downtown and south Junction City.

Figure 2-11 | Existing Fixed-Route Transit System



There are several transfer locations along the fixed-route system, allowing passengers to transfer from one route to another, but Dillon's Grocery Store services as the primary transfer point. There are currently 66 bus stops within the Junction City fixed-route transit system. While all of the stops have a sign designating them as a bus stop, there is no information provided at the stops indicating times, routes, or transfer opportunities. Signage is essential in providing the necessary information and direction for riders within the system. In addition, very few stops contain transit amenities (benches, shelters, waste bins, etc.) and have a variety of ADA compliance issues, which

hinders riders accessing the stop and boarding transit. Figure 2-12 shows all of the bus stops within the Junction City area and ranks the sidewalk accessibility to that bus stop. A transit stop inventory was conducted in order to understand the existing transit amenities and identify improvement opportunities. Table 2-1 provides a summary of the transit stop inventory. Eight requirements were analyzed at each bus stop, which required the existence of:

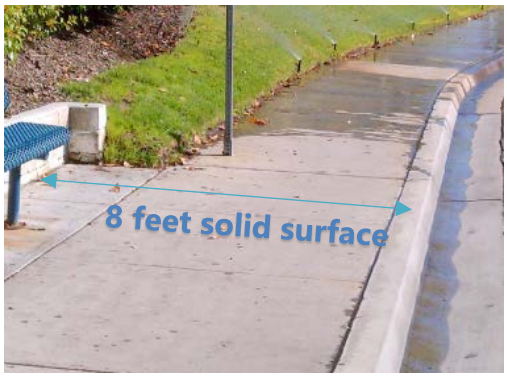
- Sidewalk width greater than or equal to four feet
- Curb ramps
- Truncated domes
- Pedestrian crossings
- Surface stability
- Surface length of 8 feet
- Sidewalk connectivity
- Traffic control within 500 feet

Table 2-1 | Transit Stop Field Inventory

Field Inventory	Average/ Percentage
Sidewalk Width in feet	3.86
Curb Ramps	47%
Truncated Domes on Curb Ramps	17%
Pedestrian Crossing within 100 ft	32%
Firm Stable Surface	24%
Clear length of 8 ft. min	15%
Connected to Sidewalks	73%
Traffic Control within 500 ft	91%

Source: Wilson & Company

After completing the inventory of existing stop conditions, each stop was scored based upon the findings. A "poor" ranking represents a stop that satisfies 0 to 3 of the requirements, a "fair" ranking represents a stop that satisfies 4 to 6 of the requirements, and a "good" ranking represents a stop that satisfies 7 to 8 of the requirements. In addition, Figure 2-12 illustrates the existing sidewalk widths within Junction City. The sidewalk width is positively correlated to the ranking of sidewalk accessibility to each bus stop. In general, transit stops are more accessible in areas closer to downtown with wide street easements (right-of-ways) and wide sidewalks. Whereas, areas towards the city edge often lack a sidewalk altogether.

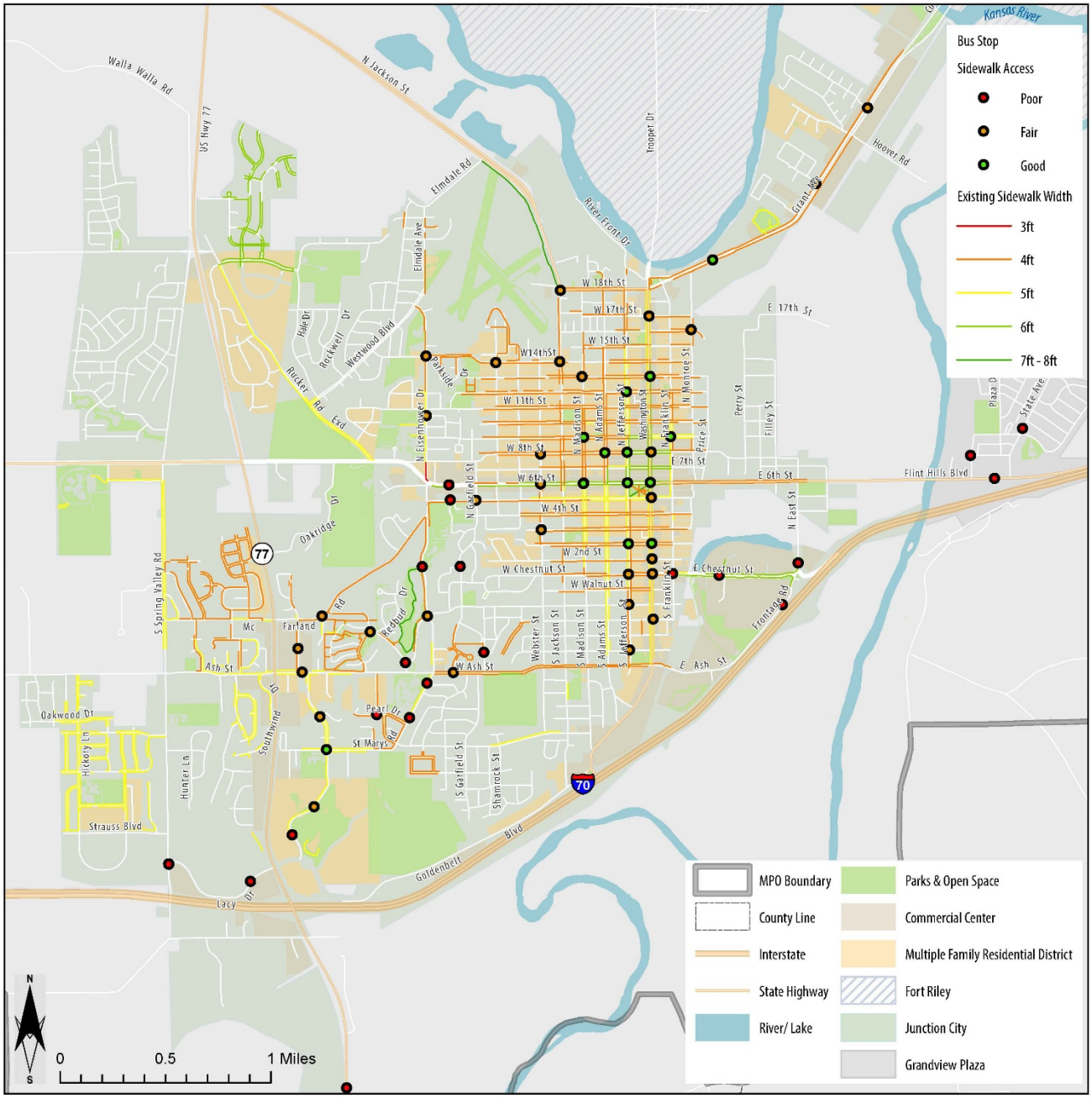


Truncated Domes

Many of the bus stops within Junction City are deficient when it comes to ADA requirements for transit stops. Only 15% of transit stops had a minimum clear length of eight feet at the transit stop. Standards require a solid surface that extends eight feet perpendicular to the bus stop to allow wheelchairs to safely board buses.[1] The average sidewalk width at transit stops was approximately four feet, which is the width of most of Junction City's sidewalks. Curb ramps are present on approximately half of the sidewalks near transit stops, yet only 17% of the stops had truncated domes that assist the visually impaired. A quarter of stops had firm a stable surface of concrete or brick, meaning 75% of the bus stops were located on either dirt or grass.

[1] NACTO - Design and Placement of Transit Stops

Figure 2-22 | Existing Transit Stops and Sidewalk Connection Ratings



3.0 BICYCLE ACCOMMODATION

The following section introduces the types of bicycle facilities generally used in urban environments.

3.1 SHARE THE ROAD

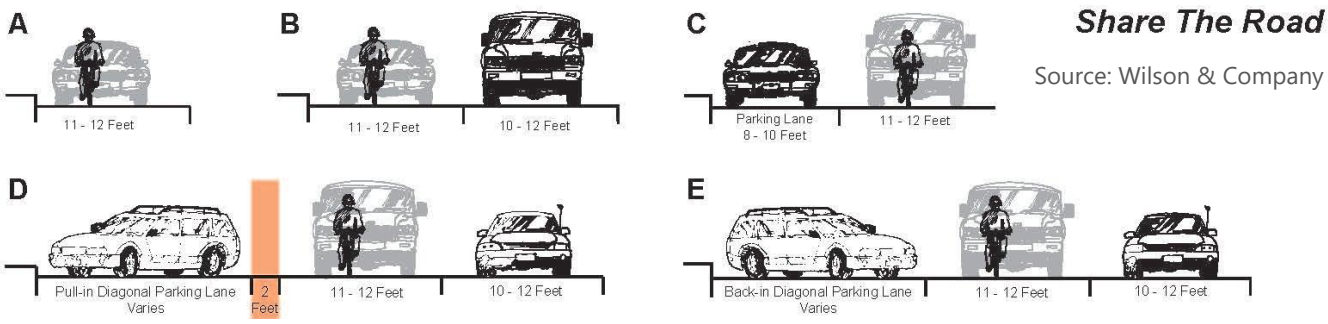
Share the road facilities (using a pavement marking called a "sharrow") are the most widely implemented facility types in the United States. The appeal to municipalities is that share the road facilities are very inexpensive and generally require no capital improvements to the road width. Share the road facilities require careful consideration prior to implementation. This treatment is typically reserved for streets with low traffic volumes and slower speeds.

Figure 3-1 illustrates ideal applications for share the road facilities based on street section conditions. In the figure, there are five main facility application types:

- Two lanes with no on-street parking;
- Four lanes with no on-street parking;
- Two lanes with parallel parking;
- Four lanes with pull-in diagonal parking; and
- Four lanes with back-in diagonal parking.

Types A through C are most commonly found in cities throughout the Midwest. Often these facilities are accompanied by share the road signage, bicycle route signage, sharrow pavement markings, and/or ordinance signage.

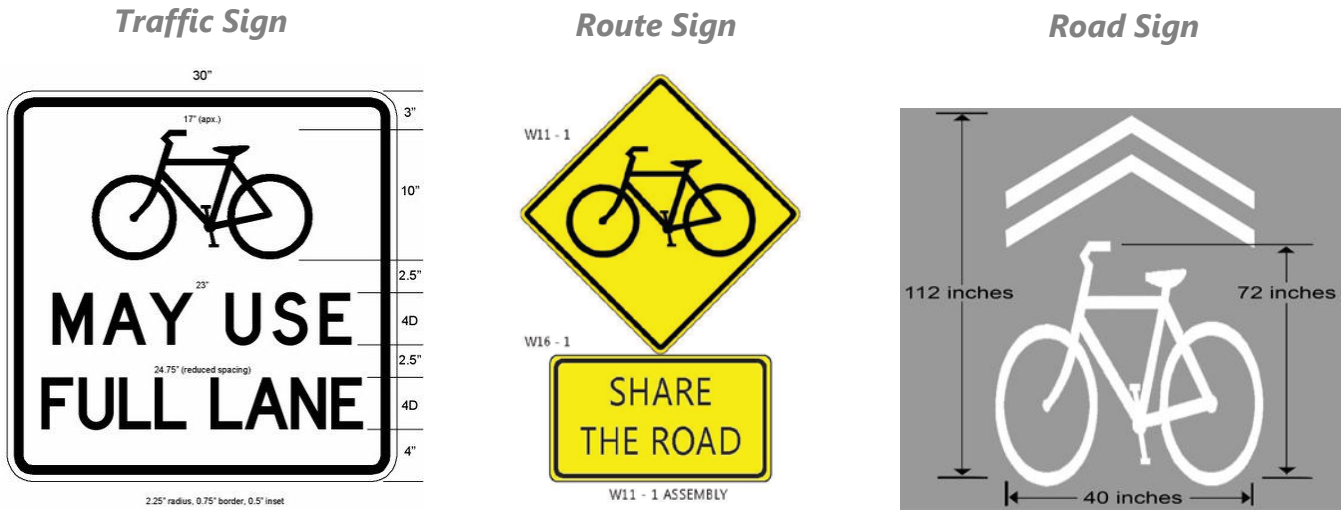
Figure 3-1 | Share the Road Facility Types



Typical signage types for share the road facilities recommended by AASHTO, MUTCD, and FHWA are provided in Figure 3-2. The existing Junction City ordinances do not address safe passing distances; therefore, it is recommended that the City adopt an ordinance in line with the Kansas state statute which states that, "The driver of a vehicle overtaking a bicycle proceeding in the same direction shall pass to the left thereof at a distance of not less than three feet and shall not again drive to the right side of the roadway until safely clear of the overtaken bicycle." [2]

Motorists and cyclists can become confused as to who has right-of-way within the travel lane. One example exists when there is a share the road facility behind pull-in diagonal parking. This scenario can cause sight line issues for the driver and should be accompanied by a delineated buffer of no less than two feet. To avoid this issue, diagonal parking can be reversed so vehicles back-in to diagonal parking spaces. This application mitigates two issues, first it allows cyclists to make eye contact with the driver of the vehicle on the driver's side, and second, it allows drivers to see oncoming cars or cyclists before entering the travel lane.

Figure 3-2 | Recommended Share the Road Pavement Marking and Signage (Source: MUTCD 2009)



[2] *8-1516. Overtaking and passing of vehicles and bicycles proceeding in the same direction.*

Share the road facilities are not appropriate within single-lane or multi-lane roundabouts. The intricacy of vehicle interactions leaves a cyclist prone to elevated levels of risk[3]. It is recommended that cyclists are diverted to pedestrian facilities where they can cross the road at a safe distance from a roundabout. Appendix A and Appendix B show examples of how a cyclist could divert onto a pedestrian landing and continue along a path, crossing the road at properly marked pedestrian crossings to continue on to a share the road facility.

3.2 BICYCLE LANE

Bicycle lanes are relatively inexpensive treatments that can significantly increase safe and convenient cycling. Given roadway conditions, particularly geometry, roadway width, traffic volume, and the number of travel lanes, bicycle lanes can be installed fairly economically.

One of the greatest advantages of implementing bicycle lanes is the delineation of separate travel lanes for cyclists and drivers. When road conditions permit a bicycle lane, this facility type should be considered over share the road facilities, especially in the case of higher traffic volumes, higher speed limits than 35 MPH, or on wide streets.

Figure 3-3 illustrates five different bicycle lane facility types including:

- Typical bicycle lane application;
- Bicycle lane with on-street parallel parking;
- Parking lane with a buffered bicycle lane;
- Pull-in diagonal parking lane with a buffered bicycle lane; and
- Back-in diagonal parking lane with a buffered bicycle lane.

[3] *US Department of Transportation. (2000). Roundabouts: An Informational Guide. FHWA-RD-00-067*

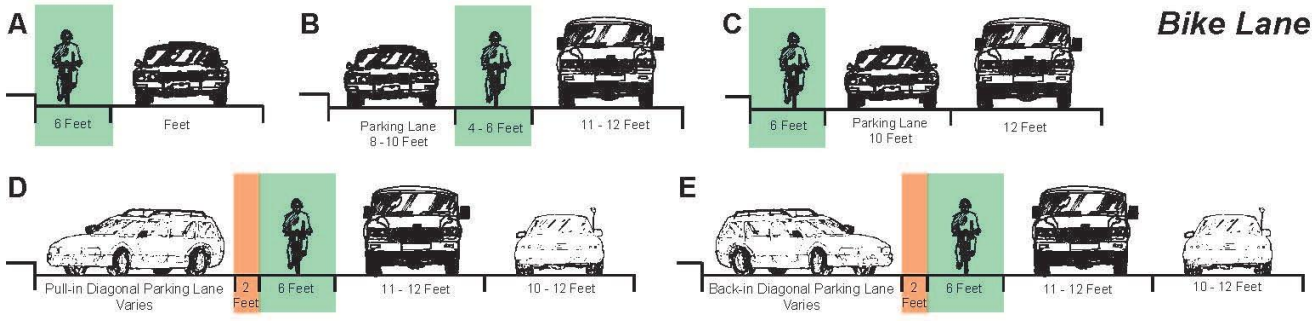
The typical applications vary between four to five feet for the clear and unobstructed bicycle lane width, however, six feet is strongly recommended for bicycle lanes to increase comfort and safety for both the cyclist and driver.

The 2012 AASHTO Guide for the Development of Bicycle Facilities recommends a minimum of five feet for bicycle lanes. Where roadways have no curb and gutter and no on-street parking, the minimum width of a bicycle lane is four feet. Bicycle lanes wider than five feet are recommended under several circumstances including high-volume streets, high speed streets, truck routes, or where on-street parking is present.

Bicycle lanes along streets with parallel parking (Types A and C in Figure 3-3) can avoid potential conflicts with exiting vehicles if there is an adequate buffer. This buffer is recommended when a bicycle lane is narrower than five feet. With a six-foot bicycle lane, the cyclist has enough room to maneuver around curb side obstacles while avoiding traffic in the travel lane. One option, as reflected in Type C in Figure 3-3, buffers bicycle lanes with parallel parking. This provides an excellent barrier to enhance the safety of the cyclist and drivers exiting vehicles. These applications are best implemented along commercial corridors or near high-density residential developments. Additionally, the width of the bicycle lane is more flexible with this application and a six-foot lane width may not be necessary for optimal comfort.

Similar to share the road facilities, bicycle lanes are not highly recommended along roads with pull-in diagonal parking. However, if there is an adequate buffer (two feet) between the bicycle and parking lane, this facility type is possible. Ideally, if bicycle lanes are to be implemented along a street with diagonal parking, back-in parking is recommended. As previously mentioned, this application improves the line of sight for the driver.

Figure 3-3 | Bicycle Lane Facility Types



Source: Wilson & Company

Figure 3-4 illustrates the design standard widths of travel lanes based upon the typical physical space required by bicycles and vehicles. Providing the preferred amount of space for each mode of transportation helps ensure a safe environment for all users.

It is highly recommended that bicycle lanes be constructed with proper pavement markings and signage to inform drivers that the bicycle lane is not a roadway shoulder or parking area. Examples of typical signage recommended by AASHTO, MUTCD, and FHWA are provided in Figure 3-5.

Figure 3-4 | Standard Vehicle Widths

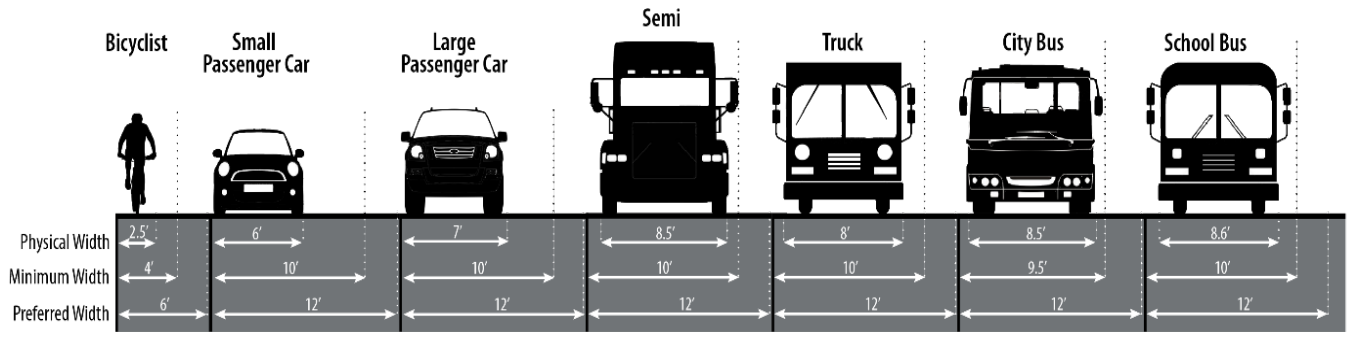
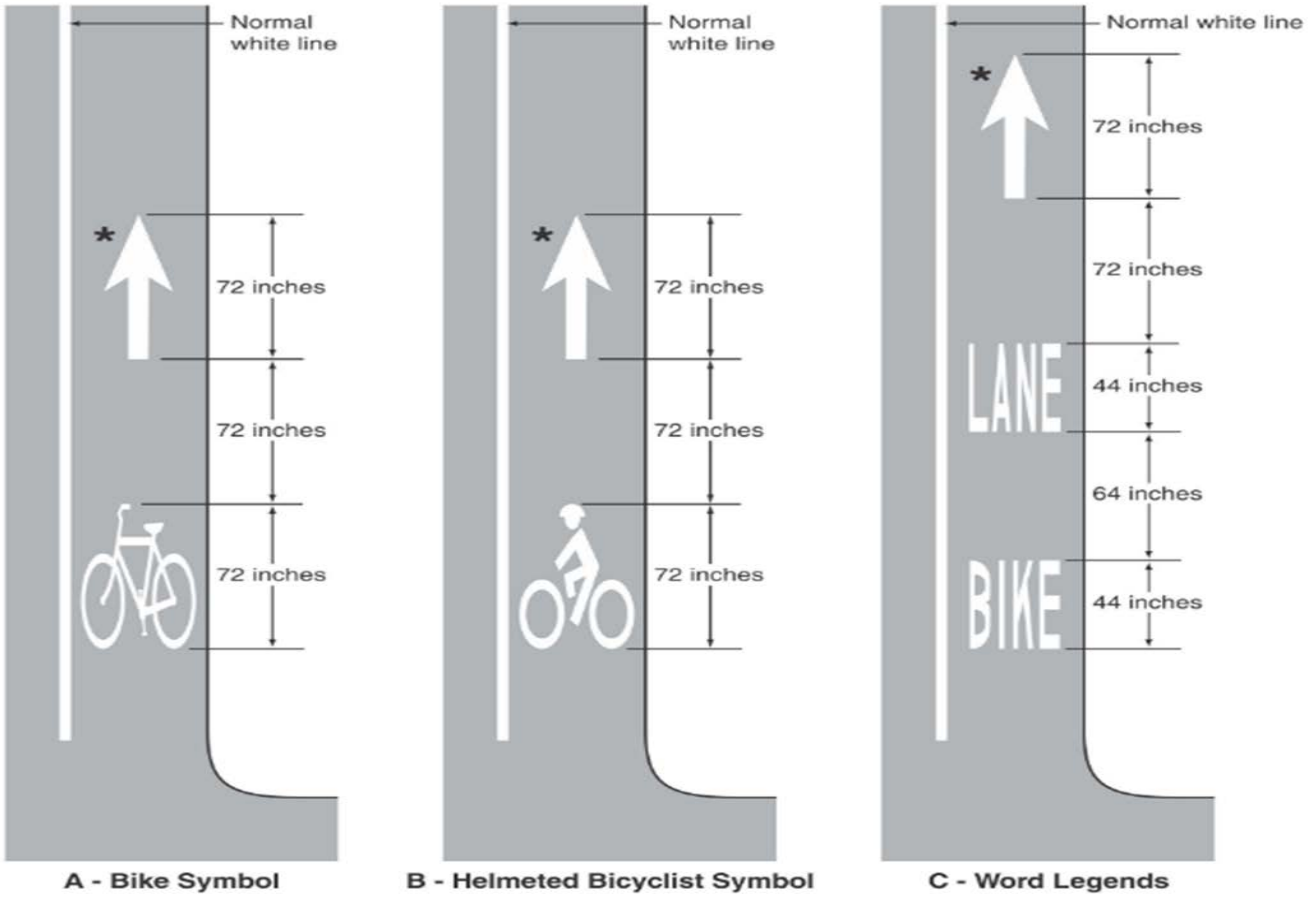


Figure 3-5 | Recommended Bicycle Lane Pavement Marking



Pavement Markings

Parking Sign

Bicycle Lane Sign

Source: AASHTO

3.3 CYCLE TRACK

Cycle tracks utilize similar applications as bicycle lanes but include a physical buffer between the cyclist and vehicle and facilitate two-way movement within the travel area. Cycle tracks are often utilized for highly trafficked roads and are inclusive for riders of all comfort levels. Based on the travel conditions that currently exist in Junction City, cycle track facilities are not anticipated in the immediate future. As the area continues to develop, there may be an opportunity to incorporate cycle tracks to improve cycling infrastructure and safety on higher volume and higher speed roads.

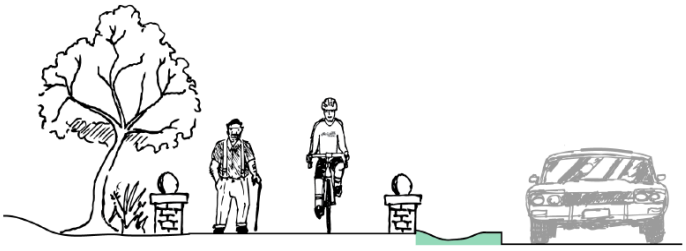
3.4 BICYCLE BOULEVARD

Bicycle boulevards function very similarly to share the road facilities, but can include traffic calming devices that help to lower the speed and increase safety for bicyclists. Ideal candidates are typically low volume and low speed streets in proximity to many destinations or adjacent to corridors with high vehicular traffic volumes or speed. Although no bicycle boulevards are recommended for Junction City at this time, many of the corridors identified as share the road could be converted to a bicycle boulevard in the future, if the demand warrants the additional improvements. Typical bicycle boulevard improvements include additional striping and signage to heighten the level of awareness of the presence of cyclists on a roadway.

3.5 MULTI-USE PATH

Multi-use paths (trails) are off-street facilities reserved for the use of pedestrians and bicyclists exclusively. These paths are typically built for recreational riders and typically do not serve local trip options or experienced riders. Figure 3-6 illustrates a conceptual layout of a multi-use path. To accommodate pedestrians and bicyclists as well as two-way traffic, a 10- to 12-foot multi-use path is recommended.

Figure 3-6 | Multi-use Path



10 to 12 Feet Multi-use Path

Source: Wilson & Company

Signage and markings for multi-use paths can vary. Identified in Figure 3-7 are recommended signage options for multi-use paths, which illustrate proper use of the path, path etiquette, and path routing/wayfinding. Figure 3-8 illustrates examples of pavement markings and traffic control devices to use when multi-use paths intersect with roadways.

Figure 3-7 | Recommended Multi-use Path Signage

Pavement Marking

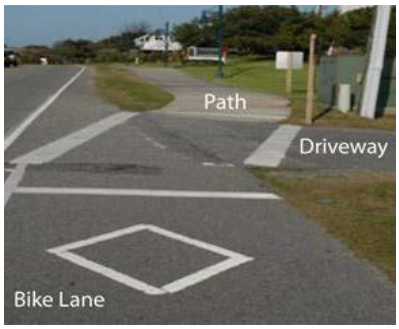
Wayfinding and Etiquette Sign

Figure 3-8 | Recommended Multi-use Path Intersection Marking

Local Road with Stop Sign

Local Road with Flashing Beacon

Arterial with Signalized Intersection

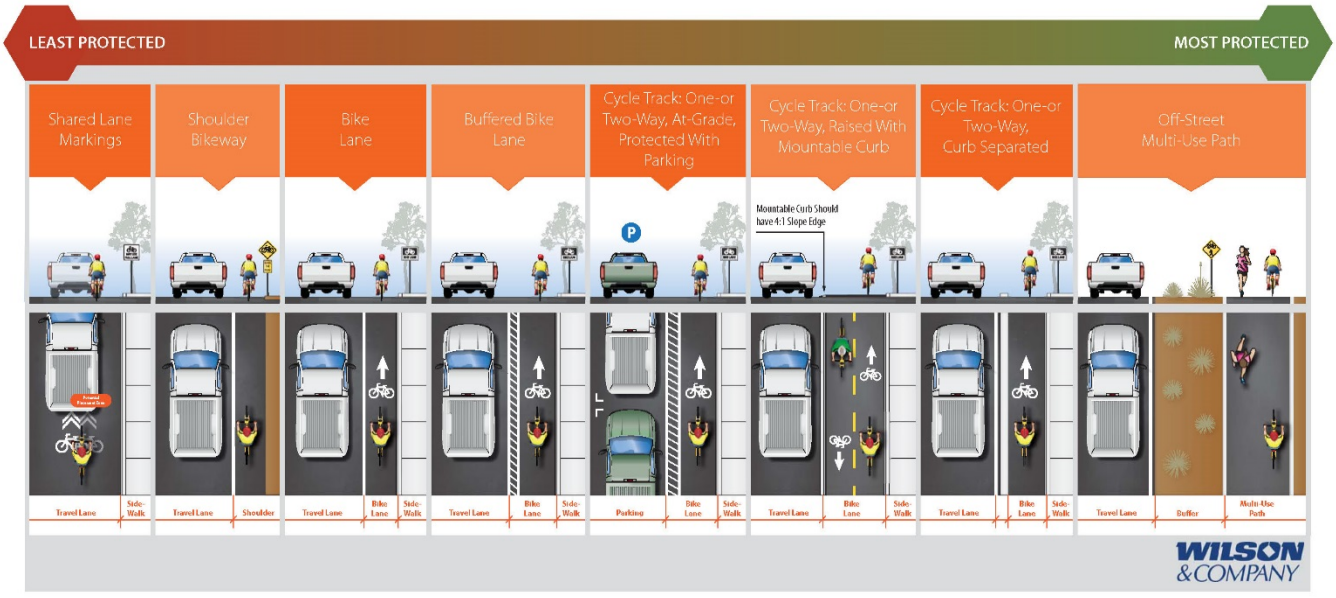


Bicycle Lane to Path Transition

3.6 BICYCLE FACILITY TRADEOFFS

The level of protection varies between the different facility types. Although the greatest amount of protection is achieved from an off-street multi-use path, there are various advantages and disadvantages for implementing share the road facilities, bicycle lanes, buffered bicycle lanes, and cycle tracks. Generally, the more separated a bicyclist is from vehicular traffic, the more protected the facility type will be. Figure 3-9 illustrates the degree of protection for the various on-street bicycle facility types with sharrows receiving the least amount of protection and multi-use paths receiving the most protection.

Figure 3-9 | Facility Type Comparison

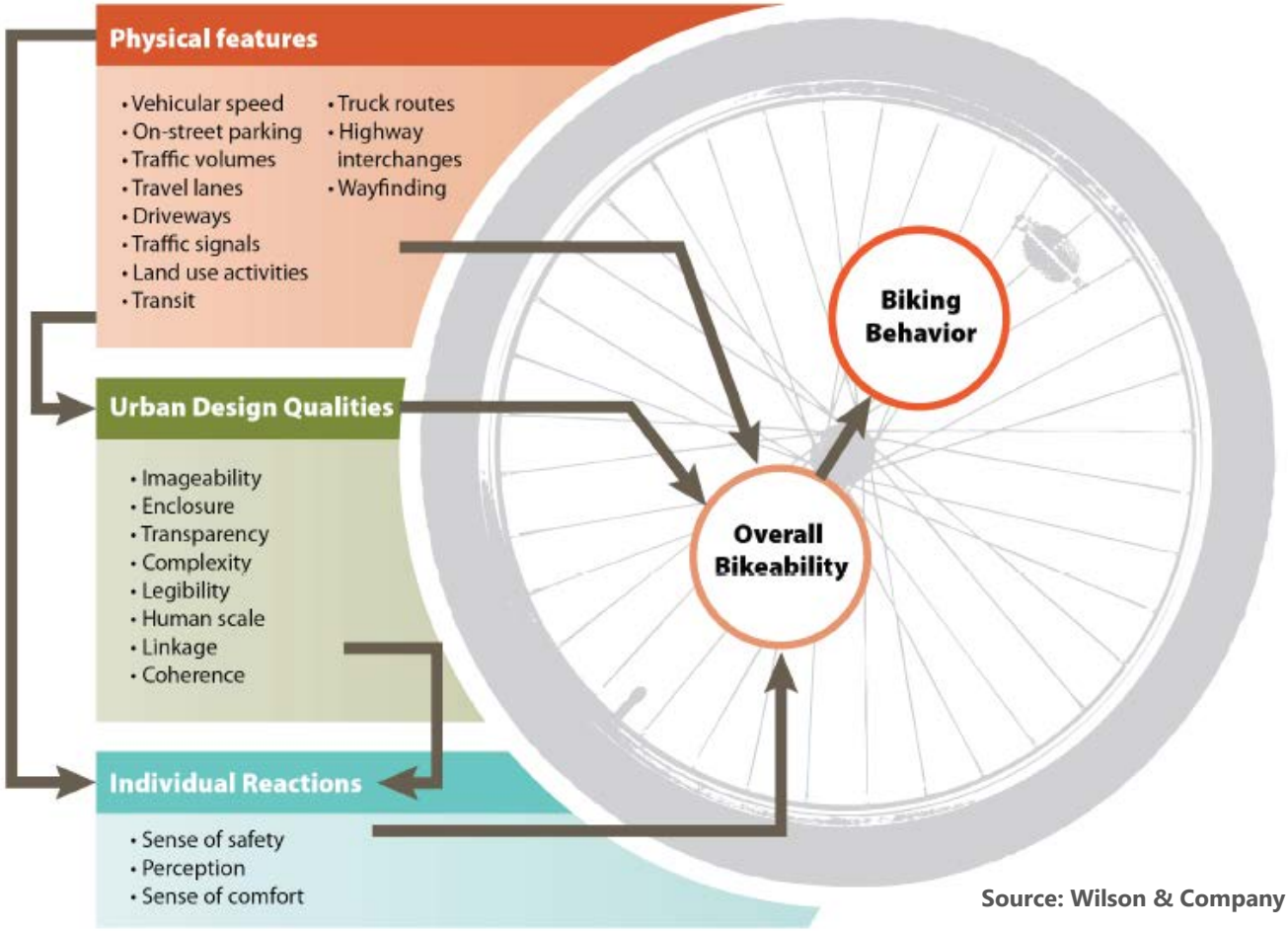


4.0 Bicycle Facility Opportunities

4.1 Methodology

Strategic bicycle routes are determined by examining the existing context of a community and the travel behavior of both the drivers and bicyclists. Determining a successful route requires an understanding of bicyclist and driver expectations. It also requires an understanding of the land use and development patterns, origins and attractions, traffic volumes and speed, roadway width and roadway configuration, among other community characteristics. Figure 4-1 illustrates the physical features, urban design qualities, and individual perceptions that contribute to a bikeable environment.

Figure 4-1 | Bikeability Factors



Source: Wilson & Company

The methods used throughout this analysis utilized both quantitative and qualitative assessments of present day conditions. Using GIS data, in addition to background and support

data collected through this project process, an understanding of connectivity and roadway characteristics was developed.

More specifically, the application potential of varied bicycle facility types in Junction City was developed by analyzing the existing conditions, understanding constraints, and conducting site visits. Existing transportation condition break points were based on AASHTO standards and Green Book best practices. For example, roads that had an average of over 5,000 vehicles per day would be precluded from sharrow application yet would be suitable for a separated bicycle lane or multi-use path. Each facility type is sensitive to different roadway characteristics. Share the road facilities have high application potential on streets with a speed limit of 35 MPH and under; however, if the speed limit increases past 35 MPH, share the road facilities are not recommended and bicycle lanes and multi-use paths are moderately applicable. Other existing conditions that were used to establish a bicycle network included:

- Number of travel lanes;
- On-street parking type;
- Proximity to activity attractors; and
- Multimodal connections.

While the existing conditions report gives quantitative analysis of data to deliver an objective unbiased assessment of bicycle facility performance, other factors influence the overall suitability of bicycle facility application. The roadways geometric design provides another valuable metric for determining bicycle facility application. The available street easement (right-of-way) and curb-to-curb width of existing streets in many cases decreases the suitability for share the road facilities, bicycle lanes, or multi-use paths. Cost also plays a significant role in the application of facility types. In general, the cost of striping a share the road facility is much lower than widening the road to incorporate a bike lane. Another qualitative aspect of the design is the network approach which takes into account the connections that each route provides. The principle behind the network approach is essentially "the whole system is greater than the sum of its parts". Making meaningful connections among routes and to key destinations provides for a more efficient system, allowing for ease of use. This is an important factor to the overall deployment of the system.

Site visits were conducted to visually evaluate potential routes, verify data, and address potential concerns. Each of the recommended bicycle routes was also ridden to confirm ease of use, safety, and overall comfort. The feedback from the site visits helped to refine the facility recommendations.

4.2 RECOMMENDED BICYCLE FACILITY APPLICATION

Figure 4-2 shows the recommended application for share the road "sharrow" facilities, separated bicycle facilities, and multi-use paths in Junction City. Routes were determined by the quantitative assessments of speed limits, road widths and traffic volumes, and were selected based on proximity to attractors (schools, multi-family, and commercial uses). In general, higher speed roads with wide lanes are recommended for separated bicycle lanes, whereas lower volume roads are recommended as shared use facilities. In addition to safety concerns and proximity to attractors, bicycle facilities were placed on roads that would enhance the overall multimodal network. Meaning, facilities are recommended on east-west and north-south streets which maximize connections with other routes. Additionally, in high use areas, bicycle facilities run parallel to one another between two and four blocks away from each other. In areas where bicycle facilities were deemed appropriate based on attractors but did not meet safety requirements due to speed and or traffic, adjacent roads are recommended.

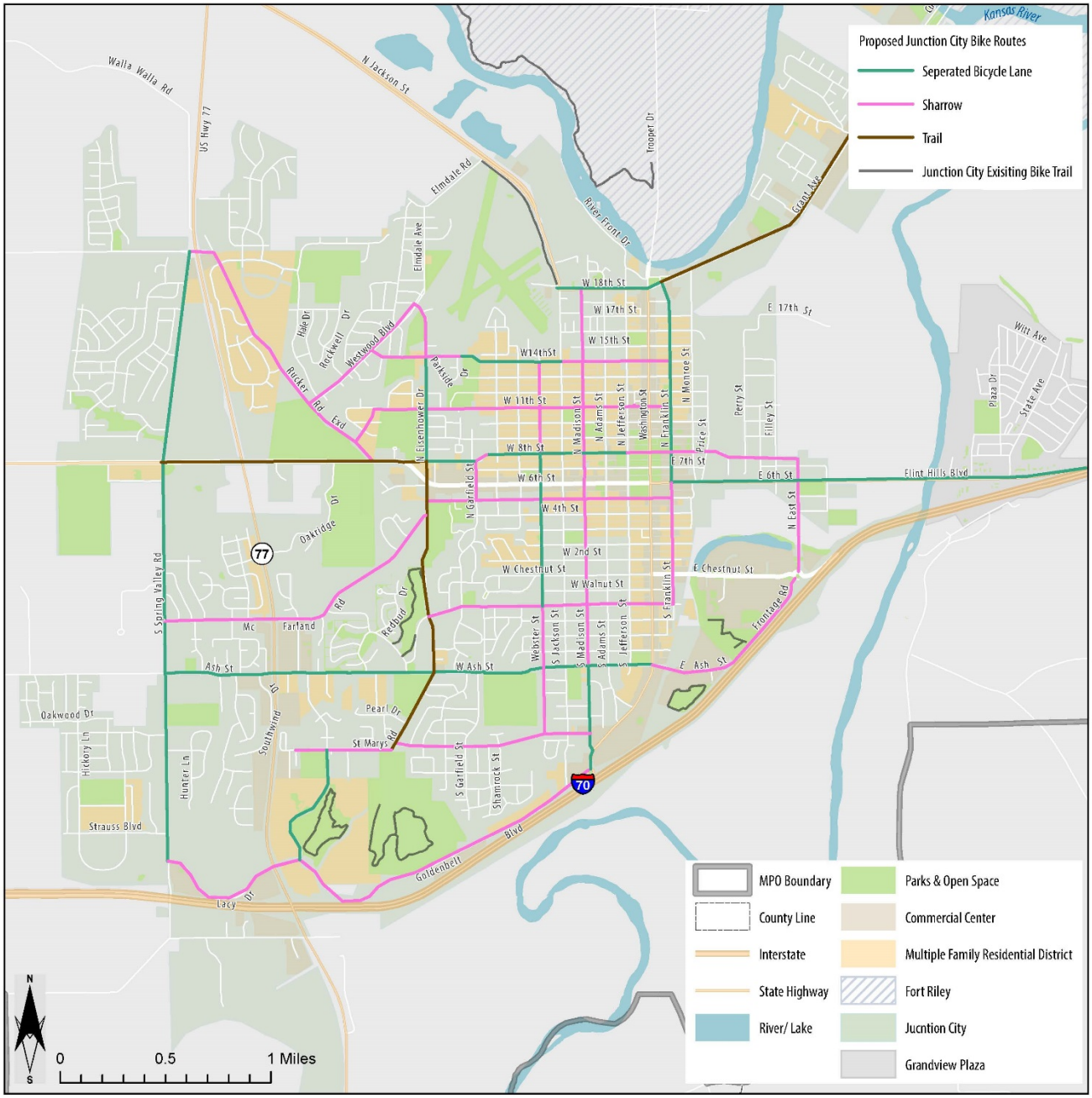
This approach found that higher volume roads like Eisenhower Drive and portions of Franklin Street, Madison Street, and Webster Street represent a significant opportunity for north-south connectivity with bicycle lanes. The southern end of Madison Street could benefit from having a northbound bicycle lane and a southbound share the road facility to increase safety for riders traveling uphill (Appendix B). In addition, it is recommended that cyclists divert to pedestrian facilities near the roundabout at Washington and Goldenbelt Drive (Appendix B). At the western edge of the residential area in Junction City, Eisenhower Drive is recommended as an important corridor for connecting east-west bicycle facilities to many schools along the north-south corridor. South of 5th Street, Eisenhower Drive could utilize preexisting sidewalk to develop a multi-use path that leads to South Park. This multi-use path on Eisenhower Drive could connect to previously proposed multi-use path facilities on 8th Street, allowing cyclists to safely travel along Eisenhower Drive and reach the western parts of Junction City via 8th Street. To the east, a bicycle lane is recommended on Franklin Street, which would help move bicycle traffic north-south in the downtown area.

Recommended facilities which connect east-west on 5th and 8th Streets parallel the 6th Street commercial corridor and connect recommended facilities on Eisenhower Drive and Franklin Street. This connection to downtown also extends east on Flint Hills Boulevard with a recommended separated bicycle facility that runs towards Grandview Plaza. Ash Street is also an excellent opportunity for an east-west separated bicycle facility. Ash Street runs from the western edge of Junction City towards the commercial area near Walmart at the eastern edge. Ash Street has wide curb-to-curb width, providing a great opportunity for a separated bike facility. It is

recommended that cyclists divert to pedestrian facilities near the roundabout at Chestnut and I-70 Frontage (Appendix A).

Other recommended facilities connect newer developments to the west towards the downtown commercial centers. These facilities will become increasingly important as the city continues to develop to the west. Spring Valley Road runs north-south on the western edge of Junction City and could connect to Rucker Road to the north with important east-west connections such as 8th Street which runs through the center of the city, Ash Street towards the south, and Goldenbelt Boulevard which runs along 18 highway from Spring Valley Road to Madison Street.

Figure 4-2 | Recommended Bicycle Facility Application



4.3 BICYCLE FACILITY PHASING STRATEGY

Figure 4-3 shows the phasing strategy for the recommended bicycle facilities in order to address different needs of the community. Where limited bicycle facilities exist, historic residential areas would be best served initially by share the road facilities and areas towards the outer perimeter of the city could be best served by future bicycle facility development. The priority

recommendations for bicycle facilities are in the core of Junction City and phase outwards. Additionally, the lower cost share the road facilities would be deployed early on to provide a foundation for more separated facilities in the future. By developing a bicycle network that is implemented from the core of Junction City outward, more users will benefit early on, providing valuable feedback that will assist in future bicycle network planning.

First Phase Routes:

- 14th Street - Share the Road
- 14th Street - Bicycle Lane
- 11th Street - Share the Road
- 5th Street - Share the Road
- Ash Street - Bicycle Lane
- Garfield Street – Share the Road
- N Webster Street - Share the Road
- Madison Street - Share the Road
- Franklin Street - Share the Road

Second Phase Routes:

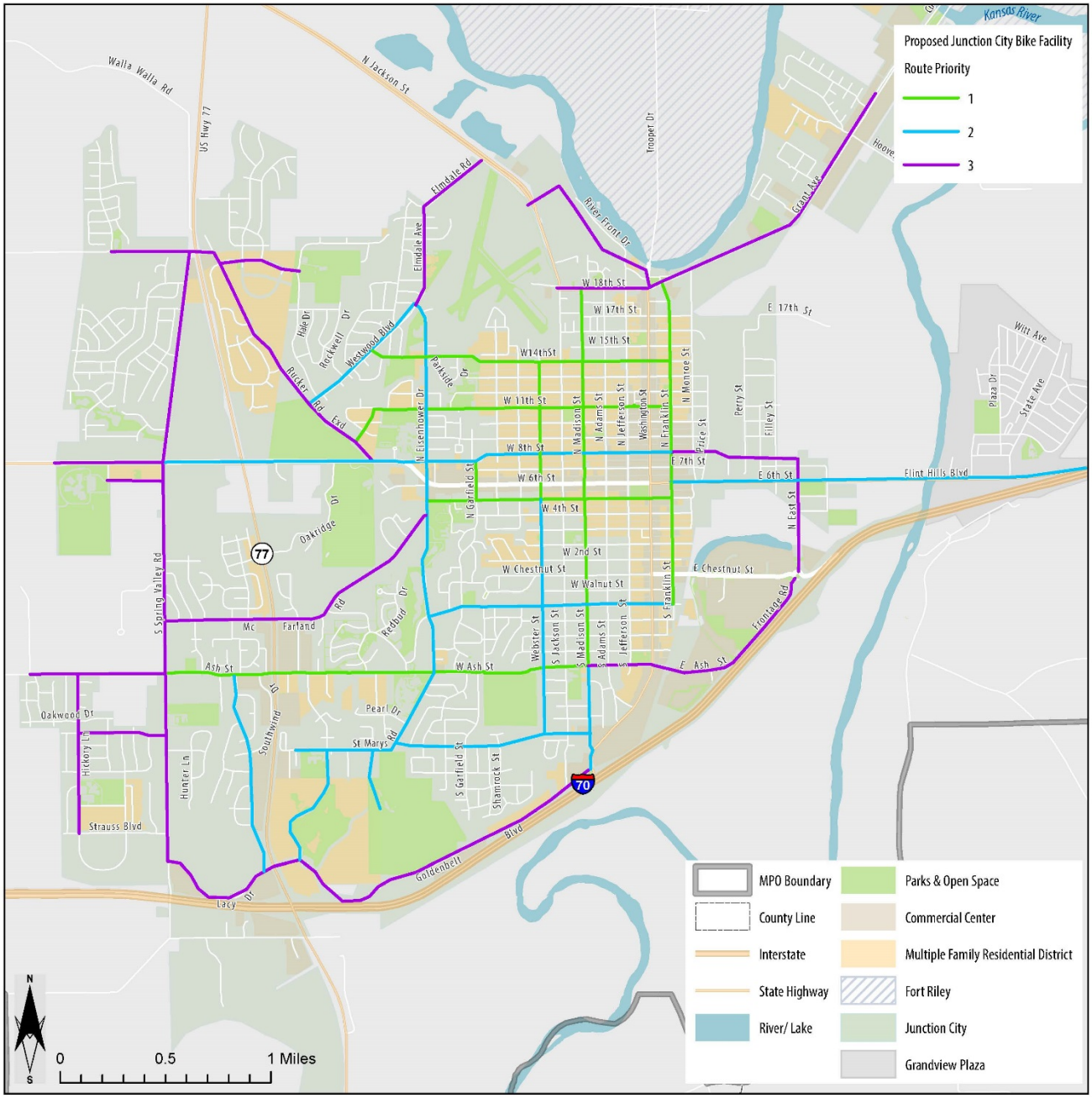
- Westwood Boulevard – Share the Road
- 8th Street – Bicycle Lane
- 8th Street – Share the Road (Appendix C)
- 8th Street – Multi-use Path
- 6th Street/ Flint Hills Boulevard – Bicycle Lane
- Spruce Street – Share the Road
- Skyline Drive – Share the Road
- N Eisenhower Drive – Bicycle Lane
- S Eisenhower Drive – Multi-use Path
- Webster Street – Bicycle Lane
- S Webster Street – Share the Road
- S Madison Street – Bicycle Lane

Third Phase Routes:

- 18th Street – Bicycle Lane
- Grant Avenue – Multi-use Path
- Rucker Road Extension – Share the Road
- E 8th Street – Share the Road
- McFarland Road – Share the Road E Ash Street –Share the Road
- Lacy Drive/ Goldenbelt Boulevard – Share the Road
- Spring Valley Road – Bicycle Lane
- N East Street – Share the Road
- 8th Street & Eisenhower – Multi-use Path (Appendix C)

A long-term strategy is suggested for the proposed multi-use path at Eisenhower Drive and 8th Street (Appendix C). Due to right-of-way constraints, the development of a continuous multi-use path through the intersection will require additional right-of-way to be acquired. An interim short term solution is a share the road facility that connects the second phase proposed multi-use path on 8th Street and Eisenhower Drive. This could later be developed into a multi-use path in the third phase, allowing optimal passage through the 8th Street and Eisenhower Drive intersection.

Figure 4-3 | Bicycle Facility Phasing Strategy



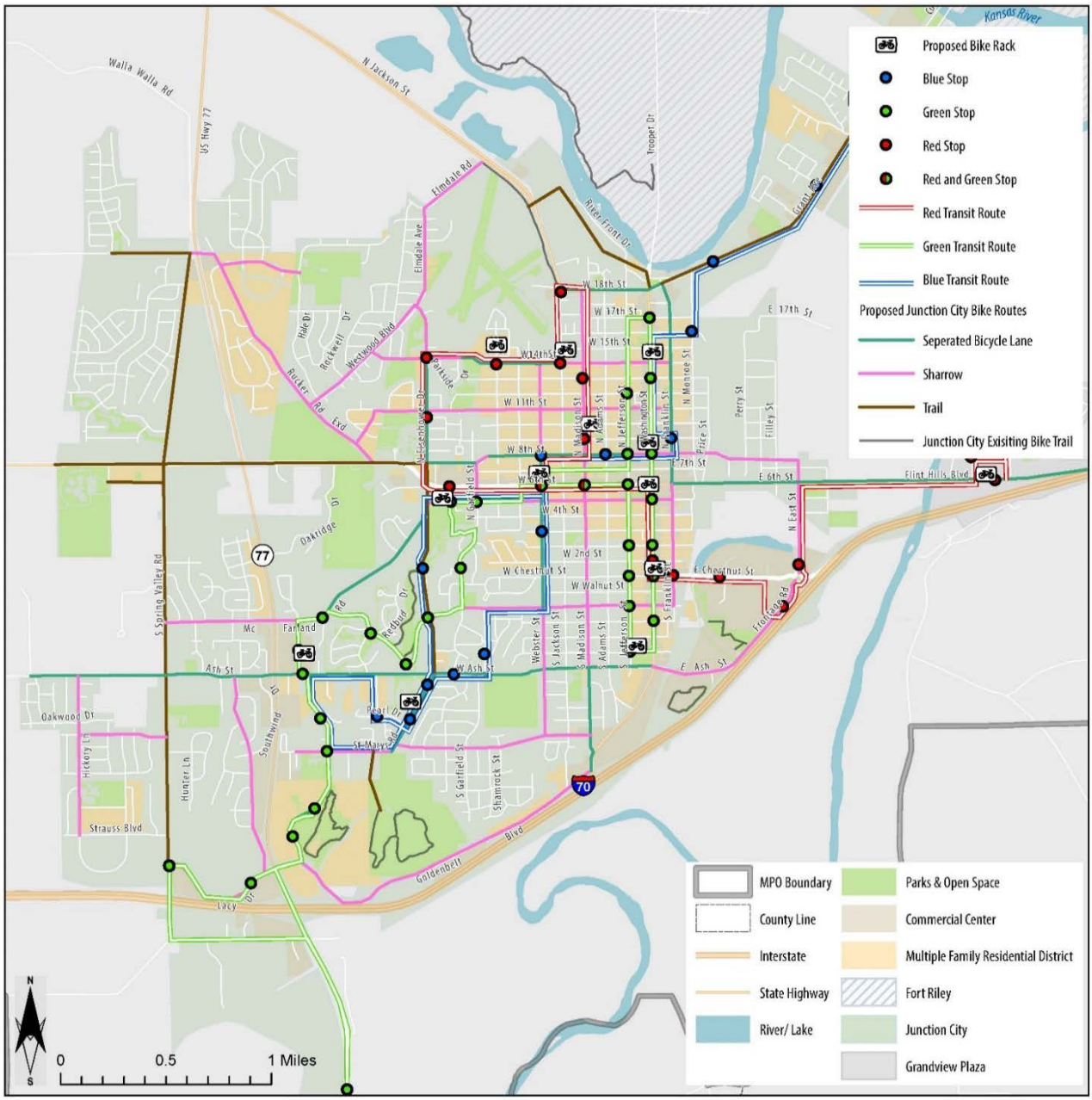
4.4 MULTIMODAL CONNECTIVITY

To promote multimodal trip planning, bicycle facilities are recommended to connect with existing transit routes. Figure 4-4 shows the relationship between proposed bicycle facilities and transit stops. To further promote multimodal activity, several bus stop locations were identified for bicycle racks, which would enable users to ride their bikes to the various transit stops. This

encourages greater travel distance without the reliance of a personal vehicle. Additional bicycle racks near stop locations allow transit users to access the transit stops by bike. Rack locations shown in Figure 4-4 are recommended in areas with anticipated bicycle facilities and transit stops along high use corridors. In addition, rack locations are proposed in areas with significant right-of-way space, city owned land, or commercial properties.

A total of fourteen bike racks are proposed throughout Junction City, which promote multimodal use of the bicycle facilities and entire transit system.

Figure 4-4 | Recommended Multimodal Connectivity



5.0 CONCLUSION

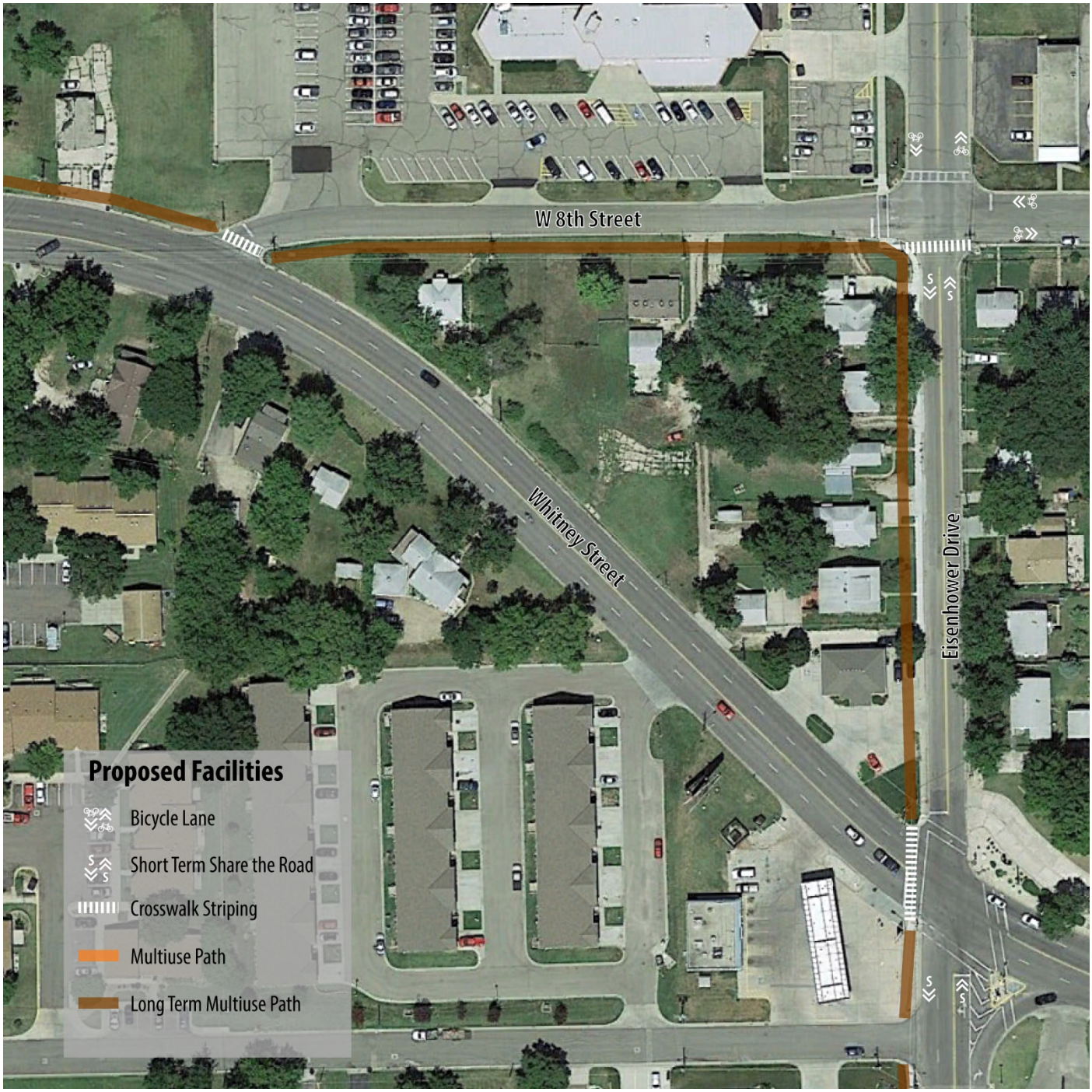
Although Junction City currently has a limited bicycle network, recent population growth and subdivision development throughout the city has created an opportunity to incorporate bicycle facilities. While the development of a bicycle network in any city will be met with obstacles, both physical and financial, the opportunity to develop a cohesive network that understands the existing conditions of the roads, integrates with transit routes, and connects population centers is vital to the sustainability of an area.

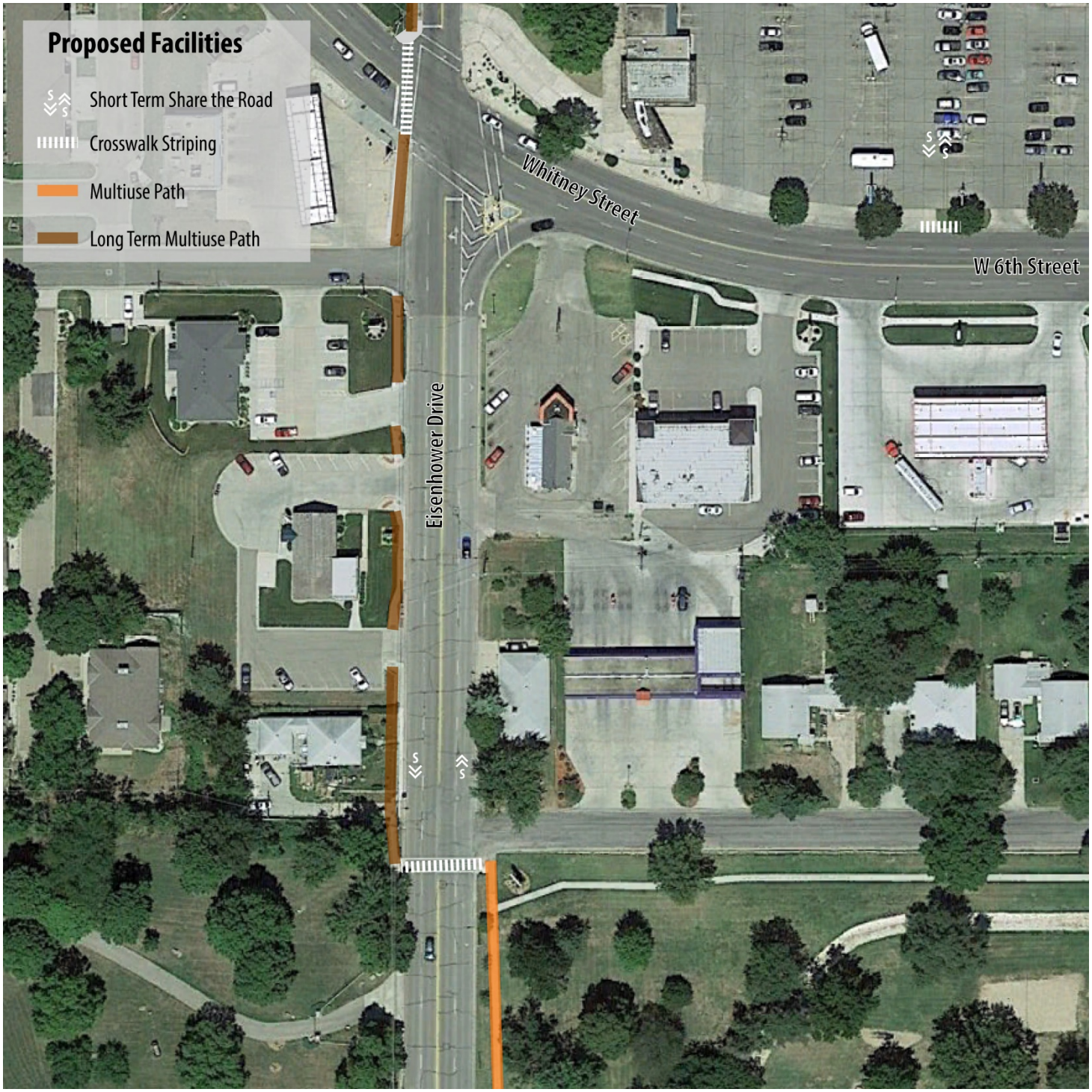
Based on analysis of the existing transportation system, the *Junction City Bicycle Master Plan* recommends a three-phased approach for incorporating shared bicycle lanes, separated bicycle lanes, and multi-use paths within the city. The phased approach allows for adoption of the routes over time. In addition, recommendations include fourteen bicycle racks to be placed at strategic bus stop locations throughout Junction City. All of the recommendations work together to facilitate a cohesive multimodal network for bicyclists, transit riders, and pedestrians, that connect residents to community destinations. Ultimately, developing a bicycle network is about creating a safe environment for all users and encourages a multimodal transportation system. The recommended multimodal network for Junction City aims to minimize the cost and maximize the system's connectivity both locally and regionally.

APPENDIX A – CHESTNUT ROAD & I-70 FRONTAGE – BICYCLE FACILITY DESIGN

APPENDIX B – MADISON ST & JACKSON ST – BICYCLE FACILITY DESIGN

APPENDIX C – EISENHOWER DRIVE & 8TH STREET – BICYCLE FACILITY DESIGN





(End of Report)