Bakersfield

# LOW STRESS BIKE NETWORK PLAN

**PROPOSAL** TO CREATE A LOW-STRESS BIKEWAY NETWORK IN THE VICINITY OF THE BAKERSFIELD HIGH-SPEED RAIL STATION

CALIFORNIA BICYCLE COALITION

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# EXECUTIVE SUMMARY

The arrival of high-speed rail provides a powerful economic development opportunity for Bakersfield. The neighborhoods within a few miles of the future High-Speed Rail (HSR) station can benefit from increased business activity; more jobs, including resilient jobs in small businesses; greater investment in public amenities; and healthier and safer streets. This outcome is not guaranteed, however. Measures that support biking and walking to and from the station and in the vicinity of the station are integral to success in meeting these goals.

Supported by a Sustainable Transportation Planning grant, the project team has developed recommendations to maximize the use of bikes, walking, and other active or low-impact mobility modes to most effectively support the health and economy of Bakersfield and other cities in the Central Valley. These recommendations address what is necessary to create safe and comfortable, "low-stress" access between the Bakersfield High-Speed Rail station and key destinations within three miles from the station.

The recommendations prioritize resident access to the existing and future transit hubs with primary goals of equity, safety, and sustainability. The proposal highlights best practices in accommodating travelers who use bikes and provides recommendations for implementing an attractive, safe, and complete low-stress bicycling network in Central Bakersfield.

This proposal includes recommendations for the safety improvements that will most effectively provide a network of routes that most Bakersfield residents would consider safe enough to bike on. If implemented fully, the recommendations will create transformative opportunities for a wide range of Bakersfield residents, including seniors and children, as well as the potential bicyclist who is 'interested in biking but concerned' about safety.

## SUMMARY OF IMPLEMENTATION OBJECTIVES

1. Build out Kern Active Transportation Plan (ATP) projects deemed low-stress first
2. Ensure all intersections and crossings are also low-stress when building a bike network

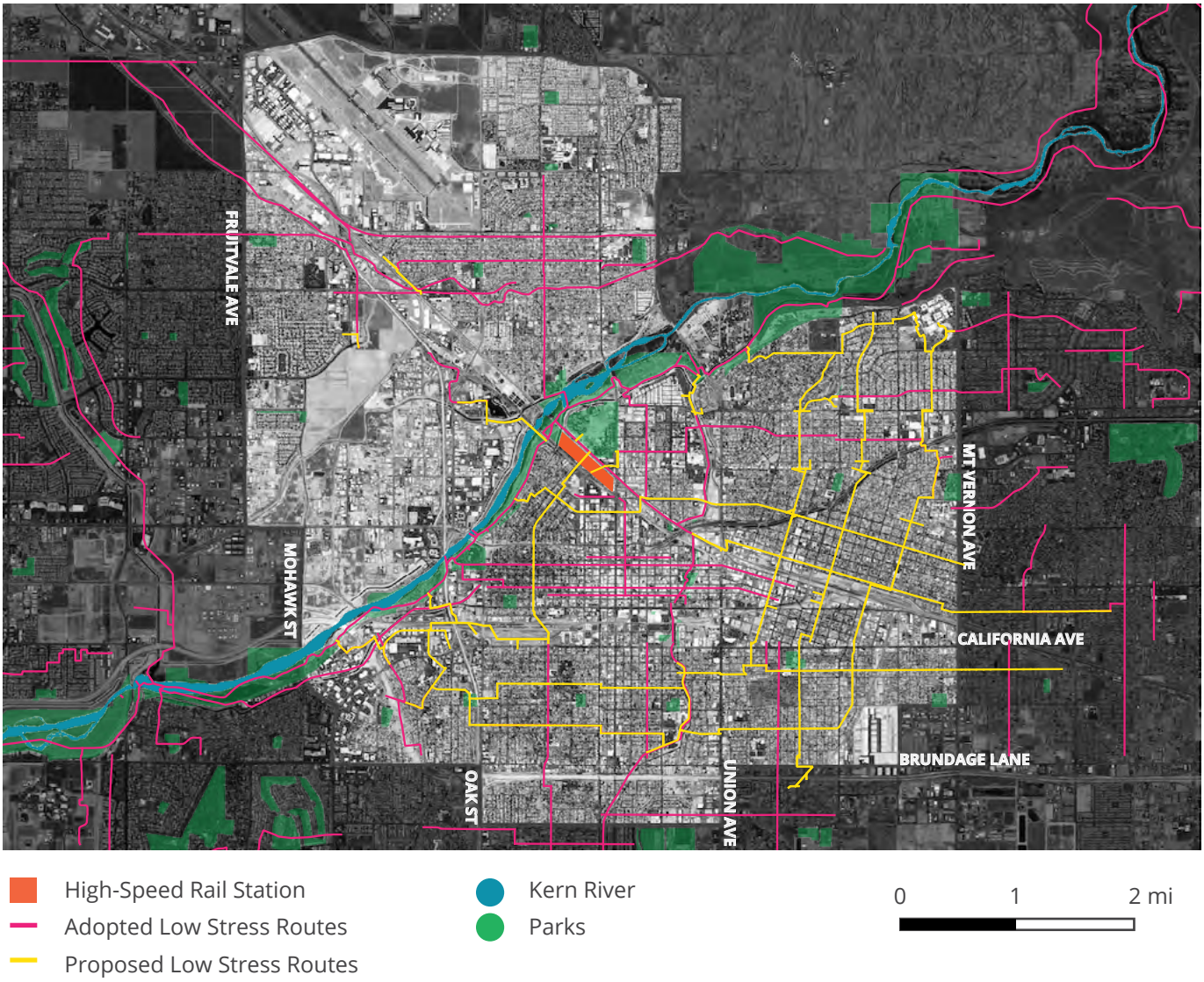



***Figure 1.*** *Recommended Bakersfield low-stress Network*

3. Build out network quickly using quick-build strategies and implement best practices as funding becomes available
4. Build network out in order of positive impact on the connectivity of the low-stress network
5. Update Bakersfield General Plan street design guidelines and standards to meet low-stress qualifications to National Association of City Transportation Officials (NACTO) standards

## RECOMMENDED PROJECTS

1. Kern Street Bike Boulevard
2. 30th/Pacific Street Bike Boulevard
3. Gage Street Bike Boulevard
4. Potomac Avenue Bike Boulevard
5. Virginia Street Bike Boulevard
6. Kentucky Street Bikeway Extension
7. Bank Street Bike Boulevard Extension
8. Pine Street Bike Boulevard Westchester Extension
9. California Avenue/Highway 99 Alternative Bikeway Connections
10. Future High-Speed Rail Station Local Bike Connections
11. Kern Island Canal Shared Use Path Extension
12. Acacia Avenue Bike Boulevard
13. Hageman Flyover Bikeway
14. Roberts Lane Bikeway

## METHODOLOGY

To create this proposal, the project team used a novel and sophisticated methodology to analyze the effect of specific improvements. The method, called the Bicycle Network Analysis, relies on the truism that a connection between two points is only as strong as the weakest link.

## EXISTING CONDITIONS

A typical bike trip in Bakersfield can involve three miles of low-stress residential streets combined with a quarter-mile of frightening riding on narrow roads with fast traffic. While Bakersfield has many miles of low-stress streets and bike paths, these routes primarily exist along the Kern River, which has a northeast to southwest trajectory and does not serve residents in the southeast of Bakersfield and the project area. The Kern River Parkway also lacks safe connections from existing low-stress routes, and to destinations people need to reach, rendering it useful to a few bike riders in higher socioeconomic communities for transportation. Outside of the Kern River Parkway, there are no low-stress facilities that cross the Kern River, itself a barrier.

Weak links in a street network are devastating for safe mobility. The impact of incomplete networks is most significant for disadvantaged populations, who are less likely to own cars due to income, age, or disability. By fixing specific weak links in Bakersfield's low-stress network, planners can create connections that are intuitive and safe for everyone. The study underlying this report reviews several potential improvements to specific weak links in the low-stress network. The analysis used Geographic Information Systems (GIS) to determine precisely which destinations will be newly accessible thanks to each improvement. The data illustrate the "network effect," which shows how fixing an intersection in one part of town can make a park or a shopping center or a school in another part of the city vastly more accessible to people walking, biking, and taking transit.

## COMMUNITY OUTREACH

In addition to the GIS analysis, this proposal relied on qualitative analysis of Bakersfield's street network, as explained in hundreds of comments and conversations in an extensive outreach process. Because of the COVID-19 pandemic and shelter-in-place orders, the project team pivoted from face-to-face engagement and moved to primarily digital or online methods for outreach and engagement.

The outreach plan utilized equitable and innovative strategies to engage residents who live, work, and travel within the project area, focusing on residents that are typically underserved and left out of community planning processes. Outreach strategies included coalition-building; paid survey administration; online survey administration with Community Based Organizations (CBOs), public agencies, and neighborhood groups; and traditional media outreach, including press releases about the project. The project team worked to overcome engagement barriers, including language and culture, disability access, connectivity to the internet or digital tools, socioeconomic status, and barriers to in-person outreach resulting from the COVID-19 pandemic.

Residents shared their travel routines, perceptions of biking in Bakersfield, and what they needed to make biking a pleasant, safe, and frequent mode of travel. Residents also dropped pins in their top three barriers to biking in the project area on a digital map.

# INTRODUCTION

## SITE AREA

The project area is the bicycle travel shed (bike shed) around the future High-Speed Rail (HSR) station in Bakersfield, California. The project team defines the bike shed as a three-mile radius around the station, or the distance most riders can comfortably ride. The area was then adjusted based on the roadway network, cutting out or extending the three-mile radius to account for major roads and excluding locations like the oil fields to which most riders would not travel. The project area includes city land, unincorporated county neighborhoods, railroad property, and canal property.

## PROJECT TEAM

The Project Team in this report refers to the organizations described below. Funding for this project comes from the CalTrans Sustainable Transportation Planning Grant.

**California Bicycle Coalition** (CalBike) is a statewide nonprofit organization that advocates equitable, inclusive, and prosperous communities where bicycling enables all Californians to lead healthy and joyful lives. CalBike planners work directly with Kern COG to ensure that the project team delivers a plan that meets the needs of all stakeholders. CalBike planners also are part of the GIS analysis, development of educational materials and reports, outreach, and ground-truthing efforts.

**Bike Bakersfield** is a Bakersfield-based nonprofit and bike kitchen that serves the Kern County area. Bike Bakersfield helped develop the community outreach plan and educational materials and conducted outreach efforts in the Bakersfield project area. Bike Bakersfield worked with CalBike planners to develop recommendations and to ground-truth suggested routes.

## EXISTING CONDITIONS

Even though walking rates in Bakersfield are lower than the state average and driving rates are above the state average, the city has a disproportionate number of collisions resulting in serious injuries or fatalities involving pedestrians and cyclists (Bakersfield BPSP, 2020). As reported in the Kern ATP, 60% of pedestrian or cyclist-involved collisions in

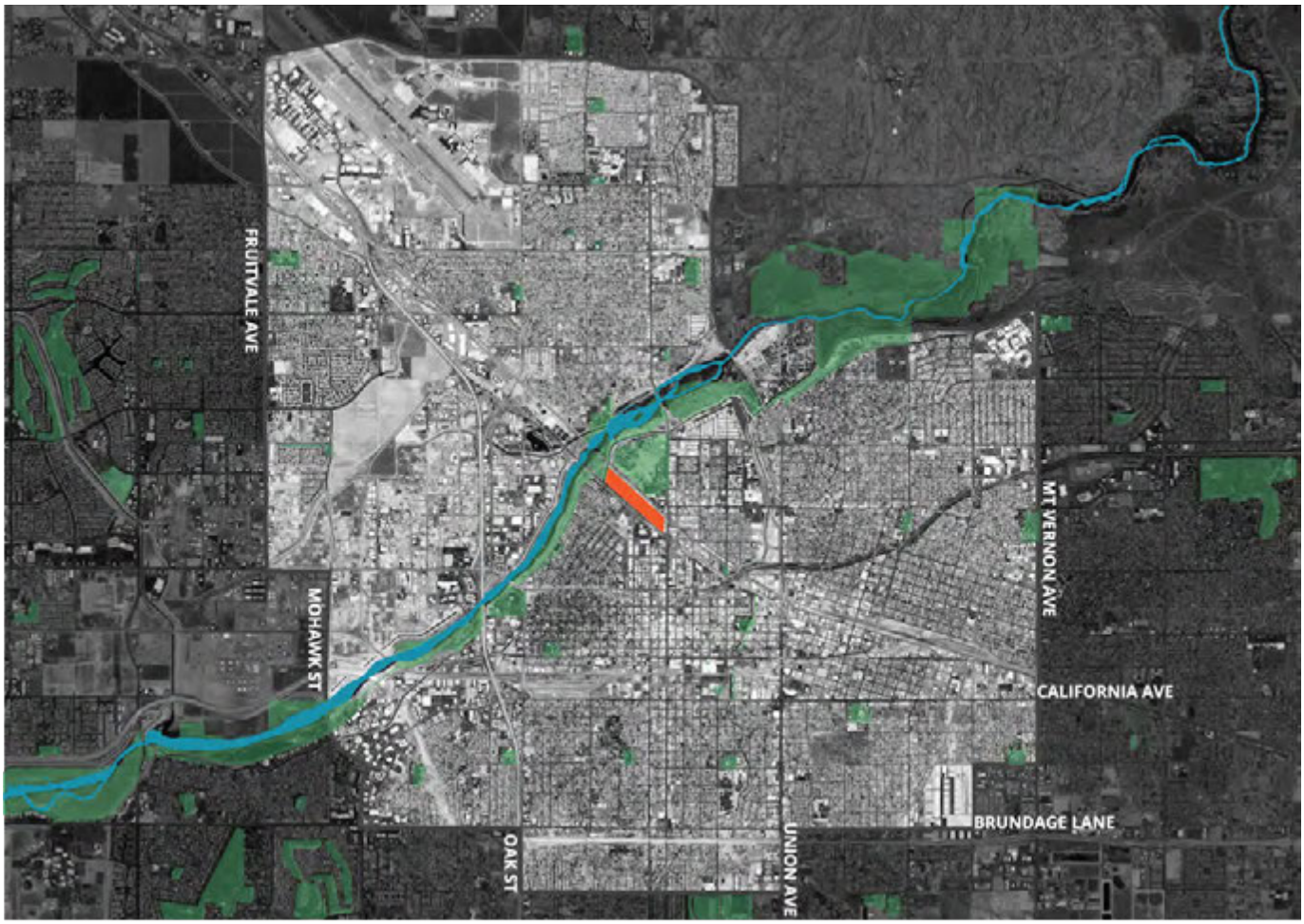



***Figure 2.*** *Site Area and Future High-Speed Rail Station*

Bakersfield occurred in the central area around the future HSR station between 2009 and 2013.

The project team analyzed existing conditions in Bakersfield. During the two years from 2014-2016, according to the Transportation Injury Mapping System (TIMS), 233 people on a bicycle were injured or killed, and 346 pedestrians were injured or killed, with a total of 45 people killed in Bakersfield. During the two years from 2017-2019, according to TIMS, 231 people on a bicycle were injured or killed, 436 pedestrians were injured or killed, and a total of 53 people died on Bakersfield streets.

## DEMOGRAPHICS AND MODE SHARE

68% of Bakersfield residents identify as White, with 33% of those identifying as "White alone, not Hispanic or Latino," and 49.5% identifying as Hispanic or Latino. Another 7% of residents identify as Black, and 7% identify as Asian. The median income is $62,340, and 18.5% of residents live in poverty. In Bakersfield, 80% of people older than 25 have a high school degree or higher and 22% have a bachelor's degree or higher (ACS, 2019).

People living below the poverty line in Bakersfield were more likely to take public transportation or walk but still mostly drove to work. Among people living below the poverty line, 3% took public transit, and 3% walked.

Current street designs and land uses in

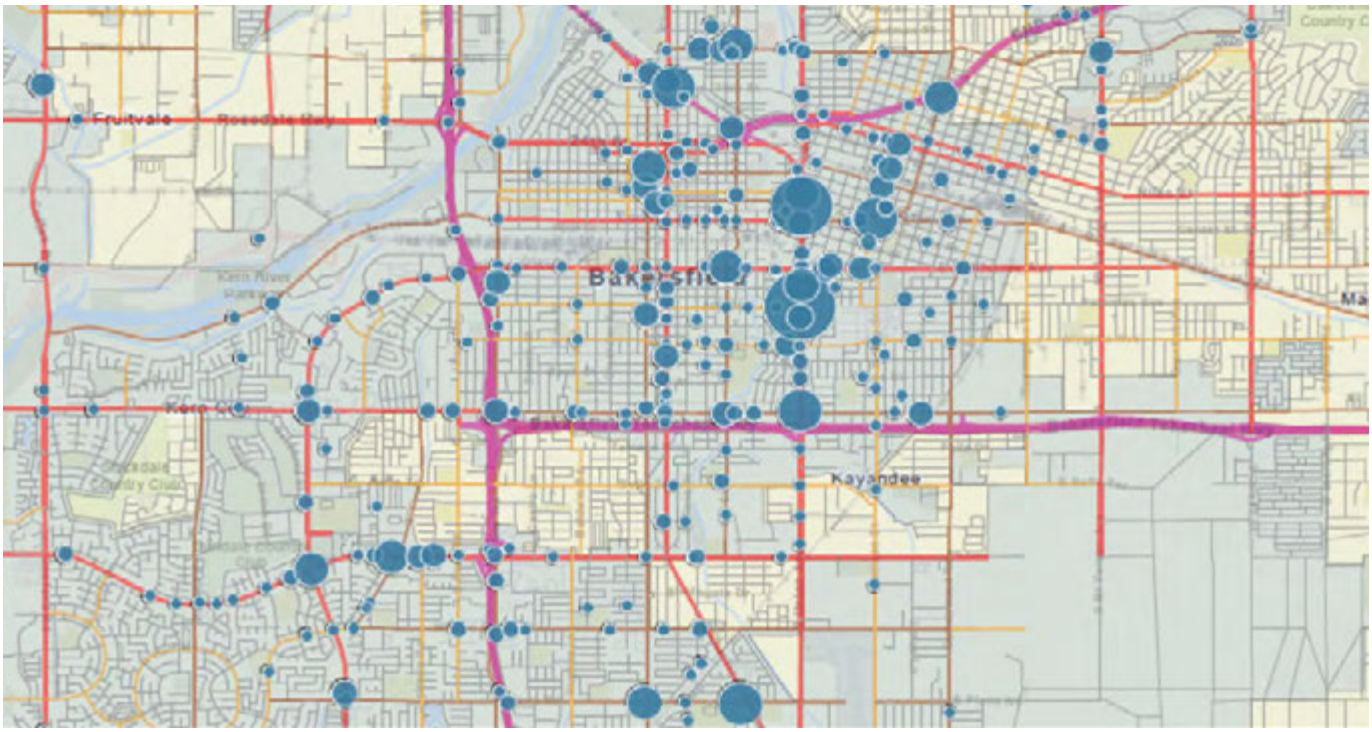



***Figure 3.*** *Pedestrian and cyclist-involved collisions in the project area between 2017 and 2019 (Source: TIMS)*

Bakersfield prioritize the movement and storage of cars. Conditions on the roadways create a hostile environment for cyclists and pedestrians. As a result, most trips are by private automobile rather than active travel modes of transportation. In 2018, 92.6% of people drove to work, while only 1% took public transit, 0.8% walked, and 2.1% used other means (ACS, 2018).

## GOALS

This project will facilitate a safe, equitable, and sustainable low-stress bike network in Central Bakersfield. When Bakersfield completes its low-stress bikeway network, as outlined in this proposal, residents and commuters will be able to access any point in the study area using low-stress bike routes.

### Equity

Building a comprehensive low-stress bike network in Bakersfield will promote equity. High-quality bike infrastructure lowers accessibility barriers for those who may not otherwise feel safe biking, including children and seniors. It increases access to many cost-effective, healthy, and environmentally sustainable forms of transportation, including cycling and mass transit. It will also connect residents, the primary users of the network, to housing, work, recreation, and transit centers. It has the potential to boost the local economy by attracting tourists. Once implemented, this project will safely connect disadvantaged communities to downtown Bakersfield through a low-stress network.

### Safety

The recommended projects in this report will promote safety for active transportation users throughout the Bakersfield Metropolitan area. Current conditions and data show a serious safety issue with cycling and walking, particularly in the project area. This project aims to enhance public safety for cyclists and pedestrians and reduce the high number of pedestrian and bicyclist-involved collisions in Bakersfield.

Users from ages 8-80 will feel comfortable and safe riding anywhere within the project area once the low-stress streets designs detailed in this proposal are implemented. These designs include protected crossings and intersections and diverting cyclist traffic away from collector streets and vehicular traffic when possible. As evidenced in cities such as Seville, low-stress bicycle networks improve safety and dramatically increase bicycle ridership.

**Sustainability**
Improving the bicycle network and connecting it to existing and adopted transit will help build a sustainable multimodal transportation system. It will also create more livable neighborhoods for Bakersfield residents. By increasing active transportation trips and reducing automobile trips, the project will also reduce air pollution caused by single-occupancy traffic while also alleviating vehicular traffic congestion. A well-designed bicycle network can also create a sense of place and spur new development, promoting a denser, more vibrant urban core that is not reliant on surface parking and vehicular traffic with a smaller carbon footprint.

## PUBLIC HEALTH

According to the 2015-2017 Community Health Assessment (CHA) in Kern County, the county failed to meet Healthy People 2020 targets in 2013 and was ranked the 56th worst county for heart disease deaths out of 58 counties in California. Kern County has a much higher mortality rate for diabetes and heart disease than the rest of the state. Also, the percentage of obese residents in Kern is higher than the state average, and the rate of individuals at a healthy weight is lower in Kern than the rest of the state.

Thus, having a Central Valley zip code means a resident is more likely to have poor health outcomes and high mortality than the rest of the state. Many individual, societal, and environmental issues contribute to these health issues. Getting more people within a community using bicycles as a form of transportation will address several of the root causes of the problem, including lack of exercise and poor air quality.

Improved public health has provided the impetus for transportation changes across California. Quality-of-life concerns can be addressed through robust investment in low-stress active transportation infrastructure. A public health perspective helps understand and measure the impact of new infrastructure on residents.

According to the Safe Routes Partnership, "Active transportation investments have "the potential to transform individual health, community health, and environmental conditions all at the same time. In other words, in a time of tight budgets, limited resources, declining workforce numbers, and growing health problems creating opportunities for safe bicycling and walking can literally provide public health practitioners with one of the biggest bangs for their already-stretched buck."

Disinvestment in active transportation infrastructure and public reduces neighborhood cohesion and negatively impacts health outcomes and mortality for residents throughout the region. The Central Valley is a region where policymakers are quick to invest public dollars into roads and freeways to the detriment of the quality of life in the area. The prioritization of traditional forms of transportation also works against stated goals and policies of local, state, and federal governments, including:

- Greenhouse Gas reductions (GHG)
- Vehicle Miles Traveled reductions (VMT)
- Air quality improvements and mobile-source emissions reductions
- Healthy People 2030 Framework
- Reducing traffic deaths related to biking and walking

Investments in an active transportation network that is safe, usable, multimodal, and well-connected will enable more individuals of diverse abilities and backgrounds to try different modes of transportation. This investment will create a ripple effect in the broader community and the environment. Even a moderate mode shift to more bike riding will provide a measurable impact on individual, societal, and environmental problems. Increasing biking is a single solution to an array of issues Central Valley residents face.

The transportation of the region not only impacts the health outcomes for residents but their economic wellbeing as well. According to TRIP Net's Central Valley Roads Report, "driving on Central Valley roads that are deteriorated, congested and that lack some desirable safety features costs the average driver $1,765

annually in the form of additional vehicle operating costs (VOC) as a result of driving on rough roads, the cost of lost time and wasted fuel due to congestion, and the financial cost of traffic crashes."

The first step is policy decisions to invest in a robust, low-stress active transportation network. Active transportation gives the biggest bang for each public dollar spent on transportation modernization because it positively impacts individual health outcomes and the economic health outcomes of the community while reducing the cost of maintenance. Bike facilities require less maintenance than traditional roadways, bikeway routes along canals, railroads, and other existing infrastructure can be considered infill development that reduces construction costs, dust, and emissions. Investments in active transportation infrastructure alongside facilities other than traditional roadways can also help preserve fragile ecosystems.

Single-occupancy vehicle traffic is the primary source of mobile emissions in the Central Valley. The best way to remove single-occupancy vehicular traffic is to create active transportation networks that residents want to use. Encouraging residents to opt out of private automobiles for transportation requires engineering a system that optimizes active transportation while determining and prioritizing residents' needs. Engaging residents to eliminate single-occupancy emissions can impact air quality and health outcomes related to pollution. According to Safe Routes to School, "improved air quality—resulting from an increase in cycling modal share—reduced disability-adjusted life years for cardiopulmonary disease caused by poor air quality." Safe Routes to School also found that "the health benefits of shifting from car to bicycle was associated with greater benefits from increased physical activity (3-14 months of life gained) compared with potential effects of inhaled air pollution (0.8-40 days of life lost)."

Regionally-connected active transportation networks hold the potential for transformative health benefits for residents anywhere in the Central Valley. Compared to a disconnected bike lane in one neighborhood, full active transportation networks will encourage more residents of diverse abilities to begin bicycling. Residents also need to be engaged in the planning process. Community-based planning of low-stress networks will create pathways for communicating important information, such as local air quality conditions and construction updates, and greater utilization of the infrastructure because residents were a part of the process.

If the ride to a destination (work, parks, grocery stores, schools) is too long or not connected through low-stress facilities, residents will opt to drive and miss out on exercise. Therefore, a connected and convenient network is crucial. It is essential to design low-stress bike networks that avoid vehicle traffic when possible and make sure that all crossings of busy streets are safe and comfortable. A well-designed bike network will encourage a mode shift to reduce mobile-emissions pollution sources, including traffic congestion, idling, and parking lot usage. This mode shift will improve the air quality of Central Valley communities.

To tap into cycling's full public health potential, bike networks must be adjacent or connected to destinations like grocery stores, parks, and other community resources, without gaps in the network. These bike networks are among the most effective ways to introduce new riders to safe cycling, foster continuing interest, and build a sense of ownership for users of community spaces while enhancing access to essential services and shopping destinations.

## VISION: THE LOW-STRESS NETWORK

Low-stress bicycle networks have proven to be very useful in cities that have implemented them. Seville, Spain, is an example of a successful rapid implementation of a low-stress bicycle network. Rather than building disconnected segments over time, Seville added 75 miles of low-stress bicycle infrastructure in around four years, creating a well-connected network. The project saw drastic results. Daily bike trips rose from 13,000 to 72,000 in just three years, and cycling became twice as safe (Calvo & Marques, 2020). We can take several key lessons from the Seville example.

While many factors determine stress level, significant factors include lane count, road width, traffic speeds, and the presence of a parking lane. The type of bicycle facility also impacts the user's stress level. In general, shared use paths, bike boulevards on low-speed, low-volume streets, and separated bike lanes tend to be lower stress, while painted bike lanes on high-volume, high-speed roads tend to be higher stress.

***Figure 4.*** *Protected bicycle lanes in Seville, Spain. Photo by Adriana CC BY*

For a network to be low-stress, not only does it need to have low-stress routes, but these routes have to connect so that riders can get from one destination to another without using any high-stress connections. The stress level of a route is determined by its most stressful component. For example, if a route includes mostly local bike boulevards but requires crossing a high-stress intersection, the route is classified as high stress. For this reason, it is common to see "islands of low-stress connectivity" that are disconnected by barriers such as freeways, railroads, canals, and high-speed arterials that lack safe crossings.

A complete, low-stress network is key to ensuring access to goods and services across the city. Therefore, the network as a whole is prioritized over individual segments. To determine network stress levels, the project team evaluated route segments and their intersections through the Bicycle Network Analysis (BNA) tool. BNA is an open-source tool designed to display bicycle stress levels at the road segment, intersection, census block, and neighborhood levels.

## METHODOLOGY

People for Bikes, a non-profit organization, created the Bicycle Network Analysis (BNA) as a public data analysis tool to measure connectivity between places on low-stress bicycle networks. The BNA is derived from four factors: data collection, traffic stress analysis, destination access analysis, and score aggregation. Each of these factors has a unique methodology that, when joined together, produce numerical scores representing the levels of stress for connections between places within a specific boundary.

### Data Collection

By utilizing OpenStreetMap and the United States 2010 Census, the BNA gathers information on geographic units of analysis and population and employment data, all of which provide a baseline of data for the rest of the analysis. The BNA is meant for public use. Therefore, it uses publicly available data to ensure the accessibility of community stakeholders. These data sources are consistent with their methodology, so the BNA can easily be updated as more data is gathered.

### Traffic Stress Analysis

Most bicycle transportation in cities happens on or along existing roads. Each road has a set of characteristics such as the number of lanes, speed limit, frequency of intersections, and type of bicycle facility (buffered lane, buffered lane with parking, sharrow, etc.). Using these street characteristics, BNA evaluates these roads and determines if cycling is considered a low-stress or high-stress experience.

### Destination Access Analysis

Access to destinations means determining if those living in a particular area can access opportunities, core services, recreation, retail, transit, and other people along a low-stress route. A score of 0-100 is calculated based on the number of those destinations available.

### Score Aggregation

Scores are aggregated on both the individual census block (and census block equivalent) and at the overall city level. For this study, the analysis focuses mostly on census block levels of connectivity.

## KEY TERMS

| Term | Definition |
|---|---|
| Adopted | This document refers to projects and infrastructure adopted through the Kern Active Transportation Plan in 2018 (ATP) that qualify as low-stress within the project area, as well as other relevant (funded and unfunded) outside of the ATP that are also deemed low-stress as "adopted." Information on these projects is in the "Background and Planning Context" section. |
| Bike Boulevards | Bike boulevards follow NACTO design guidance for routes on residential streets that prioritize the safety of active transportation users, particularly at crossings and intersections. Bike boulevard designs are often paired with traffic calming and urban greening. Routes with sharrows can be low-stress if they are implemented in combination with traffic calming treatments. See Design Guidelines for more on bike boulevard and protected bike lane design. |
| Bike Lanes | A bike lane is a Class II Bikeway that provides a striped, signed, and stenciled lane for one-way travel on a street or highway. Bike lanes typically flow in the same direction as traffic, are bordered by a solid white line (6-8inches wide), and include painted words/symbols at intersections. They require a minimum width of 4 feet of rideable surface with a 5-6 feet minimum lane with paint. Bike lane design should include intersection treatments that easily guide turning motorists and cyclists traveling straight to avoid conflicts. |
| Bike Paths | A bike path is a Class I Bikeway for travel on a paved right-of-way completely separated from the street where motor vehicles travel. An example of this is the Kern River Parkway. To fully meet low-stress criteria, bike paths must connect to other low-stress facilities in the network and address potential interactions with driveways, motorists, and pedestrians. |
| Bikeway Classification | Bikeway classifications used in this report are an application of low-stress methodology, best practices guidelines, and the City of Oakland's Bikeway Types to the existing classifications from the Kern Bicycle Master Plan. |
| Buffered Bike Lane | A buffered bike lane requires at least a 3-foot buffer and minimum 4-foot rideable space, the same as a conventional bike lane. Markings include solid painted lines on the edges of the buffer and bike lane. |
| Connectivity | A quality of a low-stress path or road is its connectivity to other low-stress routes. This plan uses the BNA Score to quantify connectivity. See definition for low-stress. |
| Cycle Tracks | Cycle tracks have physical barriers (bollards, medians, raised curbs, etc.) and vibrant paint to prevent encroachment by motorized traffic. They can allow for one- or two-way cycling traffic. |
| Destination | Destinations are high-value locations of services that residents regularly use, including parks, medical centers, grocery stores, job centers, and schools. |
| Existing | Infrastructure currently in place that is deemed low-stress by the Bike Network Analysis tool is called "existing" in this plan. Not all current infrastructure in the project area met the criteria for low-stress. (insert map of all existing, with currently low-stress) |
| Intersection | The mixing zone or junction of two or more paths that serve any form of transportation is an intersection. See Design Guidelines for more on low-stress intersection design. |

| | |
|---|---|
| Low-Stress | A bike route that provides connections between destinations efficiently and comfortably is classified as low-stress. The Mineta Transportation Institute (MTI) and People for Bikes define low-stress bikeways as "providing routes between people's origins and destinations that do not require cyclists to use links that exceed their tolerance for traffic stress, and that do not involve an undue level of detour." |
| Minor Crossing | Unsignalized, unprotected, or unofficial intersections between the active transportation network and motor vehicle traffic are minor crossings. Minor crossings include unmarked crosswalks and intersections. |
| Quick-Build | Quick-build is a method for building bike and pedestrian safety projects quickly and inexpensively. Quick-build projects use low-cost materials such as paint and plastic bollards. These projects yield immediate results, increase public support, and safeguard against political changes that could sideline long-term plans. CalBike's Quick-Build Guide lists low-cost, high impact treatments to improve the connectivity of low-stress routes quickly and flexibly. |
| Recommended | The recommended projects are those that the project team has determined are critical to complete the low-stress network in the Bakersfield project area. These recommended projects include both adopted projects and projects that expand on the adopted projects' low-stress designs. |
| Shared Use Path | Facilities that give pedestrians and cyclists the exclusive right of way and are physically protected from motor vehicle traffic are shared use paths. FWHA's design guidance on shared use paths is used for the existing, adopted, and recommended routes in this report. See Design Guidelines for more on shared use path design. |
| Spot Improvement | A targeted improvement to an intersection or crossing that will create or enhance a pedestrian and cyclist facility in a single location is a spot improvement. |
| Traffic Calming | Traffic calming includes an array of methods to slow the speed of cars, and it is required to create a genuinely low-stress bike boulevard. Speed and traffic volume management using mini traffic circles, greening, speed bumps, traffic diversion, curb extensions, innovative parking placement are all traffic calming measures. |

## OBJECTIVES

The project team analyzed current transportation plans applicable to the study area and found overlapping objectives, and adopted projects that already include the development of a complete low-stress network (see Background and Planning Context). This project's vision and goals are to highlight the existing and adopted low-stress network, thus expanding on local agencies' work and further improving biking and walking conditions.

1. Build out Kern ATP Network Projects deemed low-stress first
2. Ensure all intersections and crossings are also low-stress when building a bike network
3. Build out network quickly using quick-build strategies and implement best practices as funding becomes available
4. Build network out in order of positive impact on the connectivity of the low-stress network
5. Update Bakersfield General Plan street design guidelines and standards to meet low-stress qualifications to NACTO standards

# BEST PRACTICES AND DESIGN GUIDELINES

Low-stress guidance in this report is from the National Association of City Transportation Officials' (NACTO) Urban Street Design Guide, Urban Bikeway Design Guide, and Don't Give Up At the Intersection. See the Implementation section for more information on design guidance and standards. The Federal Highway Administration's (FHWA) Guidance on Traffic Calming discusses the benefits and strategies for implementing traffic calming measures for low-stress facilities in neighborhoods.

## POLICY RECOMMENDATIONS

Cities that have implemented successful low-stress networks have used the following strategies when planning the network:

**Involve the Public**
Obtain public support for the project before building a complete bicycle network. Make sure to engage traditionally marginalized and underrepresented groups to get input on community needs. Continue to fully engage, not merely reach out to the community throughout the process, raise awareness for the project, and gather ongoing feedback on completed projects to inform future projects.

**Implement Quick Build Strategies**
Quick-builds of the entire network yield immediate results, build public support, and safeguard against political regime changes that could stall plans. CalBike's Quick-Build Guide 2020 recommends low-cost, high impact treatments to increase bike connectivity quickly and flexibly.

**Create Multi-Disciplinary Teams**
Ensure that designers work with operations, as operations staff will be the ones who will maintain the system. Involve multiple parties in the planning and implementation process, including designers, operations staff, community stakeholders, and elected officials. However, the City of Bakersfield should be the primary actor.

**Connect Key Destinations**
Start the network at the densest core and which already has the most existing bicycle infrastructure. Then connect it outward, taking care to include neighborhoods where the most disenfranchised communities live.

## DESIGN GUIDELINES

This report recommends three types of low-stress bikeways: bicycle boulevards, protected bike lanes, and shared use paths, as well as the adoption of low-stress intersections for all of these types. As these facility types may vary in quality, this report recommends that the City follow the best practices outlined by the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide. The Urban Bikeway Design Guide provides Federal Highway Authority (FHWA) approved design standards and was endorsed by Caltrans in the 2014 memorandum "Design Flexibility in Multimodal Design."

### Bicycle Boulevards

Bicycle boulevards have low automobile traffic volume and speeds, and they should be designed to prioritize bicycles over cars. Wayfinding measures such as pavement markings and route signage, traffic calming measures, crossing treatments, and green infrastructure are all methods to prioritize bike traffic. Wayfinding alone is not sufficient to create a low-stress bike boulevard, however. It must be used in conjunction with the other measures mentioned.

Street signs and pavement markings are essential to create safe bicycle boulevards, as they encourage cyclists to use designated routes and let motorists know that they should drive slowly. Street signs are most effective when they have consistent, recognizable branding that provides a visual identity to the bike boulevard. They should be placed roughly every 2-3 blocks throughout the route and at intersections to indicate how to remain on the route. Signs placed near route turns or junctions with other routes are decision signs, and they should include directional arrows, route or destination names, and distances. They may also include time estimates to destinations. Signs should be used in conjunction with regular pavement markings to let cyclists know where to position themselves and remind motorists that they share the road with cyclists. NACTO recommends that pavement markings be at least 112 inches by 40 inches to ensure that they are visible to all road users.


***Figure 5.*** *Intersection Treatments on a Bicycle Boulevard*

Traffic calming measures are essential for bicycle boulevards to help manage speed and volume. Posted speed limits should be 25 mph or below and should be combined with targeted enforcement and vertical and horizontal deflection. Vertical deflections are wide, slight pavement elevations, such as 3- to 4-inch speed humps, speed cushions, or raised crosswalks. Horizontal deflections narrow the roadway and include curb extensions or bulb-outs, chicanes, median islands, and traffic circles.

As collisions are most frequent at intersections, it is vital to create protected intersections where bicycle boulevards cross high-traffic roads. For minor intersections between low traffic streets, the use of stop signs should be limited on the bike boulevard and reoriented to the cross streets. Stop signs inhibit cyclists from efficiently traveling because they are inefficient for a cyclist to conserve energy and often create delays for cyclists to enter the intersection. Limiting the use of stop signs may attract more motorists, so this measure must be used in conjunction with traffic calming measures. There should be traffic control elements at every intersection, such as stop signs on cross streets, traffic circles, and pavement markings in the intersection.

When bicycle boulevards intersect with major streets, city planners need to take additional measures to make motorists aware of cyclists and shorten crossing distances for cyclists. Advanced warning signs, intersection crossing

markings, raised intersections, and warning beacons increase the visibility of cyclists. Curb extensions, bicycle forward stop bars, refuge islands, and bike boxes decrease crossing distances. At signalized intersections, separate bicycle signal heads can give cyclists a head start. The specific treatments used will vary based on the conditions of the intersection.

Finally, green infrastructure helps enhance bike boulevards. Green infrastructure elements, such as street trees, bioswales, and rain gardens, not only manage stormwater and create a more pleasant environment, but they can also be used in conjunction with traffic calming measures. They can be placed in medians, curb extensions, and traffic circles.

**Protected Bike Lanes**

Protected bike lanes are one-way bicycle paths at street level separated from traffic by a physical barrier, such as a parking lane, raised concrete curbs, bollards, or planters. The project team does not define bike lanes with painted buffers to be protected, as motorists can easily cross the buffer. Protected bike lanes reduce the risk of collisions with cars, prevent cars from parking in the bike lane, and improve user perceptions of comfort and safety.

Protected bicycle lanes are appropriate for routes that would otherwise be high stress, including streets with high traffic volumes and speeds as well as frequent double parking. The lane should be at least 5-7' wide and clearly marked with street signs and pavement markings. If the barrier is a parking lane, there should be at least a 3' buffer between the parking and bike lanes to prevent collisions with doors, and the combined width of the bike lane and buffer should be at least 11'. There should also not be parking within 30' of intersections, and other barriers, such as concrete islands, should be placed there instead.

**Shared Use Paths**

Shared use paths provide low-stress bicycle infrastructure suitable for children. They are fully separated from motorized vehicles and are used by both pedestrians and non-motorized vehicles such as bicycles, wheelchairs, scooters, and skateboards. They can be built within a highway's right-of-way or inside an independent right-of-way.


***Figure 6.*** *Protected bike lane in San Francisco*

Bidirectional paths should be at least 10' and at least 12-14' in high volume areas. Center stripe lines can help organize traffic and improve safety. To ensure accessibility, shared use paths should have a firm, slip-resistant surface and a grade less than 5%.

If shared use paths intersect with roadways, extra measures must be taken to ensure that the facility remains low-stress for all users. Advanced warning signs and pavement markings should alert both path and roadway users of upcoming intersections, and traffic calming measures should be implemented on the roadways to reduce automobile speeds. Crossing distances for path users should be kept as short as possible, and where possible, high-visibility crosswalks with separate bike signals should be used.

***Figure 7.*** *Shared use path*

**Low-stress Intersections**

As intersections tend to be high conflict zones, intersection treatments are paramount to creating low-stress bicycle networks. Treatments should increase visibility and delineate a clear right of way. While appropriate treatments will vary depending on the specific conditions of the intersection, NACTO recommends the following: bike boxes, intersection crossing markings, two-stage turn queue boxes, median refuge islands, through bike lanes, and combined bike lane/ turn lane.

Bike boxes are designated bike areas at intersections in front of the traffic lane. They are appropriate at signalized intersections and increase the visibility of cyclists, reduce conflict with right-turning vehicles, and reduce signal delay. Bike boxes should be 10-16 feet deep, clearly marked with pavement markings and colored paint, and have a clear stop line for cars.

Intersection crossing markings are pavement markings that indicate that a bike lane is continued through an intersection. They are typically dotted lines that help cyclists know where to ride, alert motorists to cyclists, and remind right-turners that cyclists have priority. Additional pavement markings, such as bike arrows or paint, increase the visibility of intersection crossing markings.

Two-stage turn queue boxes are similar to bike boxes, but they are placed in areas where

cyclists frequently turn across an intersection, either left from a right-side bike lane or right from a left-side bike lane.

Median refuge islands shorten the distance that cyclists need to cross, calm traffic by narrowing the roadway width for motorists and provide a space for cyclists to wait for gaps in traffic. They are often used at unsignalized intersections but can be supplemented with bicycle signals, hybrid beacons, or active warning beacons.

Through bicycle lanes or bicycle pockets position bicyclists at intersections with turn only lanes. They are used on streets with bike lanes, and the bike lane delineation is dashed in the area where motorists can merge into the lane. Through lanes and bike pockets give both cyclists and motorists a clear travel path. This alerts motorists that bikes may be passing them as they merge and allows all users to avoid conflict. To further highlight the conflict zone and increase visibility, the bicycle pocket may be painted. Combined bike and turn lanes, or mixing zones, are similar, but instead of having a dedicated lane, the turn lane and bike lane are combined. However, there are pavement markings that indicate where the cyclist should position themself. This increases motorist awareness of cyclists and encourages them to give cyclists priority.

***Figure 8.*** *Low stress protected intersection*

**Branding, Naming, & Wayfinding**
The low-stress bike route should follow consistent design standards. Having consistent branding not only contributes to a sense of place but also improves safety by making the bicycle network more recognizable and easy to follow for both cyclists and motorists.

While there are wayfinding conventions as well as required standards defined by the MUTCD, there is some room for creativity. Performing public outreach to determine branding and naming can be an effective way to engage the public and raise awareness for the network. Route wayfinding includes signage and pavement markings that direct cyclists to and through routes. There are three main types of bike route signage: confirmation signs, turn signs, and decision signs. Confirmation signs let cyclists and motorists know that they are on a designated bike route. They should be placed every 2-3 blocks. Turn signs should be set shortly before turns. Pavement markings are used effectively in conjunction with or instead of confirmation and turn signs. Finally, decision signs are placed at the junctions of two or more bikeways and should include the direction and mileage of each route. (NACTO Urban Bikeway Design Guide, 2012).


***Figure 9.*** *Directional bike sign in Chicago. Photo by Ruth Hansen CC-BY*

# BACKGROUND AND PLANNING CONTEXT

## ADOPTED PLANS AND PROJECTS

In the past few years, there have been several new plans that address transportation planning in Bakersfield and Kern County as a whole. Among these are the Kern County Active Transportation Plan (2018), the Downtown Bakersfield High-Speed Rail Station Area Plan (2018), and the Bakersfield Bicycle and Pedestrian Safety Plan (2020). These plans share common objectives, including:

1. **Create a sustainable multimodal transportation system that is reliable and safe**
2. **Increase connectivity to jobs, transportation, and activity centers by expanding bicycle and pedestrian networks**
3. **Serve disadvantaged communities by increasing mobility and transportation access with resident needs in mind**
4. **Create more livable communities by creating a sense of place**
5. **Boost the economy by increasing access to jobs and businesses, lowering transportation costs, and promoting development**

**Kern County Active Transportation Plan (2018)**
The Kern County Active Transportation Plan (Kern ATP) was drafted by Alta Planning + Design for the Kern Council of Governments (Kern COG). It includes plans for over 1,200 miles of updated and new bikeway projects, 300 miles of pedestrian network improvements, potential locations of new end-of-trip facilities, and spot improvements. The funding for these projects comes from California's Cap-and-Trade Program and Caltrans's Active Transportation Program. Program funding allocates a minimum of 25% for sidewalk and bicycle network improvements in disadvantaged communities.

The Kern Active Transportation Plan (Kern ATP) identifies improvements at the regional and county levels, and this report focuses on both the pedestrian (0.5-mile radius) and bicycle (3-miles radius) travel sheds of existing and adopted transit hubs. This report's study area includes pedestrian projects within a 0.5-mile radius of the future HSR station and existing Amtrak stations, Golden Empire Transit (GET) stations, the future GET bus rapid transit route, as well as bicycle projects within a 3-mile radius of the HSR station. Therefore, this report is

informed by the Kern ATP, but recommendations are only within this study area.

### Plan Objectives

The Kern ATP focuses on serving disadvantaged communities in California through improvements in bicycle and pedestrian infrastructure. Because 34% of Kern County residents have disabilities, the plan seeks to improve mobility and transportation accessibility for this population. It also aims to enhance first-last mile connections and provide economic benefits such as lower transportation costs, local economic development, and job creation.

### Kern ATP Main Takeaways

The Kern ATP has many strengths. It creates an extensive bike network that not only connects amenities to each other (Kern River Parkway path, future HSR, Amtrak) but also connects the larger region to transportation hubs. It also includes many pedestrian improvements as well as suggested locations for end-of-trip facilities. The plan includes a detailed list of all recommended bikeways and study areas with mileage and estimated costs, which will make it easier for communities to implement them. The plan was based on a robust outreach program that included specific feedback on what community members wanted and locations for interventions.

However, the plan also has room for improvement. Despite community members clearly stating preferences for facilities and infrastructure that meet low-stress criteria, most of the existing facilities and adopted plans include bicycle paths that do not fit these criteria. Respondents also asked for green bike lanes and complained that traffic speeds were too fast, neither of which were addressed in the final adopted plan. As with Kern COG's Regional Transportation Plan, outreach was conducted for all of Kern County and not specifically for metropolitan Bakersfield.

In addition, many of the adopted changes are vague. Additions to the bicycle network are only categorized by class, and pedestrian improvements are classified as sidewalk improvements, corridor improvements, and crossing improvements. While there needs to be some flexibility in the plan to allow for differing conditions, guidelines on best practices would encourage cities to choose the safest possible option.

For instance, the plan lacks specificity on how intersections will be treated and only identifies one specific intersection for crossing improvements. Other "crossing improvements" are applied to entire corridors. Several different crossing improvements can be made of varying qualities.

Both the stress of the segment and intersection stress are calculated in the Bike Network Analysis score. Therefore, to improve the score of the bike network specified in the Kern ATP, the design must be revised to adhere to standards that lower the stress of the network on pedestrians and cyclists. That change is necessary for the plan to have the desired impact on the number of people who walk and bike, air quality, and mode shift goals.

**Downtown Bakersfield High-speed Rail Station Area Plan (2018)**

The Downtown Bakersfield High-Speed Rail Station Area Plan (Downtown Bakersfield Plan) aims to guide future development in Downtown Bakersfield in response to the future HSR station. The plan, produced by the City of Bakersfield in partnership with California High-Speed Rail Authority, lays out a broad vision for growth in the next 10, 20, and 30 years. One of the primary goals of the plan is to create a multimodal transportation system that connects the high-speed rail station to existing and new bike and pedestrian infrastructure, the historic core, other transportation hubs, and the surrounding area.

### Downtown Bakersfield Plan Objectives

The Downtown Bakersfield Plan's objective is to provide best practices for development sparked by the future construction of the high-speed rail station. The plan aims to densify Downtown Bakersfield both residentially and commercially, to promote economic growth, to develop underutilized or vacant parcels, to connect cultural and activity centers, to establish an "efficient, reliable, and effective" multimodal

transportation network, to increase livability and sense of place, and to secure funding to realize these goals in the next 10, 20 and 30 years.

The plan proposes three significant projects: the Wall Street Pedestrian Paseo, the Golden State Connector, and the Garces Circle Pedestrian Plaza. Through these developments and enhanced bicycle and pedestrian infrastructure on K Street and 21st Street, the plan will create a "green loop" that forms a continuous active transportation network around the downtown core. By promoting active transportation, the plan aims to turn Downtown Bakersfield into a regional hub where people will come to work, shop, recreate, and live.

- Wall Street Pedestrian Paseo will expand upon a one-block existing paseo between Eye Street and Chester Ave. By expanding the pedestrian alley east to Mill Creek Linear Park and west to D Street, the corridor will connect the densest area of downtown to the historic core.
- The Golden State Connector is a multi-use path that will run parallel to the HSR route and the Golden State Freeway. The pedestrian and bicycle path will serve as open space and connect to the existing Kern River Trail and Mill Creek Linear Park to the HSR station.
- Currently, seven roads flow into Garces Circle, including two freeway interchanges. The plan aims to make this bicycle and pedestrian-hostile intersection into a "gateway" to Bakersfield, connecting users to the HSR and Chester Ave, as well as the main street in downtown Bakersfield. The plan offers few specifics on how to turn this auto-centric intersection into a pedestrian plaza. Still, it suggests removing three of the seven intersections and adding a bus lane.

### Main Takeaways of the Downtown Bakersfield Plan

The Downtown Bakersfield Plan outlines a high-level vision for future development. It focuses on the area surrounding the future Bakersfield HSR station, and community outreach was specific to this region, making it more relevant to this proposal. The plan promotes denser, mixed-use development downtown, which creates more favorable conditions for pedestrians. It also has the potential to add to the low-stress bike network with the addition of the multi-use trail and the K Street Bike Boulevard. The Green Loop has the potential to fill in current gaps in the bicycle network.

One central hole in the plan is that it does not adequately address how street crossings and freeway interchanges will be treated. For the length of the Wall Street Pedestrian Paseo, only Chester Ave and Q Street are indicated as locations for intersection improvements, even though most intersections along the routes in this plan do not have crosswalks. The plan also says there will be intersection treatments along the K Street Bicycle Boulevard, but it is unclear whether this applies for the entire corridor or just the four blocks shown on the map.

The only specific treatment in the plan is a mini traffic circle on 21st Street. The quality of treatments will determine whether or not the K Street Bicycle Boulevard is low-stress. While the Golden State Connector has the potential to add to the low-stress bike network, its location abutting the Golden State Freeway is not ideal. Questions remain about how users will cross the freeway and how far apart the crossings will be.

Because the plan lacks specificity, it is hard to imagine how Garces Circle could be transformed into a pedestrian plaza given the current conditions. The plan does not produce a cohesive vision for how this will be realized.

Both segment stress and intersection stress are calculated in the Bike Network Analysis score. Therefore, to improve the score of the downtown core, improvements to the design of intersections and minor crossings and adherence to standards that fit the criteria for an entire low-stress network must be standardized to see an impact on the number of users on active transportation facilities.

Finally, the plan calls for a "slow roll-out plan" for bicycle improvements, stating that "[t]he general progression of bike facilities are from sharrows to bike lanes to protected bike

lanes to cycle tracks and/or bike boulevards. Each step in the hierarchy requires minimal investment that builds on the previous improvements." This method will waste resources on infrastructure (sharrows and paint-only bike lanes) that won't create the low-stress bikeways riders need to feel safe and will almost certainly fall short of goals to increase ridership meaningfully. This build-out strategy inherently takes the onus of safety off of the City of Bakersfield's shoulders to improve the bicycle network in a timely manner. Instead, the safest possible option should be installed immediately.

**City of Bakersfield Bicycle and Pedestrian Safety Plan (2020)**

### Bicycle and Pedestrian Safety Plan Objectives

The Bicycle and Pedestrian Safety Plan (BPSP) was completed by Alta Planning + Design in January 2020. It aims to "deliver a set of collision data collection tools, collision data analysis, and corridor improvements that can be applied throughout the city to improve safety for all." Through the collision data, which was collected through the Statewide Integrated Traffic Records System (SWITRS) and the Bakersfield Police Department, the report found that collisions involving pedestrians and cyclists were correlated with functional roadway classification (FRC), posted speed limits, land use, bicycle facilities, intersection control, and crosswalks. Collisions were more frequent and more often resulted in death on roads with higher FRCs, speed limits greater than 35 mph, and 4-6 lanes of traffic.

In addition, the plan identified eight priority corridors with the idea that the suggestions for these corridors could also be applied to other similar corridors. It provided a concept design for each of these corridors and a 30% design that could be implemented in the short-term. The priority corridors are as follows:

1. **California Avenue** (Oleander Ave to R St)
2. **California Ave** (Marella Way to Planz Rd)
3. **Chester Av**e (4th St to Brundage Ln)
4. **Garces Memorial Circle**
5. **Hageman Road** (Brittany St to Patton Way)
6. **Monterey St** (Alta Vista Dr to Brown St)
7. **Q Street** (34th St to 30th St)
8. **Union Ave** (21st St to Belle Terr)

Suggestions to improve bicycle and pedestrian safety outlined in the report include:

- Curb extensions
- Curb cuts and ramps at signalized intersections
- High-visibility yellow crosswalks around schools
- Advanced stop markings at all signalized intersections
- Turn lane markings in intersections for left turns
- Leading pedestrian intervals at signalized intersections
- Median trees
- Added HAWKs (High-Intensity Activated Crosswalk Beacon) or RRFBs (Rectangular Rapid Flash Beacon)
- Repainted bike lanes including green paint in conflict areas
- Bus stop islands
- Continental crosswalks
- Bike lane markings after major driveways
- Lighting improvements
- New or adjusted medians where they impinge on the crosswalk
- Buffered bike lanes
- Bollards next to bike lanes
- Parking protected bikeway

### BPSP Main Takeaways

The BPSP provides useful takeaways for particularly dangerous segments of the bicycle and pedestrian network based on crash data. It also responds to community wishes. While the plan has been completed, the City of Bakersfield has not released it to the public.

In addition, the BPSP focuses on improvements to established corridors rather than on an entire network separate from arterials that prioritize single-occupancy and fossil-fuel-powered transportation.

For the eight corridors highlighted in the BPSP to have low-stress qualities, they must have treatments to intersections and crossings while emphasizing physical protection from vehicular traffic. More than corridor improvements, designing networks that encourage active transportation users to use slower, neighborhood streets instead of busy, high-volume, and high-stress collectors is the key to low-stress implementation.

**Other Projects Included in the Adopted Low-Stress Network**

Some projects included in the analysis of the low-stress network within the Bakersfield project area that are not part of the Kern ATP. These projects are funded through the Thomas Roads Improvement Program (TRIP) or supported by grant funds not part of the Kern ATP. See the definition of "Adopted" in the "Key Terms" section.

These include the Friant-Kern Canal Class 1 Bikeway, a 6-mile shared use path along the Friant-Kern Canal, the Hageman Flyover Bike Path from Knudsen Drive to the intersection of Rio Miranda and Buck Owens Boulevard, the Centennial Corridor Bikeway, a class 1 bike path that will run Centennial Corridor from Commerce Drive to the intersection of Ford Ave and North Stine Road, and the Kentucky Street Greening Project, build new bike lanes and a pedestrian walkway starting at Beale Avenue and ending West of Mount Vernon.

# EXISTING + ADOPTED NETWORK ANALYSIS

The project team mapped both the existing infrastructure and adopted infrastructure and assessed the score of the areas within the HSR travelshed. With an analysis of expected BNA conditions in this travelshed, the project team proposed routes for further analysis that would best improve the BNA score. These projects are listed in the Recommended Projects section.

**Method for Selecting Recommended Routes**
The project team also prioritized routes based on the existing road conditions, including whether there was adequate space in the existing roadway or if bikeways would need to be built outside of the existing right of way. The project team and Toole Design used GIS analysis, a ground-truthed assessment of existing conditions, and resident feedback presented in the preliminary survey to rank recommended projects based on their transformative impact on the BNA score.

1. Extensions of existing and adopted active transportation projects to provide seamless connectivity between jurisdictions throughout the bike network
2. Low-stress connections directly to the future HSR station site, in particular from the adjacent Westchester neighborhood
3. More and safer, protected north/south crossings of the Kern River and freeways
4. More bike facilities for east/west travel, particularly south of East California Avenue and crossing the 99 Freeway
5. Crossings of railroads and canals throughout that are protected from vehicle traffic
6. Enhanced bikeways on neighborhood streets to divert active transportation traffic away from vehicular traffic on major roadways

**Assumptions for Recommended Routes that include the Adopted Network**
The project team proposed routes that prioritize establishing low-stress connections for neighborhoods isolated from the existing and adopted network while assuming that many of the outcomes of the adopted network will be low-stress by design.

1. All intersections and minor crossings built fit the criteria for low-stress
2. Places where the bike network is offset will have low-stress connections across the jog in the street network
3. The K Street Bike Boulevard will pass through the Garces Circle to connect with the future HSR route along the rail line to the north of Golden State Highway
4. Three of the seven existing streets feeding into the Garces Circle will be closed for vehicle traffic (Downtown Bakersfield Plan)

## BIKE NETWORK ANALYSIS OF THE EXISTING LOW-STRESS NETWORK

A survey of the existing conditions in Bakersfield using the Bike Network Analysis tool makes it clear that the current network is neither connected nor low-stress. The existing routes do not give bike riders access to key destinations highlighted in the survey outreach, including areas both inside and outside the Bakersfield project area.

There is a lack of wayfinding, so it's hard for new riders to follow the existing bike network. Recognizable and community-oriented facilities will increase ridership and access to key places such as the high-speed rail station, the Amtrak station, and the upcoming BRT stops from the Kern ATP.

**Figure 10** shows the 3-mile potential bikeshed surrounding the HSR station. As it currently stands, the area surrounding the station is entirely inaccessible via low-stress bicycle routes due to a lack of infrastructure and the prioritization of automobile mobility.

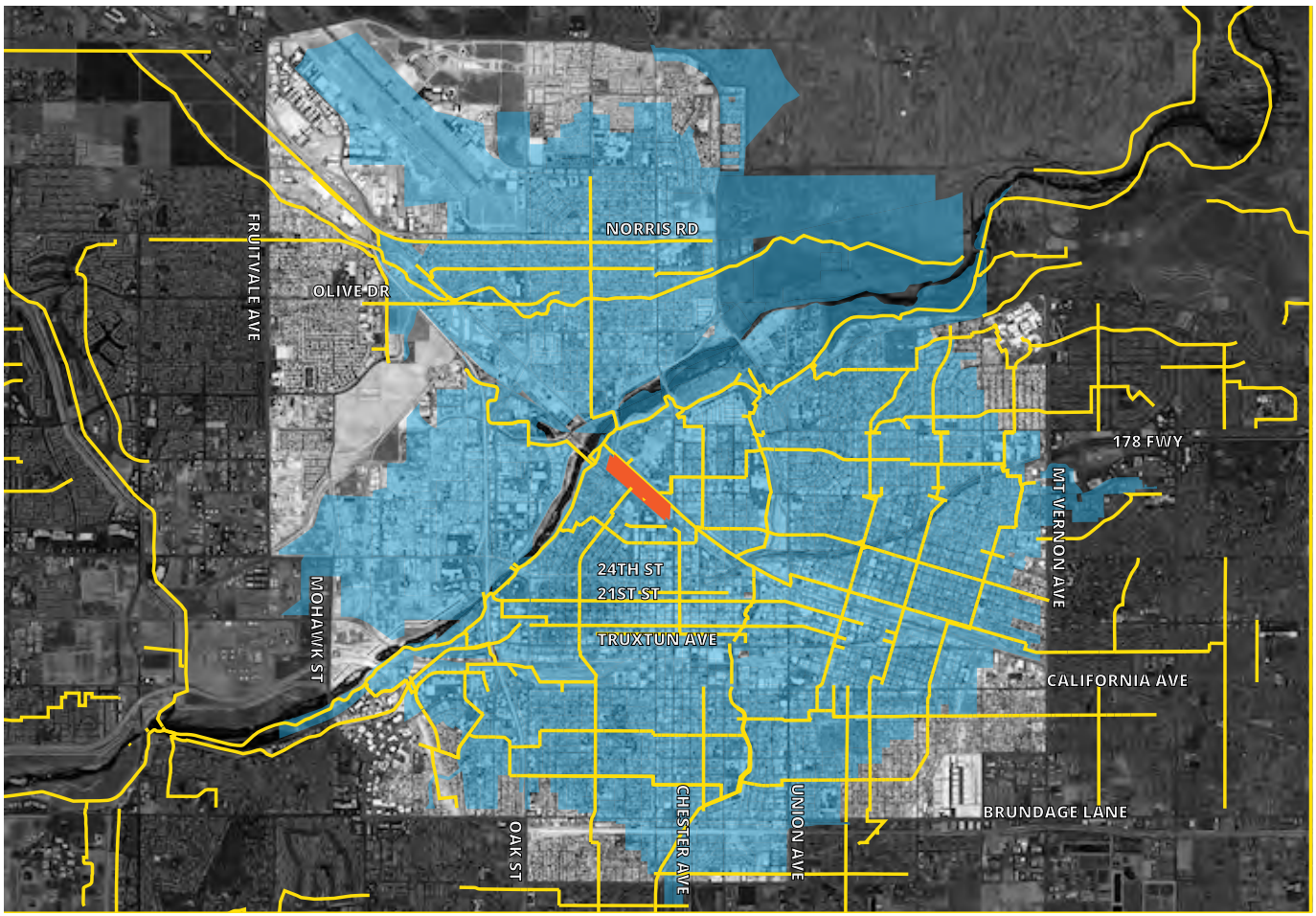



***Figure 10.*** *High-Speed Rail Station Site and Potential Three Mile Bikeshed*

**Figure 11** shows the existing BNA score for the 3-mile bikeshed around the high-speed rail station, illustrating the lack of connected, low-stress routes that enable cyclists to reach the station. The map highlights two existing shared use paths that are low-stress: the Kern River Parkway Trail, a 20.5-mile multi-use path running east-west across the region, and the Mill Creek Path. Connections to these routes from the high-speed rail station and other vital destinations would drastically improve bike circulation between the east and west sides.

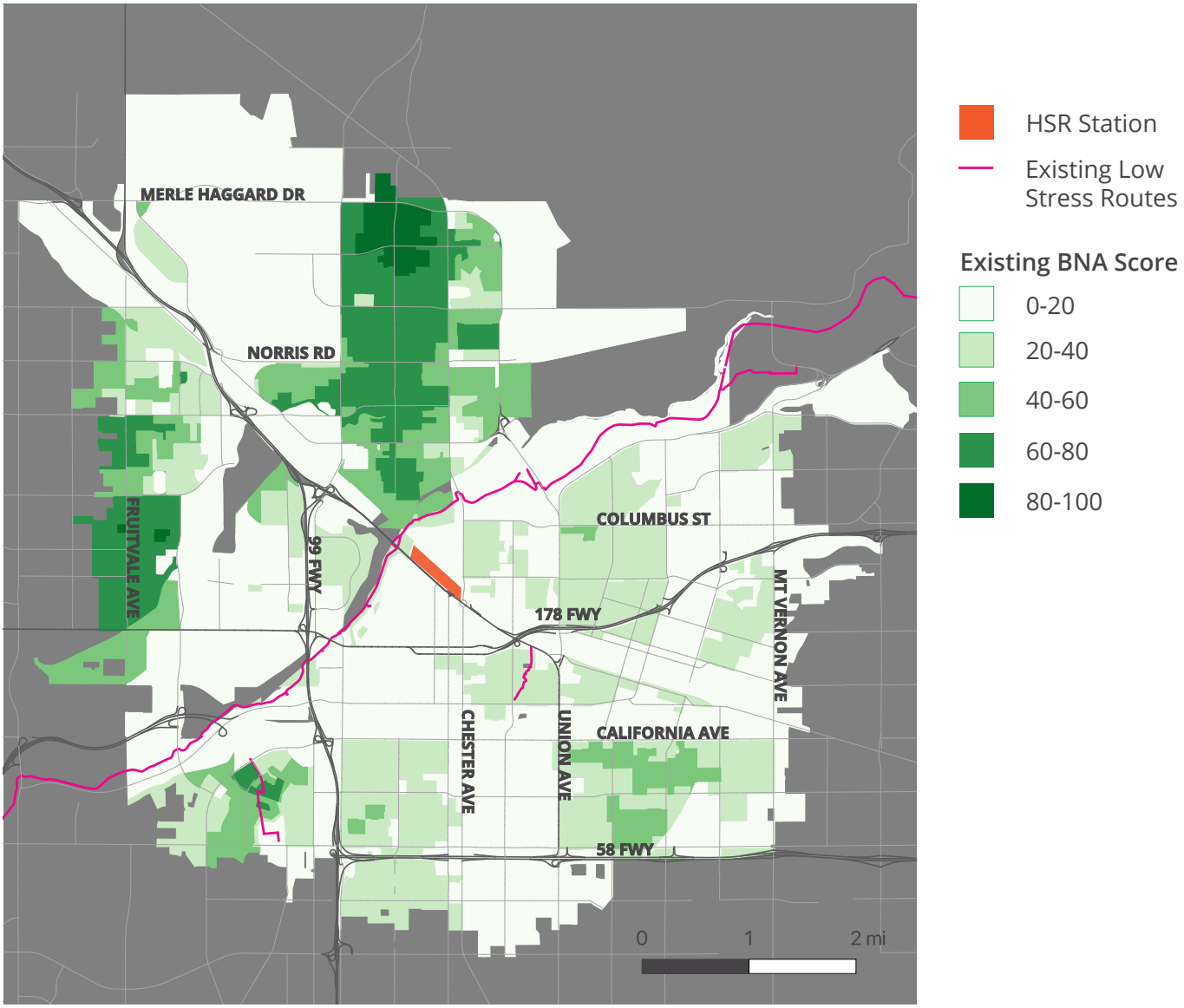
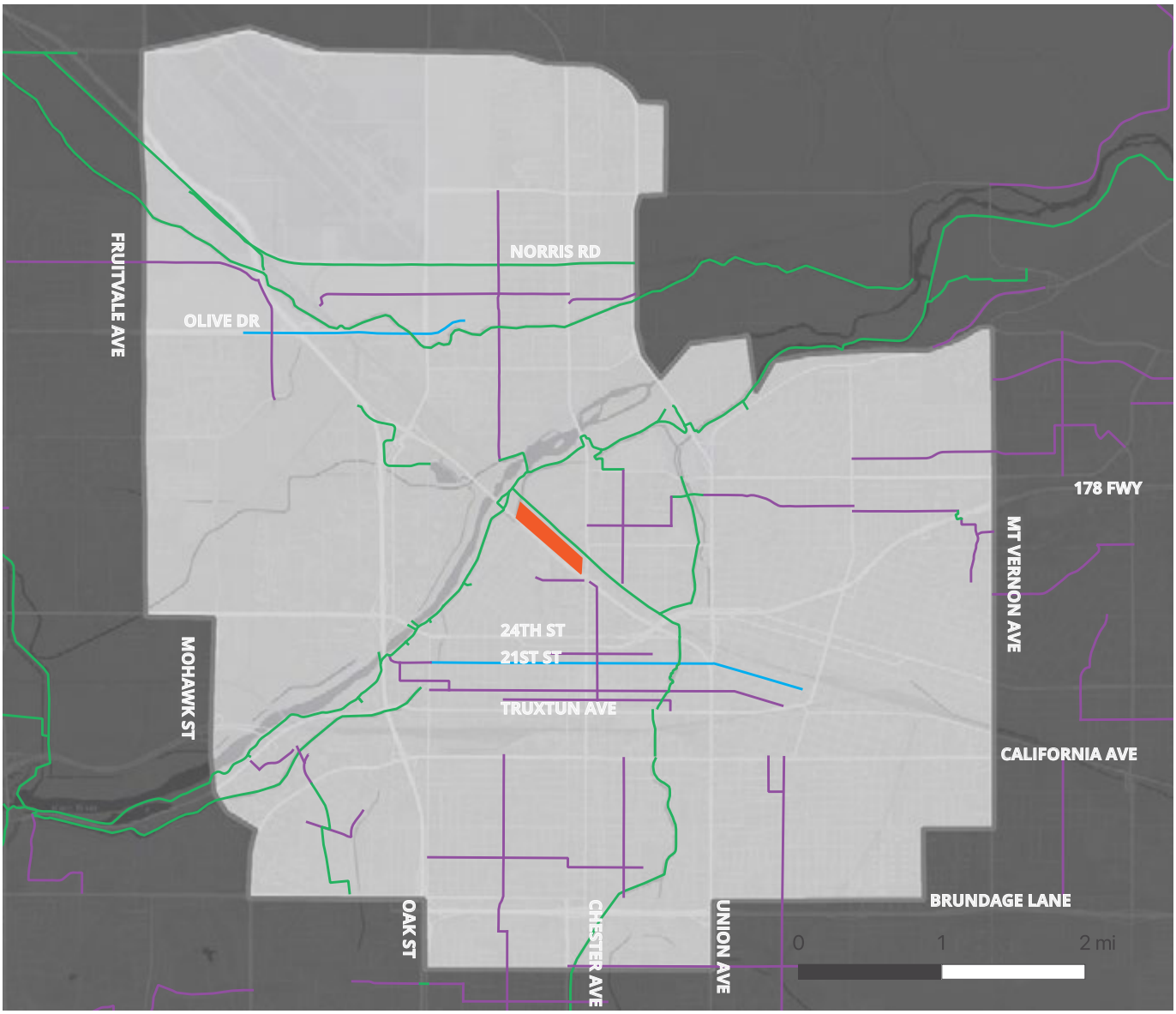



***Figure 11.*** *Existing Conditions Connectivity Analysis (BNA Scores)*

## BIKE NETWORK ANALYSIS OF THE ADOPTED LOW-STRESS NETWORK

**Figure 12** shows three types of recommended future routes: shared use paths, bike boulevards, and protected bike lanes. Each of these improvements, according to the BNA output, will increase bicyclist access to goods and services across Bakersfield by improving the connectivity of the low-stress network.




**Existing + Adopted Low Stress Routes**

- Protected Bike Lane
- Shared Use Path
- Bike Boulevard

***Figure 12.*** *Dedicated low-stress Bike Routes Existing and Adopted in Kern ATP (Note: Local streets meeting the definition of low-stress are included in network analysis but are not shown in the above figure.)*

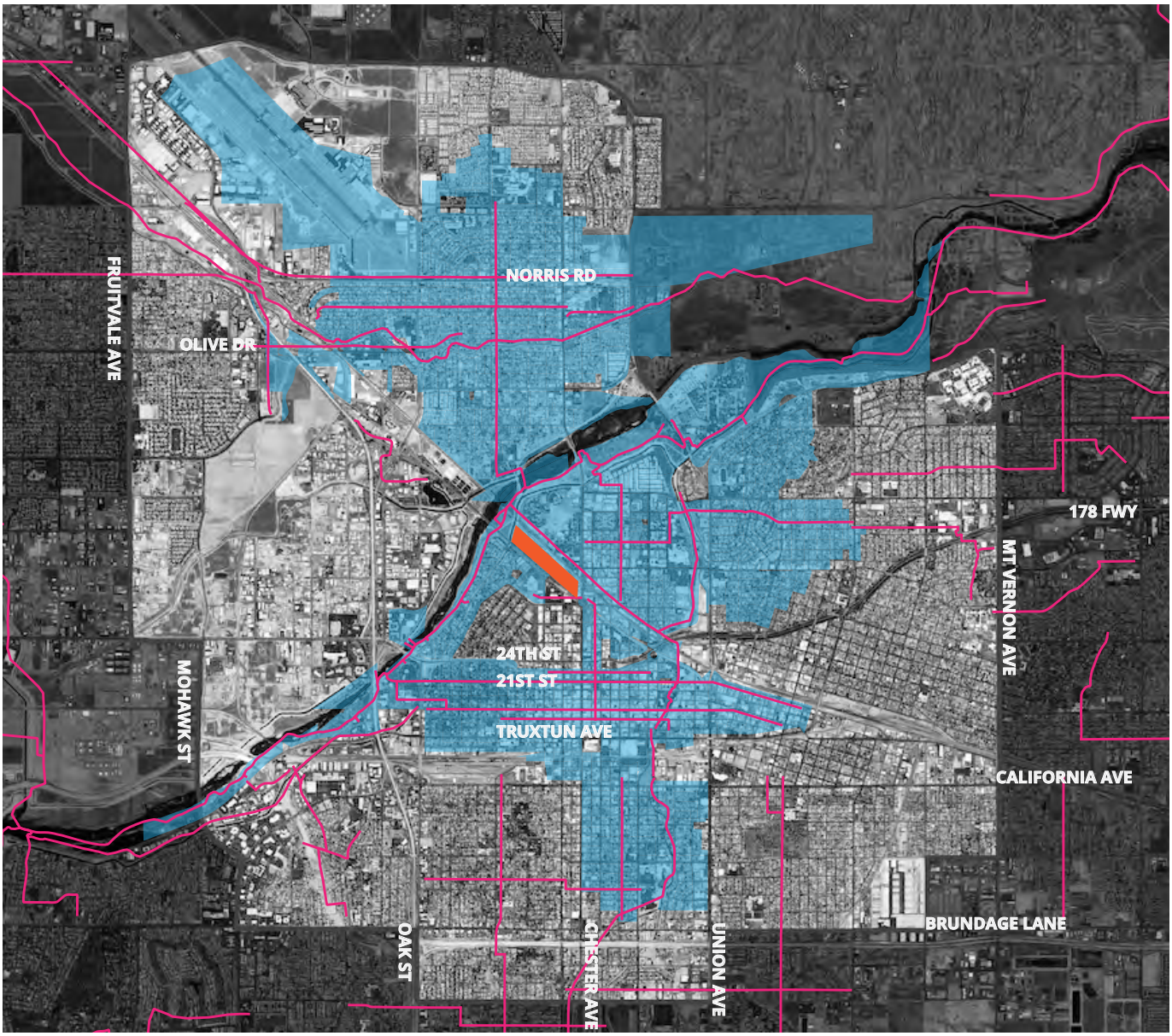



***Figure 13.*** *Bikeshed to Future High-Speed Rail Station with Full Buildout of Kern ATP low-stress Infrastructure*

**Figure 13** shows the low-stress connections between the future high-speed rail station and the recommended bicycle network. Once these segments are added, the area surrounding the station will be connected in nearly every direction within the bikeshed radius from the HSR station site. The BNA is useful for planning the connectivity for a network because it prioritizes the web of connections over individual routes. The recommendations are a network of routes that intersect with each other away from major streets and collectors to allow riders of all ages and abilities to have a low-stress bike route to many places.

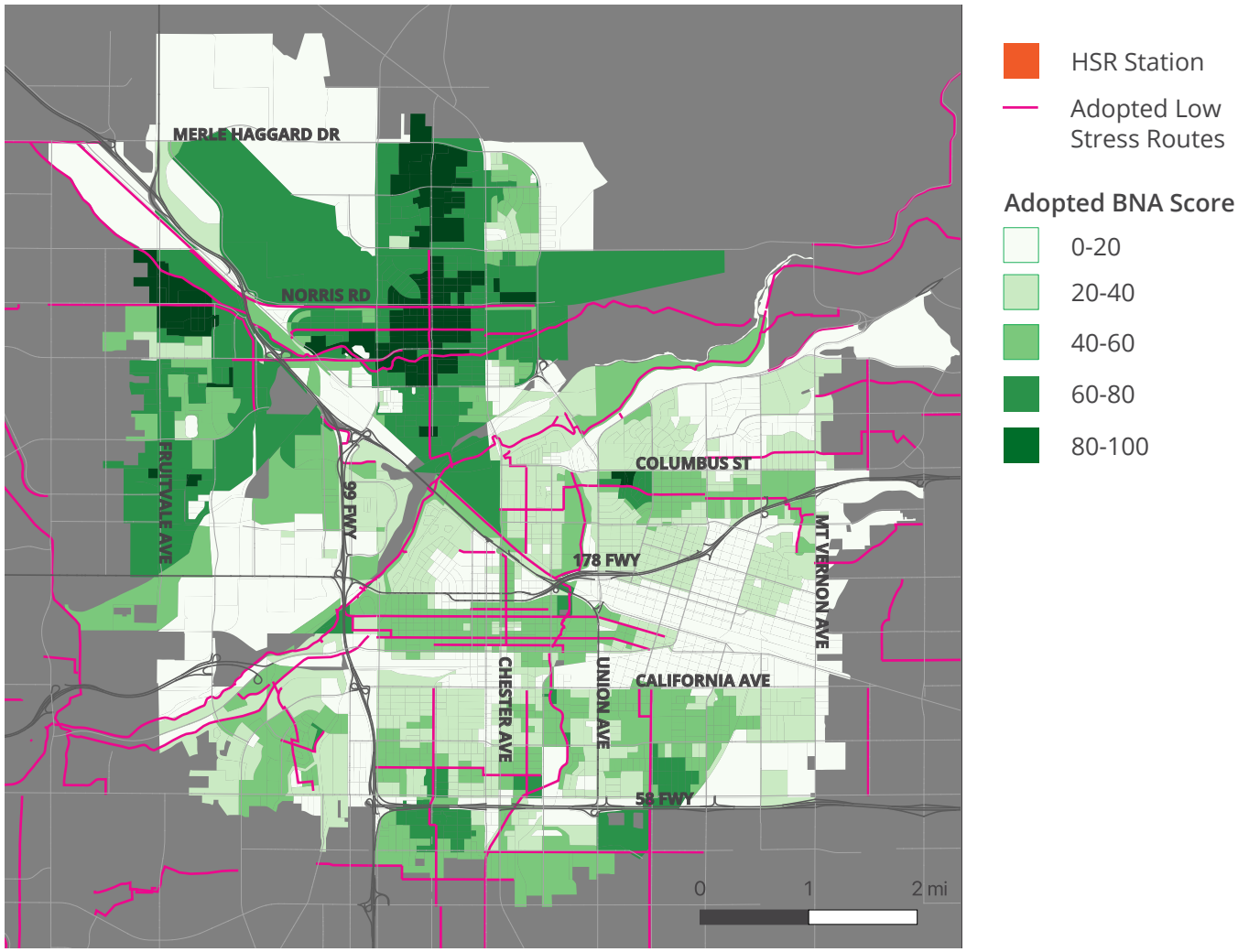



***Figure 14.*** *Connectivity Analysis (BNA Scores) of Adopted Bike Network in Kern ATP*

**Figure 14** overlays existing low-stress, multi-use bike routes with each census block's BNA score. With a range of 0-100, the BNA score represents the level of accessibility experienced by cyclists within that block. The light green and white areas show parts of Bakersfield that are particularly lacking in low-stress connections. The northern portion of the project area has the most low-stress links. The central area, particularly the blocks adjacent to the future high-speed rail station, have very few low-stress connections. The adopted network in Figure@ will provide an increase in bike accessibility across Bakersfield, particularly in the eastern and central parts of the study area.

# COMMUNITY OUTREACH

The project team's community survey ran four months from July - October 2020. The project team developed a presentation about the project, including existing and planned bike routes, and included time after the informational slides for residents and CBOs to take the survey. Respondents shared travel routines, perceptions of biking and walking in the project area, and what was needed to make biking a pleasant, safe, and optimal travel mode. Residents located their top three barriers to biking and their top three local travel destinations using any mode of transportation.

The project team relied on the expertise of community-based social justice partners to develop a culturally competent, inclusive stakeholder engagement plan. Survey incentives were often administered with the following organizations:

- Kern County Homeless Collaborative partners and providers: Outreach Committee, Homeless Youth Committee, Flood Ministries, Community Action Partnership of Kern
- Foster youth and youth in work programs within the project area: The Dream Center, Cesar Chavez Environmental Corps Youth Work program
- Downtown transit users and bike kitchen users
- Community-based organizations with direct resident networks: Dolores Huerta Foundation, Leadership Counsel for Justice and Accountability, Bike Bakersfield

Many of the target resident groups and organizations were on hiatus due to COVID-19, and lockdown requirements slowed progress temporarily. Instead, the project team switched to online and limited in-person surveys.

Nearly 600 Bakersfield community members shared their experience and expertise navigating the local street and existing bike network, including 172 paid respondents. Outreach from this survey created a listserv of 122 residents interested in following up about the project.

The project team also sent out press releases to statewide and local media contacts to promote the survey and the overall project, and both state and local news outlets picked up the story. The project was also highlighted in community presentations with California Walks and UC Berkeley Safe Transportation Research and Education Center (Safe TREC), where the information was recorded and also translated into Spanish. The project team was invited to present the project methodology and survey outcomes to the local chapter of the American Society of Civil Engineers.

The project team is currently working with the City of Bakersfield and the Leadership Counsel for Justice and Accountability on the City of Bakersfield's Transformative Climate Communities survey outreach and using feedback from both surveys to develop recommendations.

## SURVEY ANALYSIS

Survey results provided information on respondents' experiences and desired improvements to the project area's bicycle network. While cyclists account for a low percentage of overall traffic in Bakersfield, 76% of respondents indicated that they bike in the project area shown below. Of these respondents, 30% said they bike every day, 36% said they bike once or twice a week, 21% said they bike a few times a month, and 13% said they bike once a month or less. In addition, when asked how they get to destinations, 71% said they bike, 62% said they drive, 22% said they walk, 14% said they used public transit, and 3% used another mode. These results seem to suggest that respondents bike more than the average Bakersfield resident, which may reflect that those who already bicycle were more inclined to participate in the survey.

***Travel Mode To Destination***

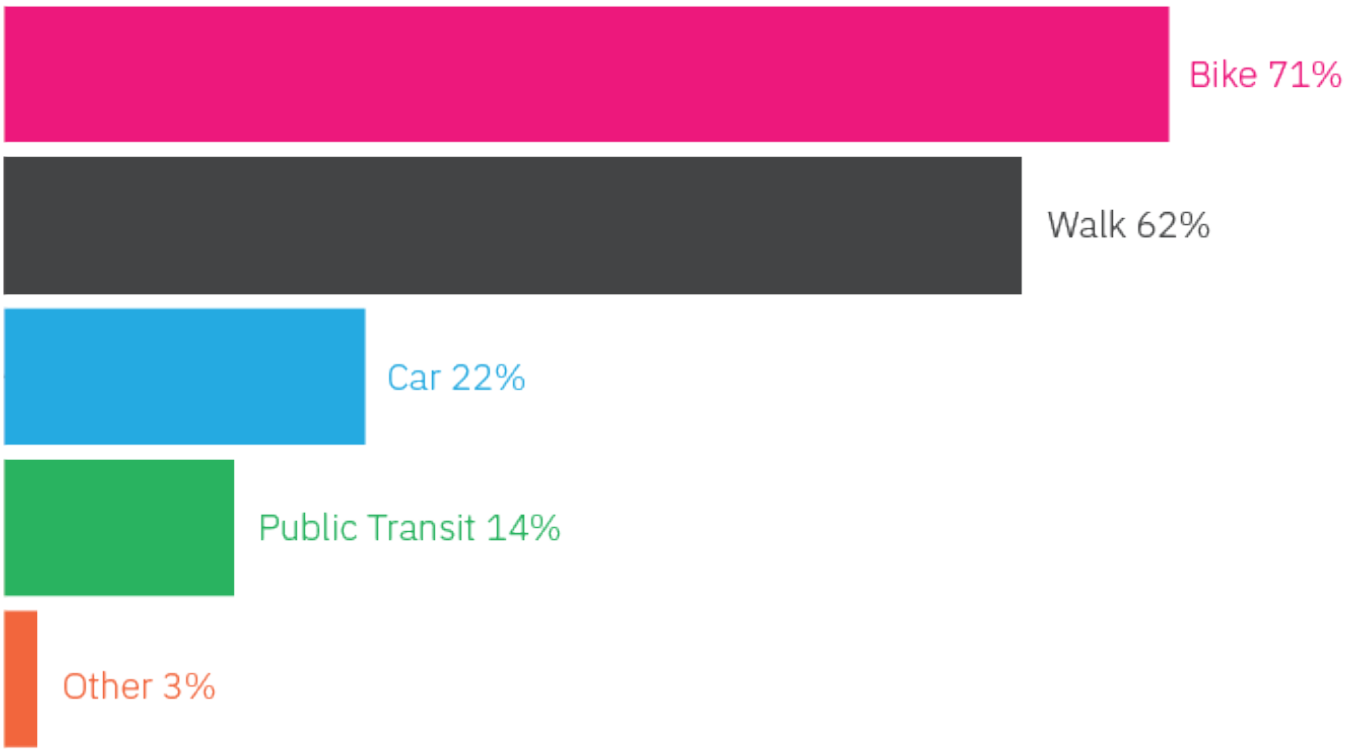



***Figure 15.*** *Travel mode to destinations*

***Do you bike in the area below?***

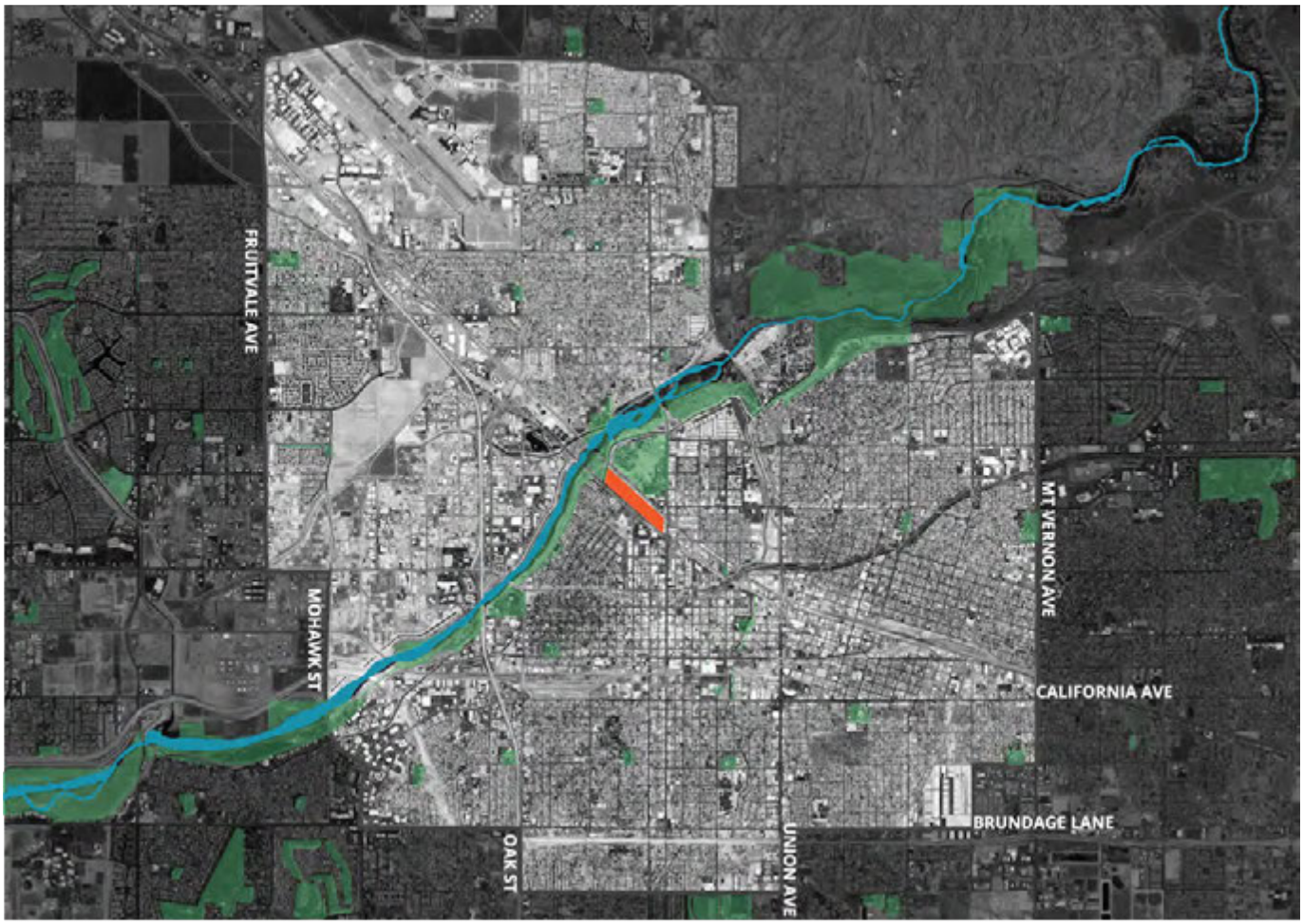



***Figure 16.*** *Project Area*

The survey also collected responses on the perceived safety by cyclists. Out of respondents who said that they do bicycle, 22% strongly agreed with the statement "I feel safe and comfortable riding a bicycle," 33% somewhat agreed, 6% neither agreed nor disagreed, 19% somewhat disagreed, and 18% strongly disagreed. The fact that almost half of respondents who choose to bicycle do not feel safe is telling, as there are likely many more who choose not to cycle as a result of feeling unsafe. Creating a low-stress bike network will not only make current cyclists feel safe but also attract new cyclists.

***"I feel safe and comfortable riding a bicycle."***


***Figure 17.*** *Measuring residents' confidence riding a bike (Note: Only asked of residents who stated they do bike in the study area.)*

***What destinations do you visit most often using any mode of transportation?***

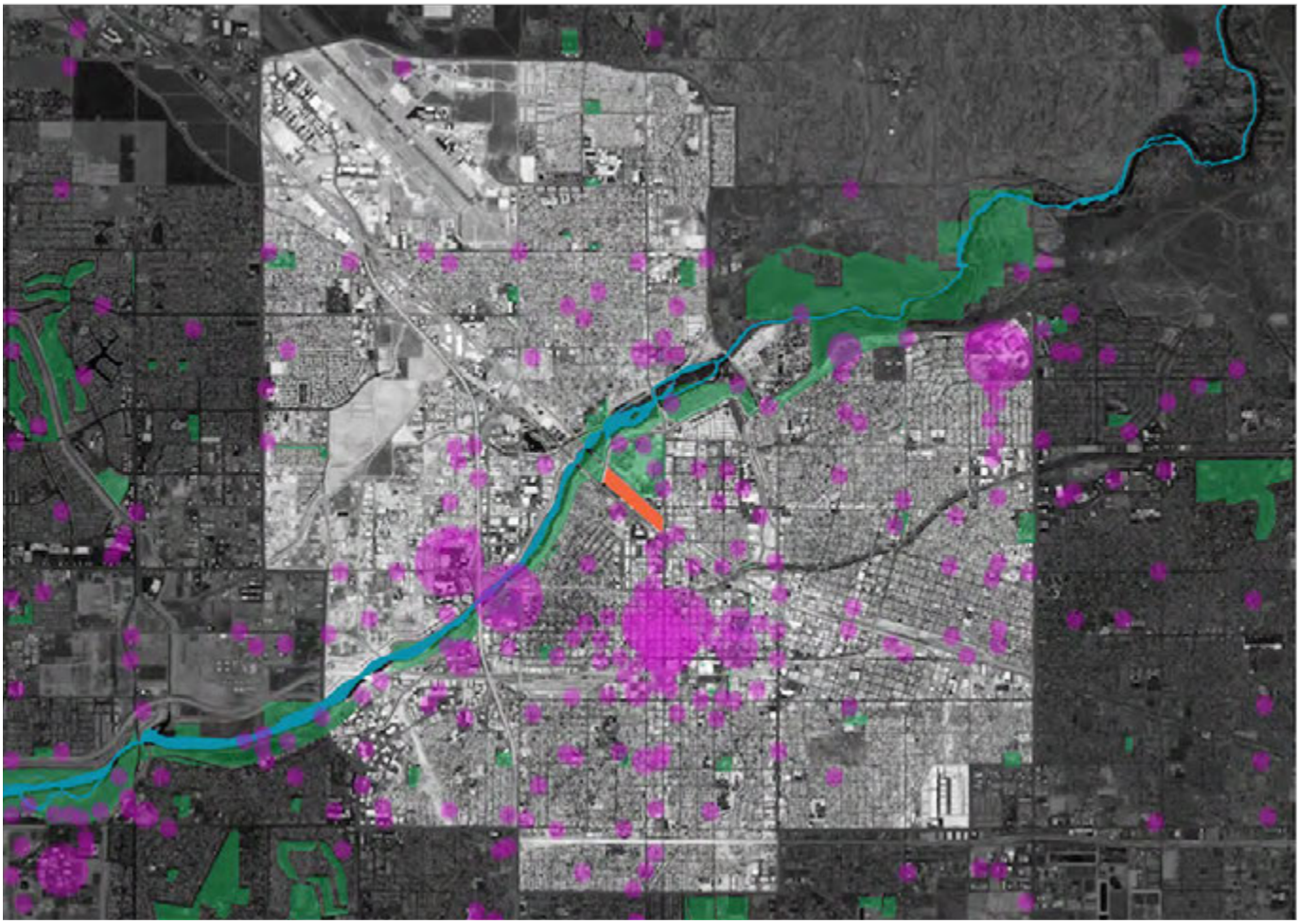



***Figure 18.*** *Top travel destinations (Note: Residents selected their top destinations using a Google Maps integration that allowed them to type in a destination or drop a pin on the map.)*

***Where are the places you experience barriers or challenges biking?***

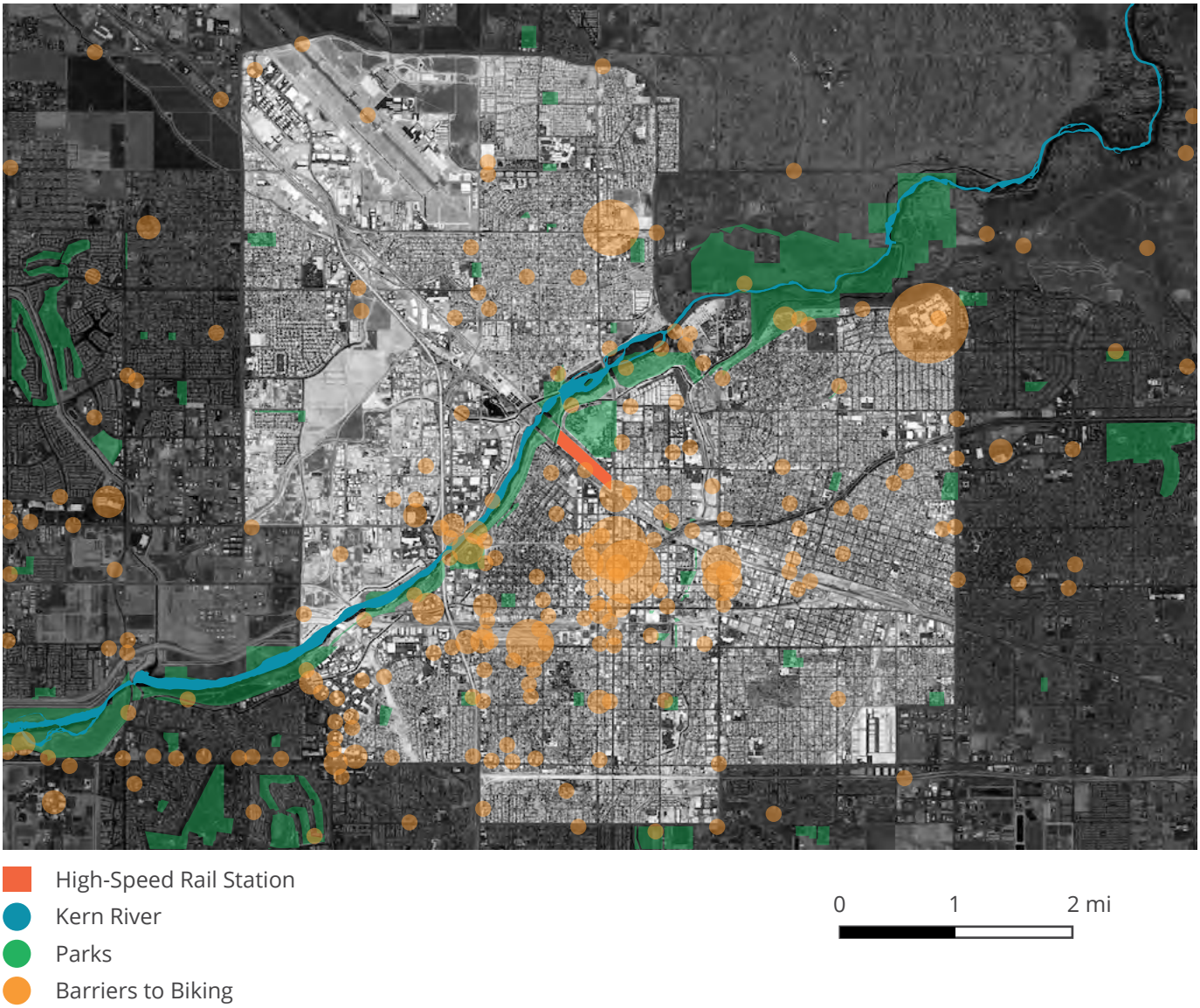



***Figure 19.*** *Top barriers to biking (Note: Residents selected their top obstacles to biking using a Google Maps integration that allowed them to type in a destination or drop a pin on the map.)*

As seen on the destinations and barriers maps (figures 18 and 19), there was a significant overlap between top destinations and barriers. This could be, in part, because people are more likely to perceive the obstacles in places that they do travel to versus places where they do not go. However, it also suggests that there are significant barriers to biking to destinations people want to reach. These areas include commercial centers, such as Costco and the Valley Plaza Mall, and large commercial thoroughfares such as Chester Avenue between 23rd Street and Truxtun Avenue. Other areas that are both popular destinations and spots with barriers include Bakersfield College and Beach Park. Perceived barriers were frequently around freeways or major arterials.

When non-bikers were asked why they don't bike in the area, nearly a quarter of them responded that they were scared a car would hit them, and 64% said they would consider biking if they had safe routes to their destinations. When asked what would make their biking experience more positive, 79% of respondents selected safer routes to their destinations, 45% chose more trees for shade, 41% selected better signage, 36% selected better lighting along the route, and 28% selected better bike parking at their destinations. This data suggests that if Bakersfield builds a safe network, people will use it.

*What are some reasons you don't bike in the area?*

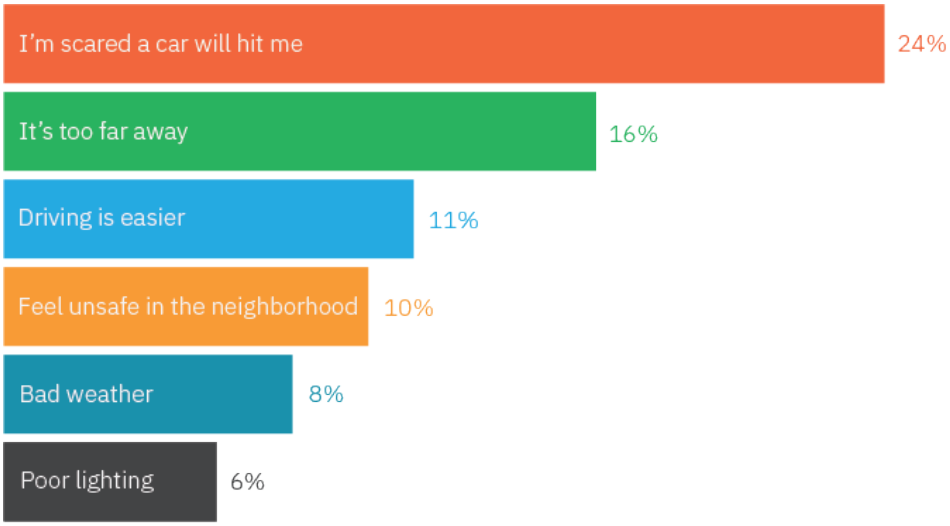



***Figure 20.*** *What are some reasons you don't bike in the area? (Note: Only asked of residents who stated they do not bike in the study area.)*

*Would you consider biking if you had safe routes to your destinations?*


***Figure 21.*** *Would you consider biking if you had safe routes to your destination? (Note: Only asked of residents who stated they do not bike in the study area.)*

*What would improve your experience of biking?*

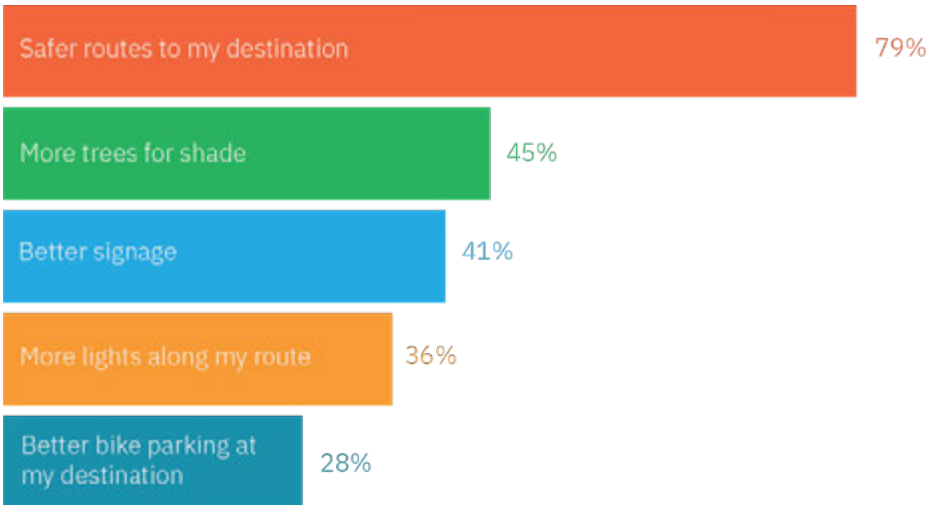
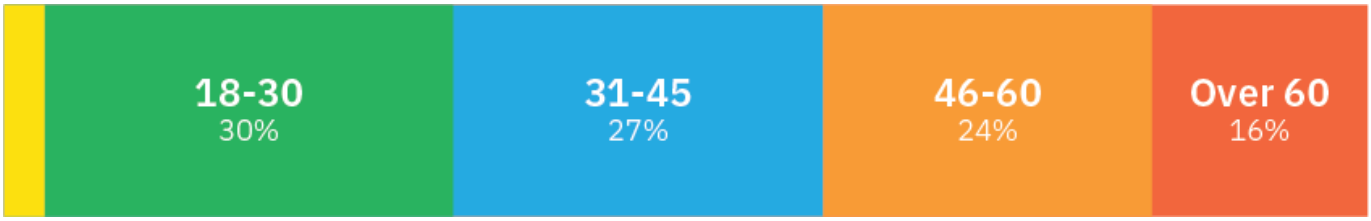
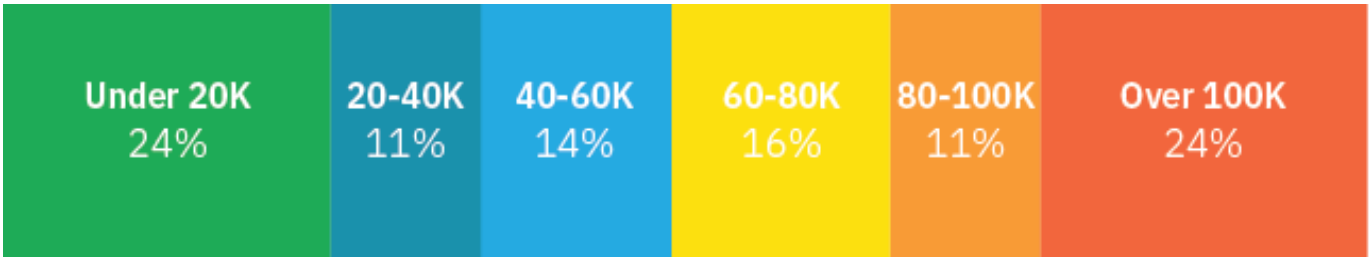



***Figure 22.*** *What would make your biking experience more positive? (Note: Respondents were allowed to select multiple responses and to provide their own.)*

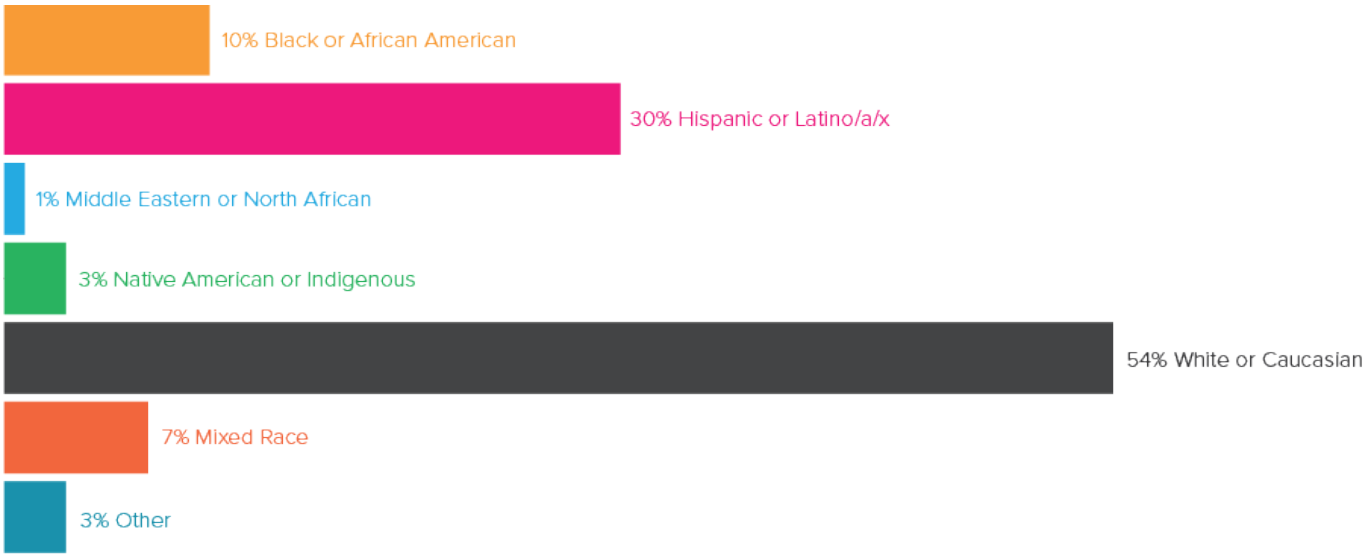
*What is your age?*



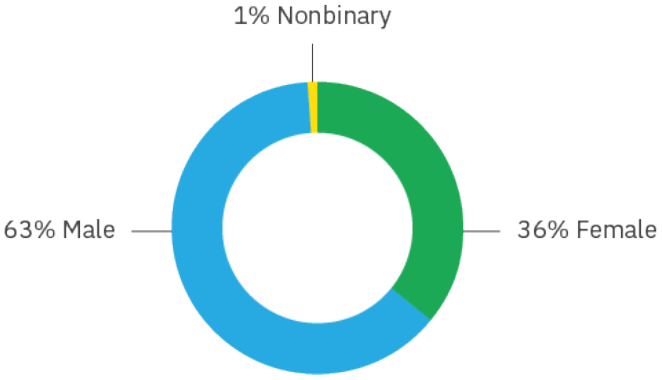

*What is your household income?*




*What is your race/ethnicity?*




*What is your gender identity?*



# RECOMMENDED PROJECTS

All treatments in this section are recommendations and conceptual designs for the ideal network and conditions for the broadest range of riders possible (LTS1). They will require further engineering and design work to implement fully. It is essential for the routes that are implemented to connect to each other. In addition, these routes should be fully low-stress at intersections and crossings and easy for any rider to understand.

The project team used the low-stress facilities in adopted projects, including the Kern Active Transportation Plan (Kern ATP), as the starting point for creating a complete network. The majority of the projects adopted in the Kern ATP do not have a design completed. Therefore some of the recommendations are enhancements and extensions of Kern ATP and other adopted projects.

The projected bike network analysis score (BNA) of the Kern ATP assumes that these projects meet the criteria for low-stress routes. The project team cannot emphasize enough the importance of low-stress intersections in completing the network. Intersections and minor crossings without low-stress facilities serve as a barrier to users and is the reason for the low BNA score in the project area and within the city limits.

Low-stress facilities include segments (bike boulevards, shared use paths, Class 4 protected bike lanes) and crossing treatments (intersections and crossing treatments) with traffic calming and greening throughout.

The community-identified barriers and destinations were used to determine which routes were needed in conjunction with the adopted routes outlined in the Kern ATP. This low-stress network is shown below in Figure 23. The yellow lines highlight which routes the project team recommends adding to complete the low-stress network, while the blue lines represent the low-stress network classified as existing or adopted. Some of the yellow recommended routes include low-stress additions to existing and adopted projects.

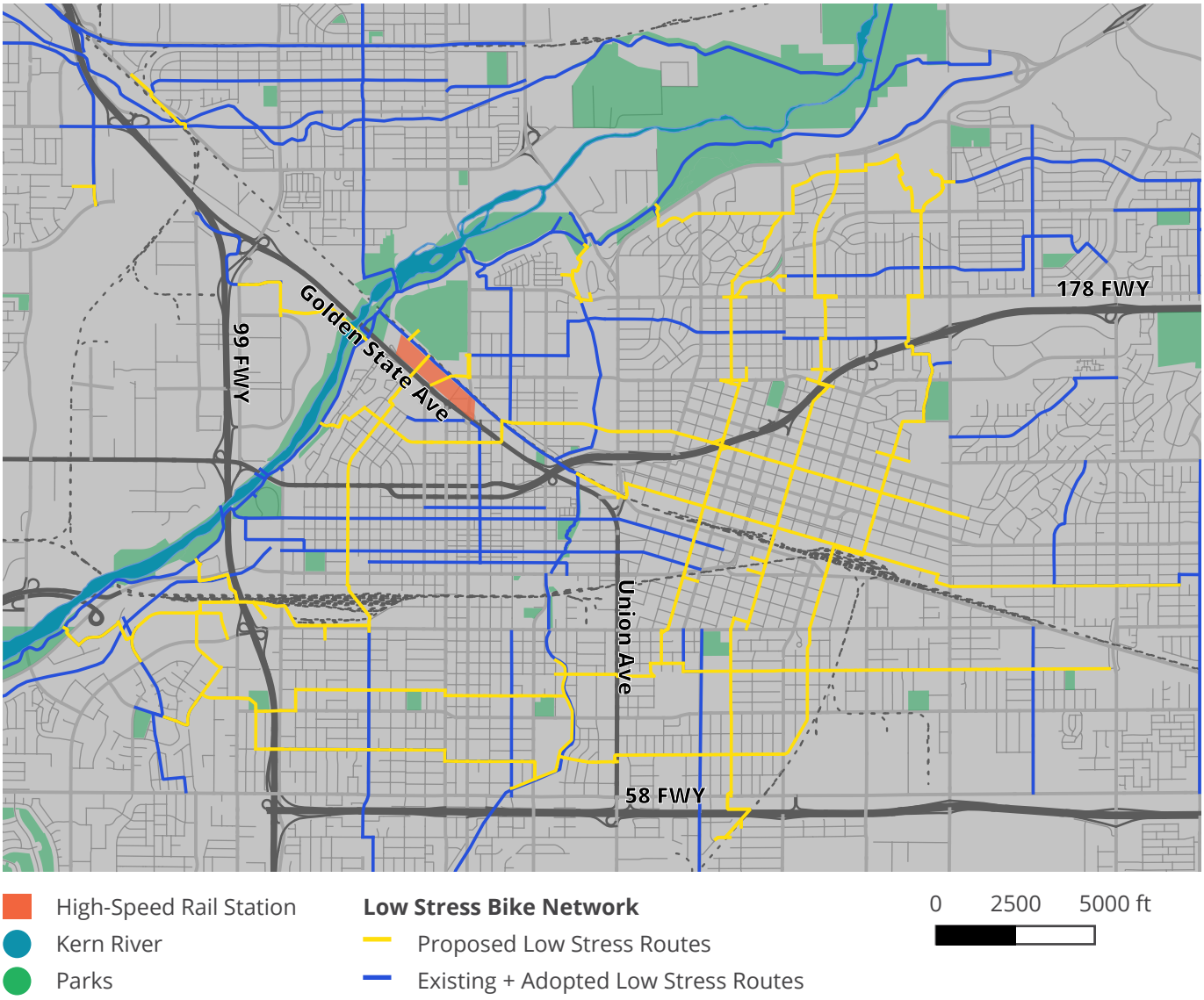



***Figure 23.*** *Map of Recommended Projects overlaid with Existing and Adopted Bike Network*

The bikeshed from the Bakersfield HSR station site is highlighted below (Figure 24). The yellow lines represent all bike-dedicated infrastructure (existing, adopted, and recommended), including both off-street and on-street bikeways. The project team assumed that all intersections on shared use paths, bike boulevards, and protected bike lanes would be built to low-stress standards. Please see the implementation section for further details on design guidelines and standards.

*Note:*
*The project team is sharing recommended projects with the community and government stakeholders in Fall 2020. This network is subject to change depending on community feedback. Additionally, the project team will be proposing an additional 2-5 projects based on the results of our analysis. The recommended network shown below will need further intersection improvements in the Downtown area and parts of East Bakersfield.*

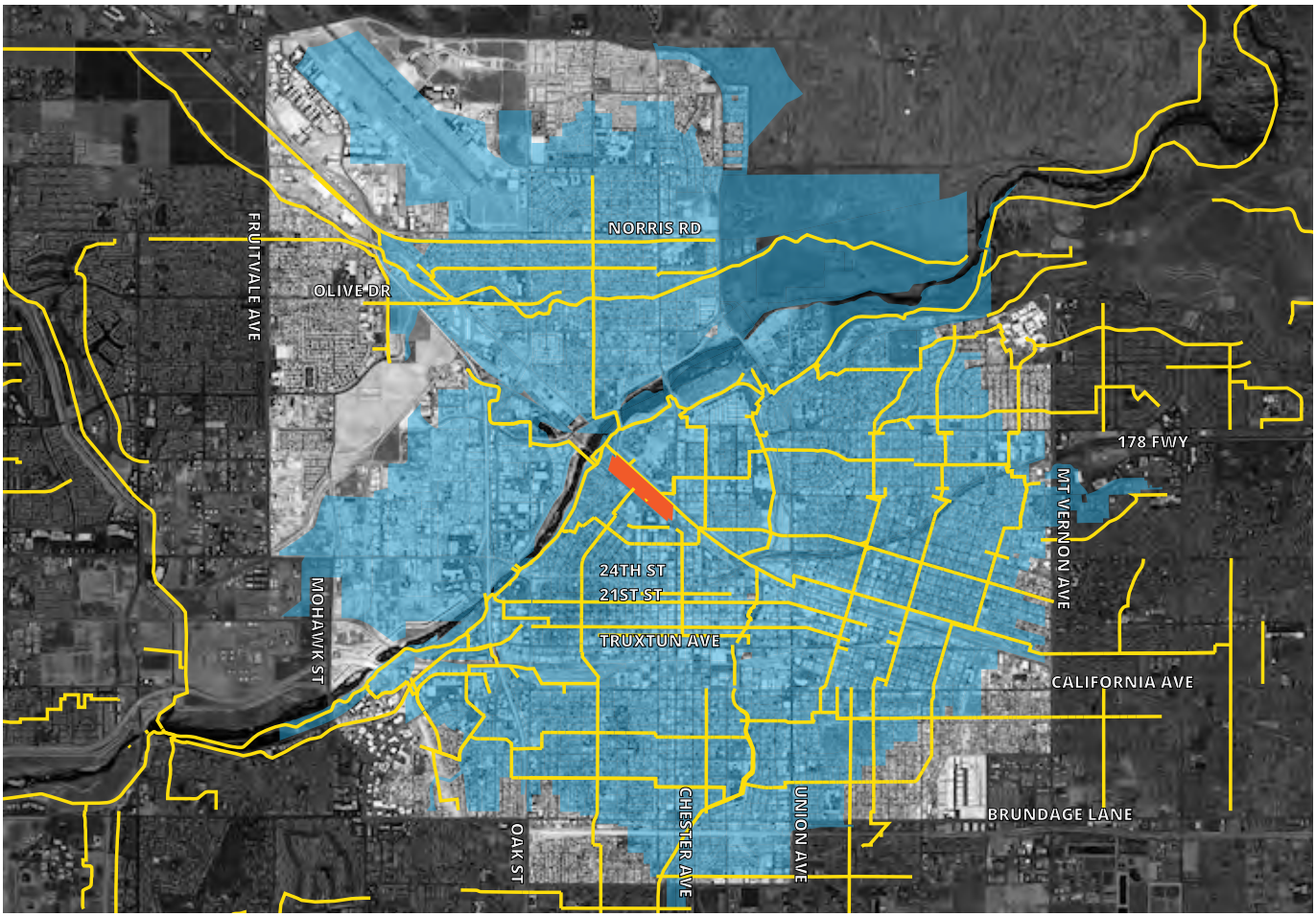



***Figure 24.*** *Bike Travel Shed from the Future HSR Station with Full Low Stress Network*

The project team used the BNA to rank how each project would increase bike access in the planning area. Marginal increases in connectivity (BNA scores) are measured using the full build-out of low-stress facilities adopted in the Kern ATP as a baseline. The recommended projects all have higher BNA scores than the network adopted in the Kern ATP. Some projects increased connectivity significantly. Recommended projects are ranked by the amount of increase in connectivity (Figure 25). Descriptions of each recommended project's route, infrastructure needs, and improvement in BNA scores follow. Projects that will have the most impact in creating a low-stress bike network for Bakersfield are listed first.

| Bakersfield Bike Network Recommended Projects | BNA Overall Connectivity Score | Improvement in Bike Network Connectivity | Connectivity Improvement % Change |
|---|---|---|---|
| Kern Active Transportation Plan Full Buildout (BASELINE SCORE) | 41 | - | - |
| Kern Street Bike Boulevard | 56 | 15 | 38% |
| 30th/Pacific Street Bike Boulevard | 56 | 15 | 37% |
| Gage Street Bike Boulevard (Lakeview to Bakersfield College) | 55 | 14 | 34% |
| Potomac Avenue Bike Boulevard | 54 | 13 | 31% |
| Virginia Street Bike Boulevard | 53 | 12 | 29% |
| Kentucky Street Bikeway Extension | 52 | 11 | 26% |
| Bank Street Bike Boulevard Extension | 52 | 11 | 26% |
| Pine Street Bike Boulevard Westchester Extension | 51 | 10 | 25% |
| California Avenue/Highway 99 Alternative Bikeway Connections | 50 | 9 | 22% |
| Future High-Speed Rail Station Local Bike Connections | 50 | 9 | 22% |
| Kern Island Canal Extension | 49 | 9 | 21% |
| Acacia Avenue Bike Boulevard | 49 | 8 | 20% |
| Hageman Flyover Bikeway | 49 | 8 | 20% |
| Roberts Lane Bikeway | 48 | 7 | 17% |

***Figure 25.*** *Recommended Projects ranked by increase in connectivity.*

## KERN STREET BIKE BOULEVARD

The Kern Street project includes 4.6 miles of primarily bike boulevard and includes five proposed crossing or intersection treatments. Note that the Kern Street Bike Boulevard project encompasses more than just Kern Street and can be renamed and distinguished with wayfinding as the community desires. The Kern Street Bike Boulevard will have the most significant impact connecting the network compared to any other project recommended in this plan. As proposed, there will be a 15 point increase in BNA score or 38% increase in connectivity to a low-stress bicycle network for adjacent census blocks. Currently, these communities have no continuous low-stress connections to the rest of the city. This project will address a large unmet need in communities currently underserved by the existing and adopted bicycle networks.


***Figure 26.*** *Kern Street Bike Boulevard Route*

Starting in the south, the Kern Street Bike Boulevard will require signage at 9th and Kern Street, traffic calming at 10th and Kern Street, and the replacement of existing stop signs at 11th Street with a mini traffic circle.

At East California Ave, the project will become a 2-way cycle track utilizing the existing median where a protected westbound left-turn exists. A further traffic study may be needed to address this intersection with low-stress crossings. Flashing beacons will connect South Kern to Kern Street with calming and neighborhood greening throughout, particularly at Butte Street, Chico Street, and Dolores Street.

The Kern Street project will include an at-grade shared use path of the railroad tracks, with a signalized intersection at East Truxtun Avenue and Kern Street and traffic circles at East 18th Street and East 19th Street. 21st Street will have protected bike lanes as part of the Kern ATP plan, so enhanced crossing treatments between the intersection of these two paths will need to be considered.

Sumner and Kern Street will require new signalization or stop signs and a shared use path across railroad tracks ideally grade-separated, with traffic calming at Jackson Street and Kern Street. At the intersection of Kentucky Street and Kern Street, which will both be part of the low-stress network, a mini traffic circle will encourage traffic calming. The Lake Street intersection will need further study, but improved visibility for cross traffic and bike boulevard traffic is necessary.

Kern Street and both Monterrey Street and Niles Street will require signalization and shifting the diagonal parking to back-in diagonal, specifically between Oregon and

Niles. The Kern Street Bike Boulevard will cross the 178 Freeway on a shared use bridge, which is also proposed in the Pacific Street Bike Boulevard. The bike boulevard treatments and traffic calming should continue seamlessly, specifically on Flower Street and Kern Street. The recommended bridge over the 178 could be used as a quick-build crossing if a road diet were implemented there and the route was detoured (as well as Pacific/ 30th). That would be a short-term solution only until the preferred route options could be built.

Bernard at Kern Street, which is currently a vacant lot, can be made into a safe crossing with pedestrian refuge islands, bulb-outs, traffic yield markings, and potentially a flashing beacon. Wayfinding signage will direct users to two routes to travel up to Bakersfield College: a more direct and steep route and a longer but more relaxed ride using River Boulevard.

- Relaxed Route: extend bike boulevard treatments from Hawthorne Avenue to River Boulevard via both Skyline Avenue and a new multi-use path leading from Huff Street to the River Boulevard and Noble Avenue intersection.
- Direct/Steep Route: North of Tulare Street and Columbus, extend the bike boulevard treatments to Skyline Boulevard with a protected crossing at the five-way intersection of Skyline Blvd, Acacia Ave, and River Blvd.

At River Blvd, both route options merge. The bike boulevard takes a protected left to a crossing of Acacia onto Amherst Street, then right onto Princeton Avenue. From there, riders will travel through to a protected crossing at Haley Street Crossing into the heart of the Bakersfield College campus.

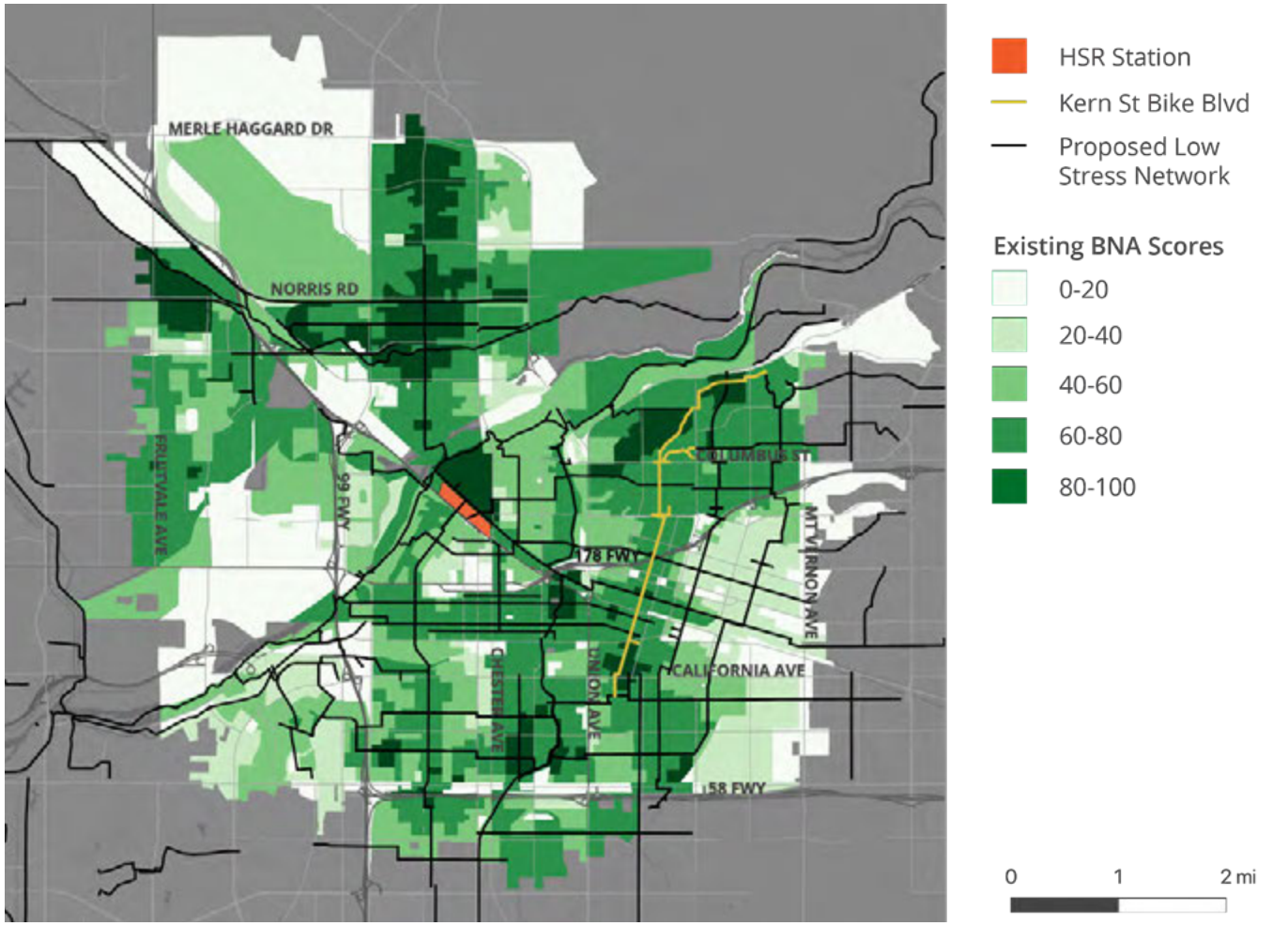



***Figure 27.*** *Kern Street Bike Boulevard BNA Score*

## 30TH/PACIFIC STREET BIKE BOULEVARD

The 30th/Pacific Street Bike Boulevard project recommends 4.1 miles of new bikeways and utilizes the recommended multi-use bridge crossing of the 178 Freeway proposed in the Kern Street project. The recommended project travels east/west from the Kern River Parkway, through downtown and the HSR station area, and can be continued eastward, outside the project area.

As proposed, this project would increase BNA score by 15 points, or a 37% increase in connectivity to low-stress networks for the adjacent census blocks. This proposed project will connect neighborhoods east and west of downtown using this wide street and proposed treatments to bring communities to and from downtown all the way East towards Kern Medical Center while seamlessly connecting to existing low-stress infrastructure.

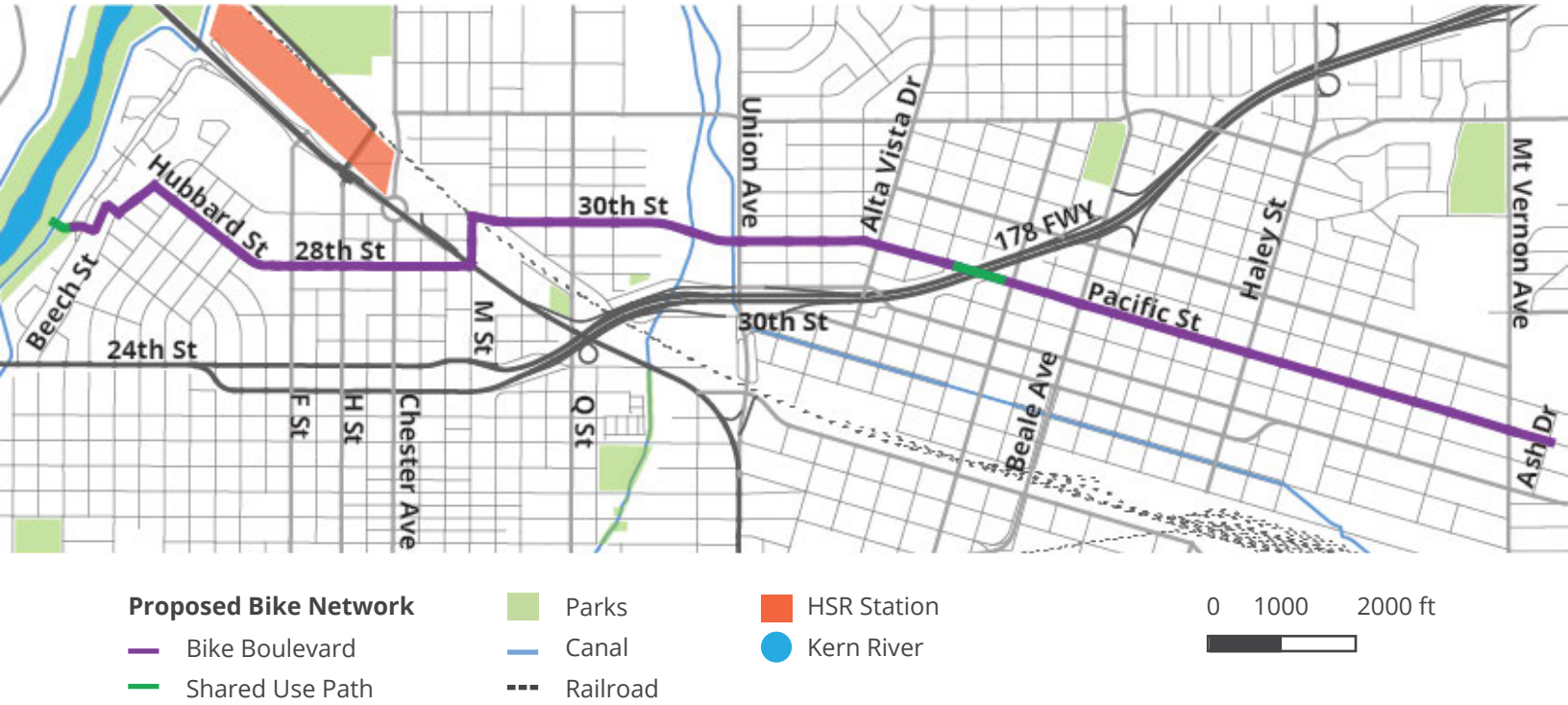



***Figure 28.*** *30th/Pacific Street Bike Boulevard*

A new bike boulevard from the Kern River Parkway trail through the Westchester neighborhoods north of 24th Street will require wayfinding and the utilization of existing alleys. This project includes mini traffic circles and traffic calming at Drake Street and Beech Street, Hubbard Street and Beech Street, and Hubbard and Pine Street. The project team recommends bike boulevard treatments on 28th Street. The street is also wide enough for protected bike lanes as well, and they should also be considered here.

Traffic calming along 28th Street, with a right-hand turn lane and straight travel bike lane at F street and 28th towards the HSR station with signalized intersections at 28th and H Street, and Chester and 28th. On 28th Street east of Chester Ave, the diagonal parking will need to be converted to back-in diagonal parking. Create either a 4-way stop or traffic calming at 28th and K street, which will be an intersection of the K St bike boulevard.

In the area of 28th, M Street, and Golden State Avenue, which will be part of the HSR station area, install a protected intersection with bike boxes and leading pedestrian intervals. Special design consideration is needed for this intersection as an entrance to the HSR station, a low-stress connection to the shared use path along the HSR alignment from M Street, and improvements to the railroad crossing. The project should include wayfinding and traffic

calming through the M Street intersection to 30th, upgrading the existing bike lanes on 30th street. Q Street and 30th Street will need to be signalized with enhanced traffic calming measures like complete high-vis crosswalks, median refuge islands, and bulb-outs that seamlessly connect to a buffered bike lane east of Q Street and crossing Union Avenue.

Traffic calming should be standard at every neighborhood intersection east of Union Avenue on Pacific Street, including bulb-outs, chicanes, or street trees. Traffic diversion measures like right turn only can be considered at Alta Vista and Pacific Street. Wayfinding will lead to a shared use bridge over the 178 Freeway used by both the Kern Street and Pacific Street Bike Boulevards.

South of the 178 freeway, install traffic calming throughout neighborhoods with hi-vis crosswalks and ensure there are as few stop signs as possible along Pacific Street. Build median refuge islands at Baker Street and Pacific Street, and mini traffic circles to calm traffic at King Street, Gage Street, and Virginia Street intersections with Pacific Street. At Pacific and Beale Street, and Pacific and Mount Vernon, install new traffic signals and protected intersections.

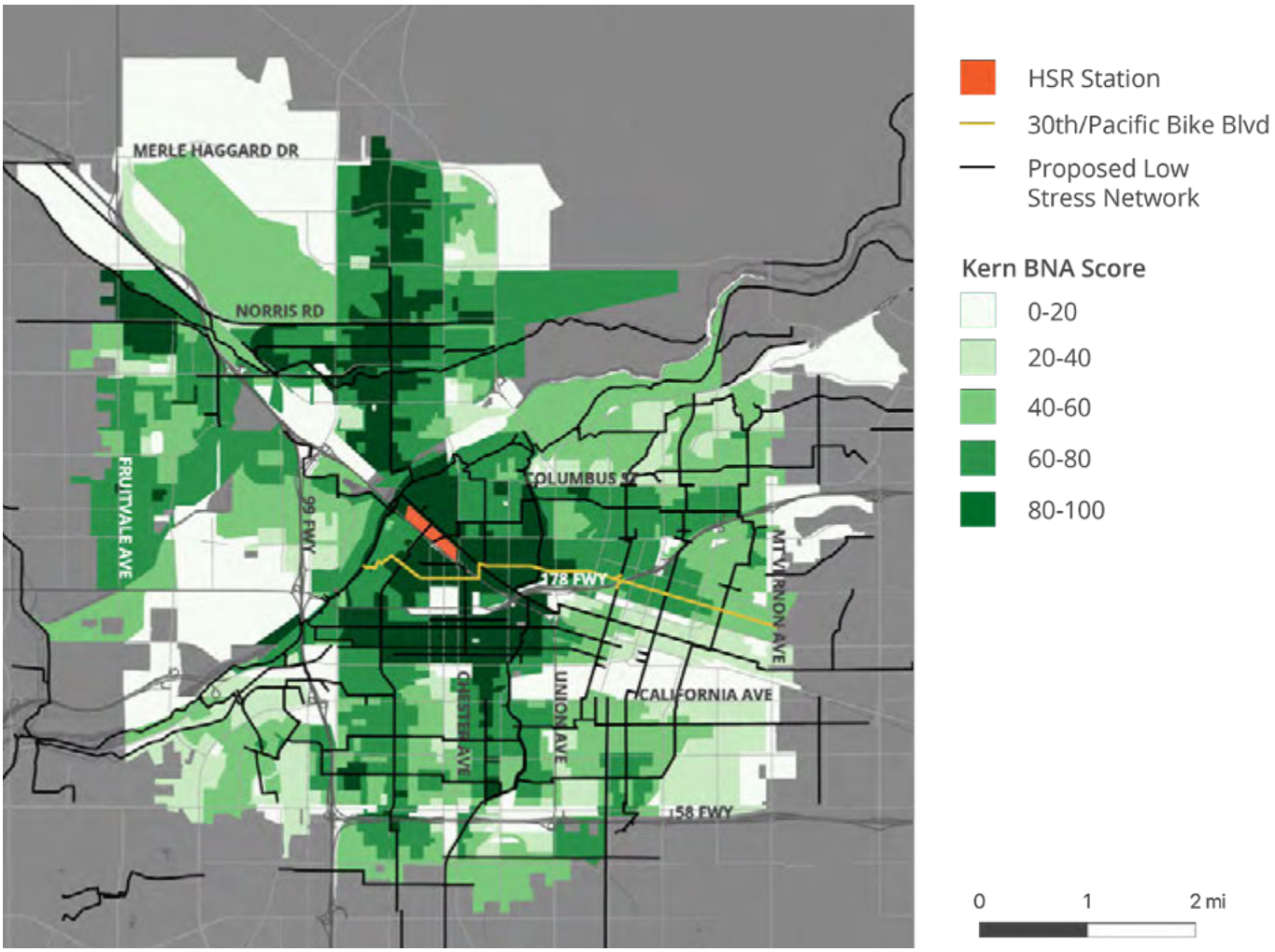



***Figure 29.*** *30th/Pacific Street Bike Boulevard BNA Score*

## GAGE STREET BIKE BOULEVARD


Parks
Canal
Railroad

**Proposed Bike Network**

Bike Boulevard
Shared Use Path

0 .25 .5 mi

***Figure 30.*** *Gage Street Bike Boulevard Route*

The Gage Street Bike Boulevard project proposes 4.7 miles of bike boulevard, a cycle track along the existing Bernard Street Bridge, above-grade railroad crossings. This project includes traffic calming measures at Knotts Street and Gage Street. As proposed, this project will increase BNA score by 14 points, or a 37% increase in connectivity to low-stress bike infrastructure for adjacent neighborhoods.

This route will connect residents from the Northeast Bakersfield, Central Bakersfield, and Old Town Kern, to Lakeview and Martin Luther King Jr. Park neighborhoods and important destinations, including Bakersfield College, Kern Medical Center, and east/west routes along the bike network. This project will cross two freeways, two railroad tracks, and six major roadways. This project will also intersect with seven other segments recommended in the bike network.

Starting at the intersection of Panorama Drive and Bucknell Street, install bike boulevard greening and traffic calming throughout. This route will require median refuge crossings, wayfinding around the intersection of University Avenue and Noble Avenue. At Columbus and Nelson street, NACTO Guidelines for Offset intersection should be applied.

The bike boulevard treatments will connect to a shared use path installed on the existing Height Street bridge to cross the 178 freeway, with traffic calming and a mini traffic circle at Gage and Knotts Street. An alternative to the Height Street shared use path crossing, Knotts street can be constructed to a protected shared use bridge crossing.
The Gage Street project includes a 2-way cycle

track on Bernard Street from Beale Avenue to Haley Street with traffic calming throughout neighborhoods. The Gage Street and Flower Street intersection require median refuge crossings, flashing beacons, and a protected intersection.

Add new signalization on Gage Street at Niles Street and Monterey Street with traffic calming in the neighborhoods and wayfinding where bike boulevards meet. A new above grade shared use path will land at a new fully protected intersection at East Truxtun Avenue and Gage Street, with low-stress exits to both East 21st Street and Sumner Street with crossing treatments.

This project will require a fully protected signalized intersection at Owens and East California with traffic calming from both approaching directions, wayfinding at Potomac Avenue and Texas Street, and traffic calming measures in particular at Gage Street and Virginia Avenue.

NACTO Guidelines for Offset intersection should be applied at East Brundage Lane and Owens street, with new signalization and a low-stress crossing to the shared use path adjacent to the railroad tracks with the potential to create a shared use path through currently vacant lots. The shared use path along the railroad tracks should include low-stress treatments at the crossings of Padre Street, Feliz Drive, and South Hayes Street.

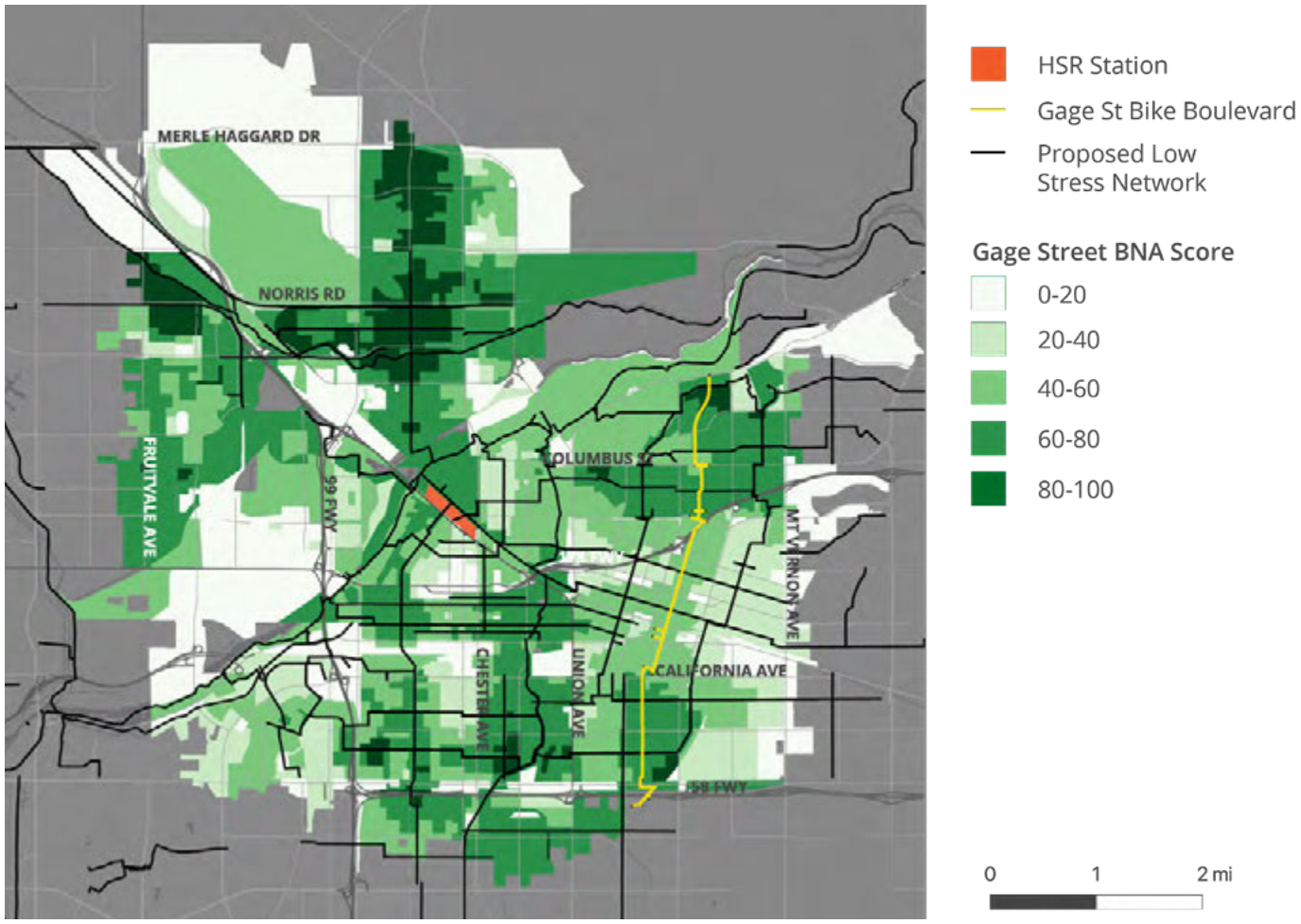



***Figure 31.*** *Gage Street Bike Boulevard BNA Score*

## POTOMAC AVENUE BIKE BOULEVARD

The Potomac Avenue Bike Boulevard will increase BNA score by 13 points, or a 31% increase in connectivity for adjacent census blocks. The project proposes 6.6 miles of bike boulevard, an at-grade railroad crossing, and improvements and installations of protected pedestrian treatments.

The route begins from the Kern River Parkway Trail with a shared use path that crosses Truxtun Avenue via Commercial Way with wayfinding and bike lane treatments along Commerce Drive to the planned Westpark Multiuse Trail and Marella Way shared use route.

Once on Garnsey Lane, install traffic calming in the neighborhoods with a mini traffic circle at Real Road and Garnsey Lane. Vacant lots adjacent to Garnsey and Real Road could extend the shared use path through Saunders Park. At Palm Street and Wetherley Drive, south of Saunders Park, traffic calming and wayfinding will seamlessly connect the route with the Bank Street Bike Boulevard while also protecting those crossing Palm to use Saunders Park.

On the north side of the street along Palm Street and bridge over the 99 Freeway, protected bike lanes or a 2-way cycle track will create less stress at the Palm and Oak Street intersection, with wayfinding from Palm Street east to Olive and Dracena Streets with traffic calming at minor street crossings as standard.

At H Street, 6th, and Dracena Streets, use NACTO Guidelines for offset intersections. Extend bike boulevard treatments onto 6th street, a traffic light at Chester and 6th, traffic calming, and median refuge island at P Street and 6th Street. Extend treatments to the planned shared use path along the canal, with wayfinding installations to connect the bike boulevard treatments along 8th Street starting from the canal.

At Union and 8th Street, use NACTO Guidelines for offset intersections to route onto East 8th Street. Once on East 8th Street, use traffic calming measures and wayfinding to route the bike boulevard onto Potomac Avenue.

Install protected intersection at South King Street and East Potomac, and a signal at Potomac Ave and Dr. Martin Luther King, Jr. Boulevard. Throughout these neighborhoods, install traffic calming at the minimum, with an at-grade railroad crossing west of Washington Street. Install protected intersection treatments traveling east, including Washington Street, Beverly Drive, and Mount Vernon Avenue.

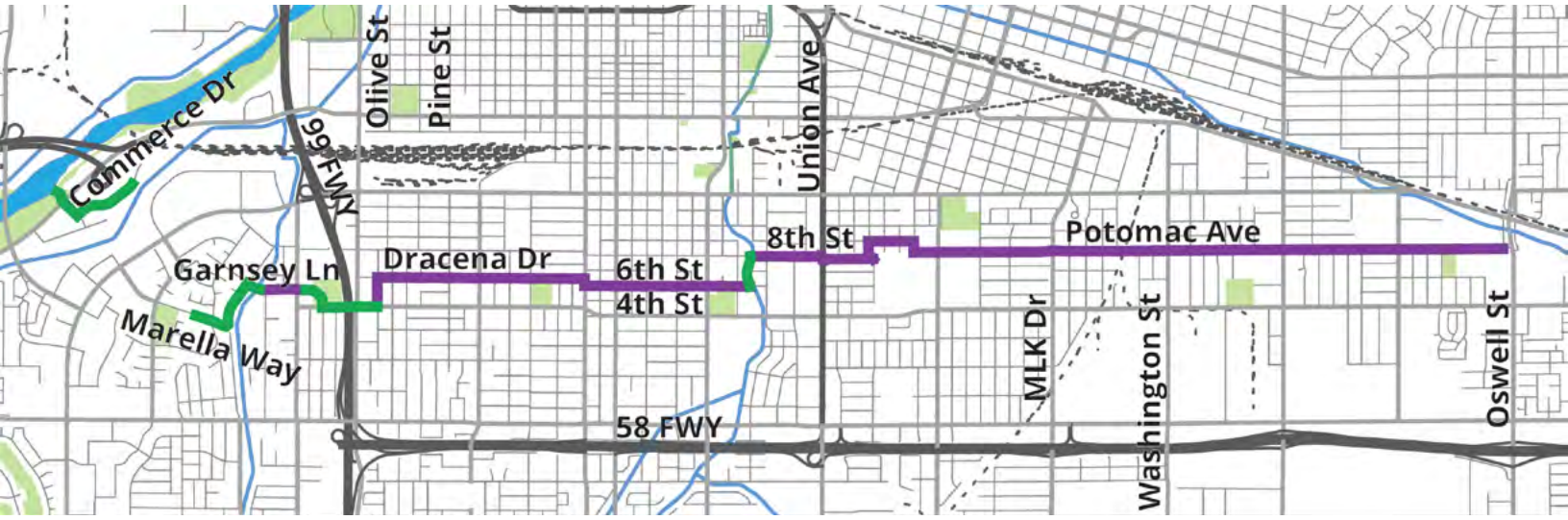



***Figure 32.*** *Potomac Avenue Bike Boulevard Route*

At the Mt. Vernon and Potomac intersection, crossing treatments like rapid flashing beacons, median refuge islands, and paint are essential to protect children who need to reach the adjacent school. The treatments can extend to Oswell Street, which is outside of this report's project area.

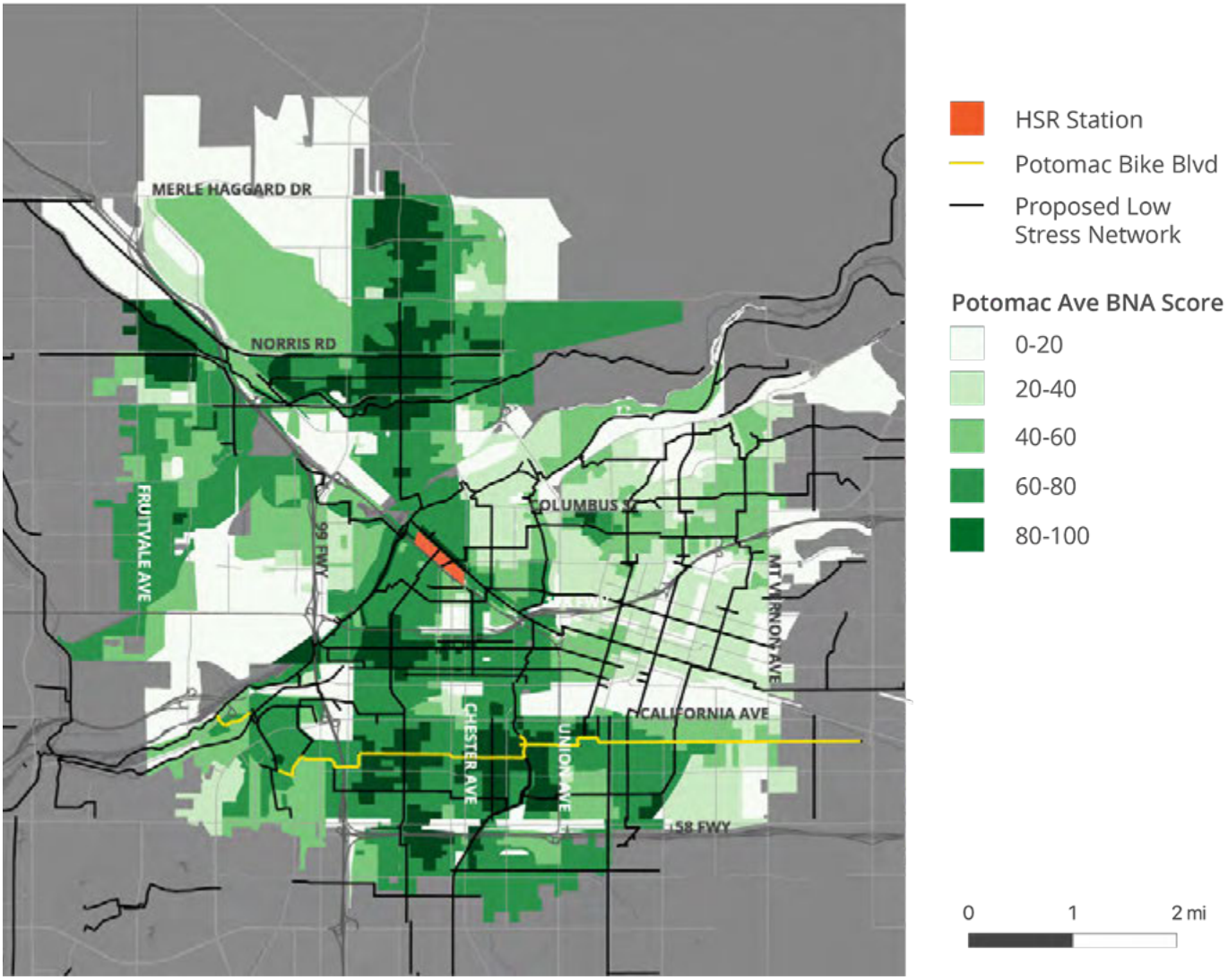



***Figure 33.*** *Potomac Avenue Bike Boulevard BNA Score*

## VIRGINIA STREET BIKE BOULEVARD

The Virginia Street Bike Boulevard will increase the BNA score by 12 points, or a 29% increase in low-stress connectivity for adjacent census blocks. It proposes 3.3 miles of bike boulevard and a canal bridge crossing.

This project recommends a route from the core of Bakersfield College at the large football stadium parking lot. The route will start with a protected crossing of University Avenue to the south of Bakersfield College onto Occidental Street. Wayfinding and bike boulevard treatments on Noble Avenue and a 2-way cycle-track along Columbus with median refuge islands on Columbus will guide the route to Sunny Lane. On Sunny Lane, the bike boulevard will connect to a new shared use path on existing Height Street, crossing the 178 Freeway landing at a bike boulevard at Floral Drive.

Bernard Street and Camino Real will require traffic calming and median refuge islands with a design that continues onto Ridge Road. This will intersect with the planned Virginia Street Bike Boulevard and will need enhanced traffic calming on Flower Street and Virginia Street, and Virginia and Niles Street.

At Virginia and Lake Street, a shared use path bridge starting at the canal will cross over Kentucky Street and railroad tracks. This bridge can be extended to East Truxtun with low-stress crossings at minor streets. Wayfinding and bike boulevard treatments will route the project onto Brown Street. The East California Avenue/ Brown Street/South Brown Street and also South Brown and Potomac Avenue intersections need upgrades to signalized and protected intersections.


***Figure 34.*** *Virginia Street Bike Boulevard Route*

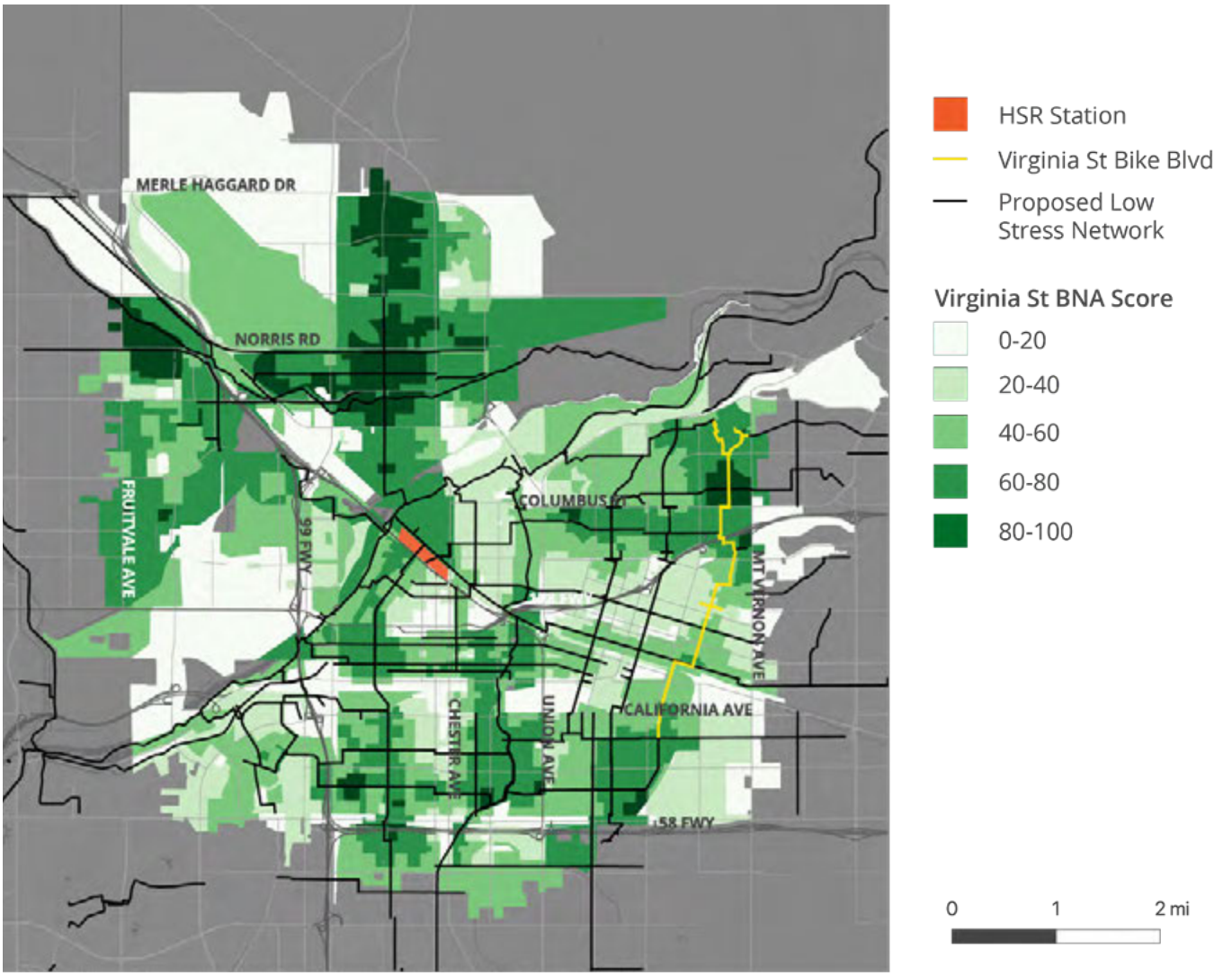



***Figure 35.*** *Virginia Street Bike Boulevard BNA Score*

## KENTUCKY STREET BIKEWAY EXTENSION


***Figure 36.*** *Kentucky Street Bikeway Extension*

The Kentucky Street Bikeway extension proposes 3.5 miles of Class 2 bike lane, pedestrian treatments on minor crossings, the Beale Avenue underpass, and an at-grade railroad crossing at Kentucky and Sumner Street. This will increase active transportation traffic to and from Kentucky Street and promote businesses in historic Old Town Kern and east.
These recommendations would increase the BNA score by 11 points, or 26% for the area, with the baseline score including the existing Kentucky Street Urban Greening Project that is under construction at the time of this report.

This project recommends extending the shared use path to be built adjacent to the HSR alignment directly onto Kentucky Street east of the proposed HSR station area. It will include underpass enhancements at Kentucky Street and Union Avenue. This project recommends an at-grade crossing of the railroad tracks and a bike boulevard that seamlessly reaches the City of Bakersfield's Kentucky Street Urban Greening Project. Connectivity to this project requires calming measures like bulb-outs at Kentucky Street and Baker Street to the west of the Urban Greening Project while extending the Kentucky Street Urban Greening Project treatments east to cross Mount Vernon via Center Street with underpass enhancements.

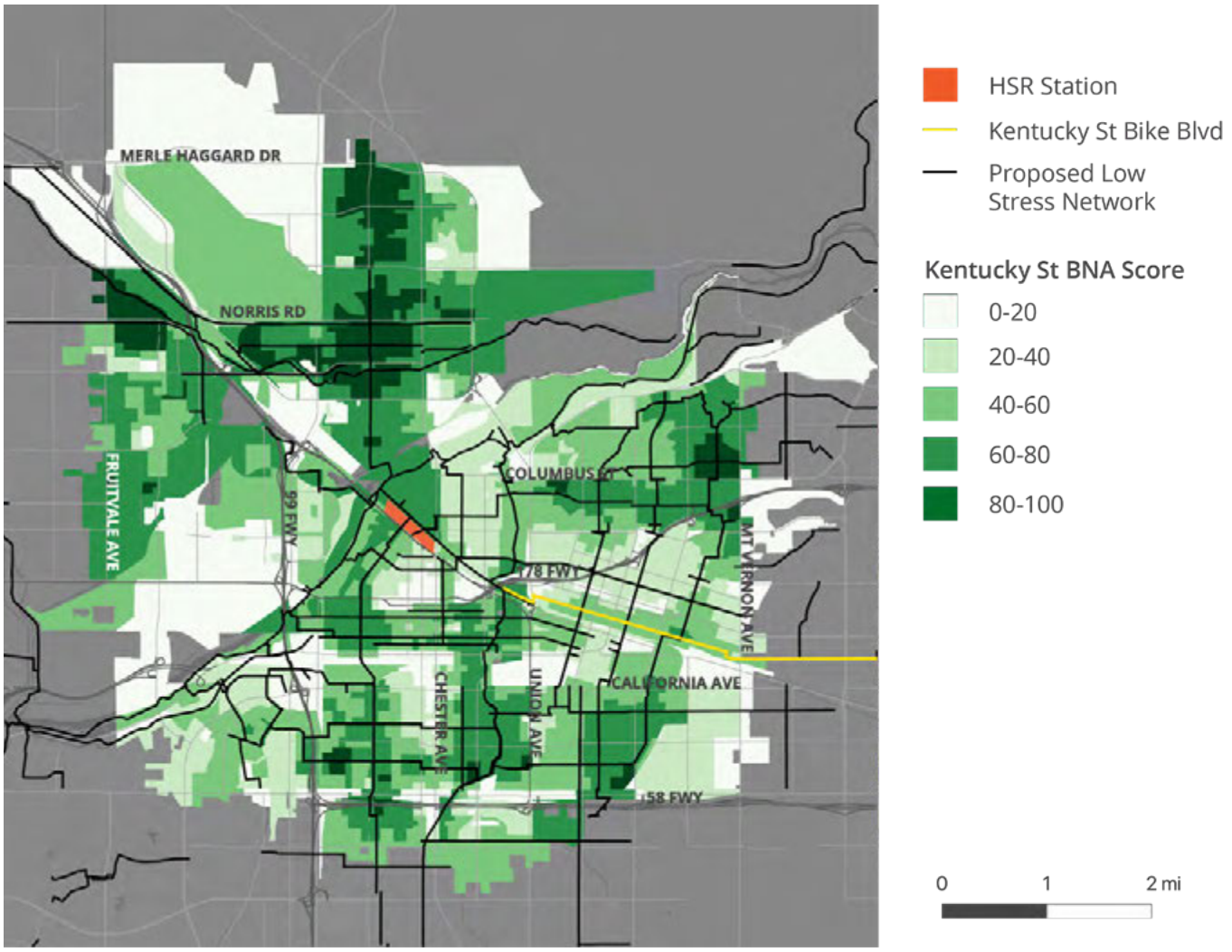



***Figure 38.*** *Kentucky Street Bikeway Extension BNA Score*

***Figure 37.*** *Kentucky Street Bikeway Extension BNA Score*

## BANK STREET/SOUTH BROWN BIKE BOULEVARD EXTENSION

The Bank Street Bike Boulevard recommends a low-stress east and west crossing of the 99 Freeway with 4.6 miles of bike boulevard that would increase connectivity by 11 points, or 26%. Starting in the east from Saunders Park, traffic calming or a traffic circle at Wetherley Drive and Palm Street will slow traffic for the park users. Palm Street will need a shared use path bridge over the 99 Freeway and protected intersection treatments crossing Oak Street. Traffic calming throughout the neighborhoods east of Oak Street, a mini traffic circle or median refuge islands Bank Street and A Street, and special consideration of crossing treatments suitable for the adjacent school will significantly improve neighborhood connectivity, both east and west.

The treatment from the NACTO Design Guidelines for Offset Intersections is needed at H Street and Spruce Street, and also Union Avenue/2nd and Texas Street. This project recommends signalization at Chester and 2nd Street, wayfinding to intersect the M Street Bike Boulevard, and wayfinding to a shared use path at P Street.

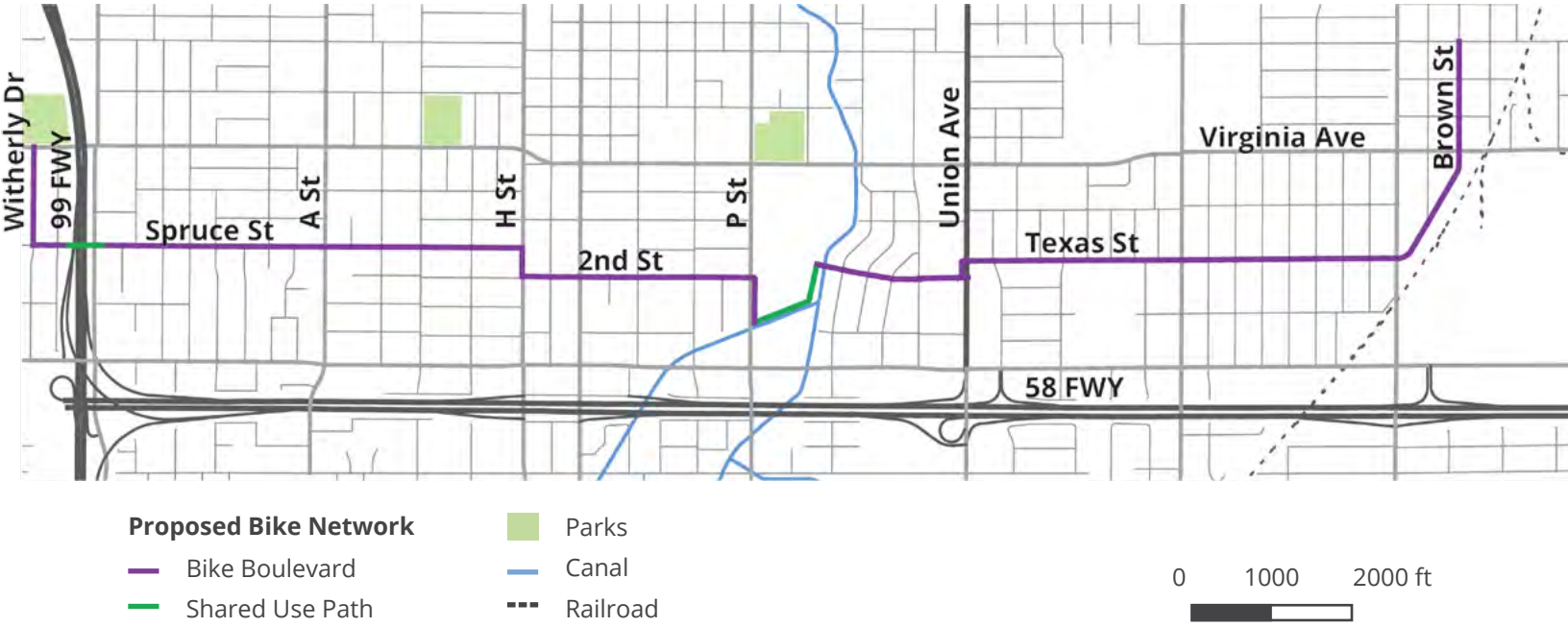



***Figure 39.*** *Bank Street/South Brown Bike Boulevard Extension*

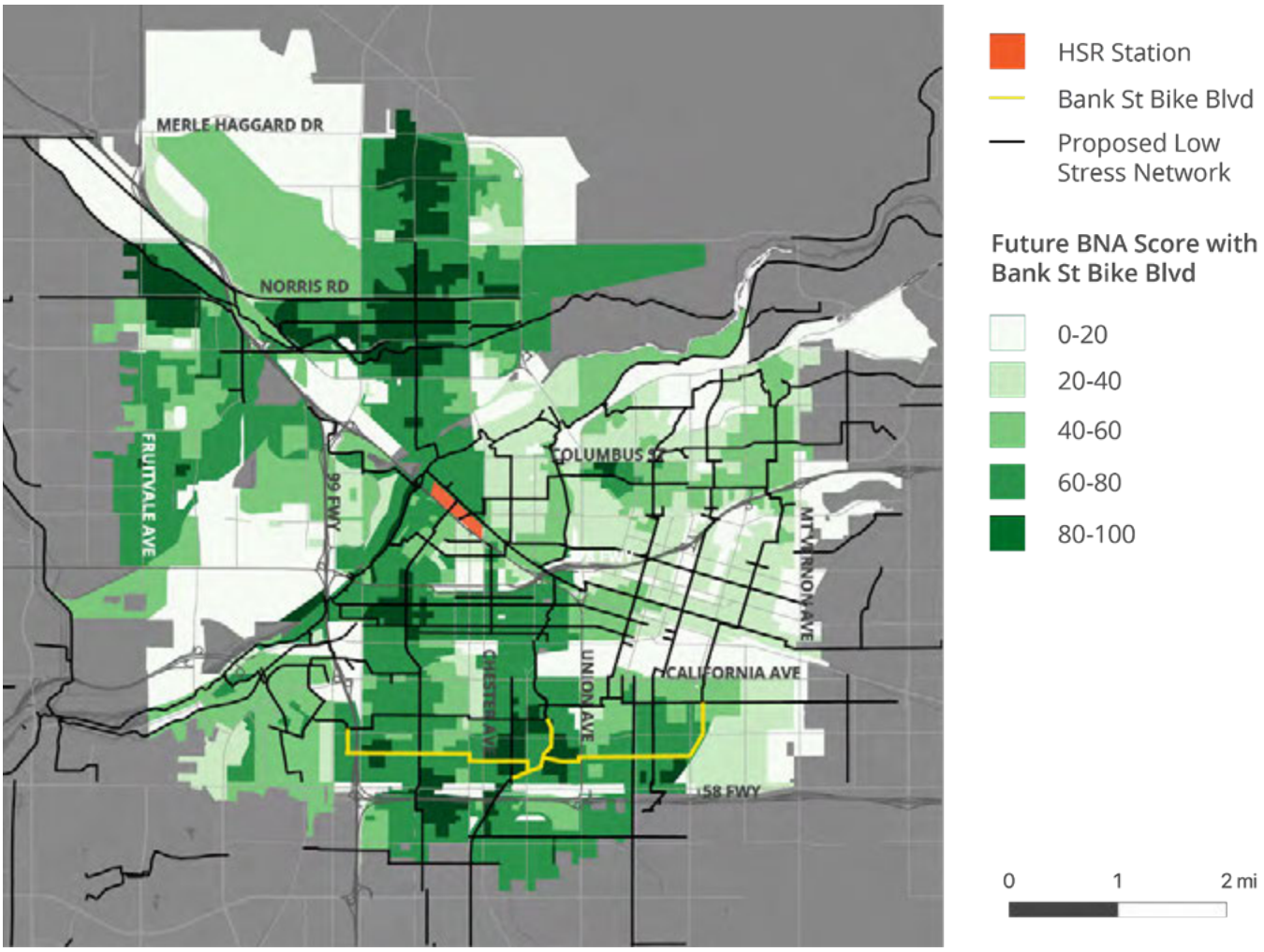



***Figure 40.*** *Bank Street Bike Boulevard Extension BNA Score*

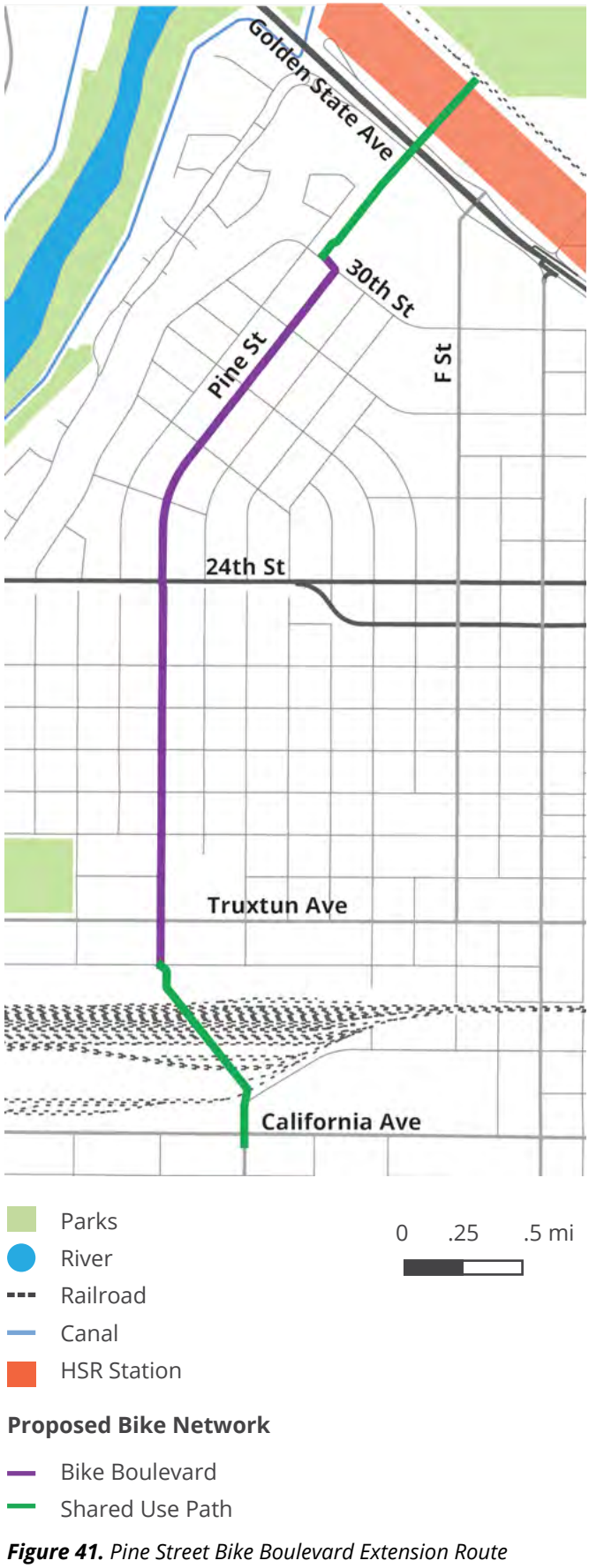



***Figure 41.*** *Pine Street Bike Boulevard Extension Route*

## PINE STREET BIKE BOULEVARD WESTCHESTER EXTENSION

The Pine Street Bike Boulevard recommends 1.2 miles of bike boulevard that would increase connectivity by 10 BNA points, or a 25% increase in connectivity for adjacent neighborhoods.

Currently, the 24th Street Improvements essentially splits Westchester neighborhoods, with Pine Street as the only low-stress crossing of 24th Street. The northern neighborhoods of Westchester are immediately adjacent to the future HSR station but are also an island surrounded by high-stress roads or intersections.

A new grade-separated shared use path which can be over or under Golden State Highway from the HSR station through the existing Golden State Mall with wayfinding to route onto the 30th Street then Pine Street with bike boulevard treatments or wayfinding treatments until the rapid flashing beacon crossing 24th Street.

The neighborhoods around 21st, 19th, and 18th Streets should have traffic calming throughout, including median refuge islands where Pine Street intersects. Upgrade the existing diagonal curbside parking to back-in diagonal parking between 18th Street and Truxtun Avenue alone Pine Street.

At Truxtun and Pine Street, which is adjacent to a hospital, a new signalized and protected intersection will assist cyclists and pedestrians. A shared use bridge with wayfinding from Truxtun Avenue will cross over 16th and Pine Streets to land at a new signal at the A Street and California Avenue intersection by Bakersfield High School. Clear wayfinding is needed throughout.

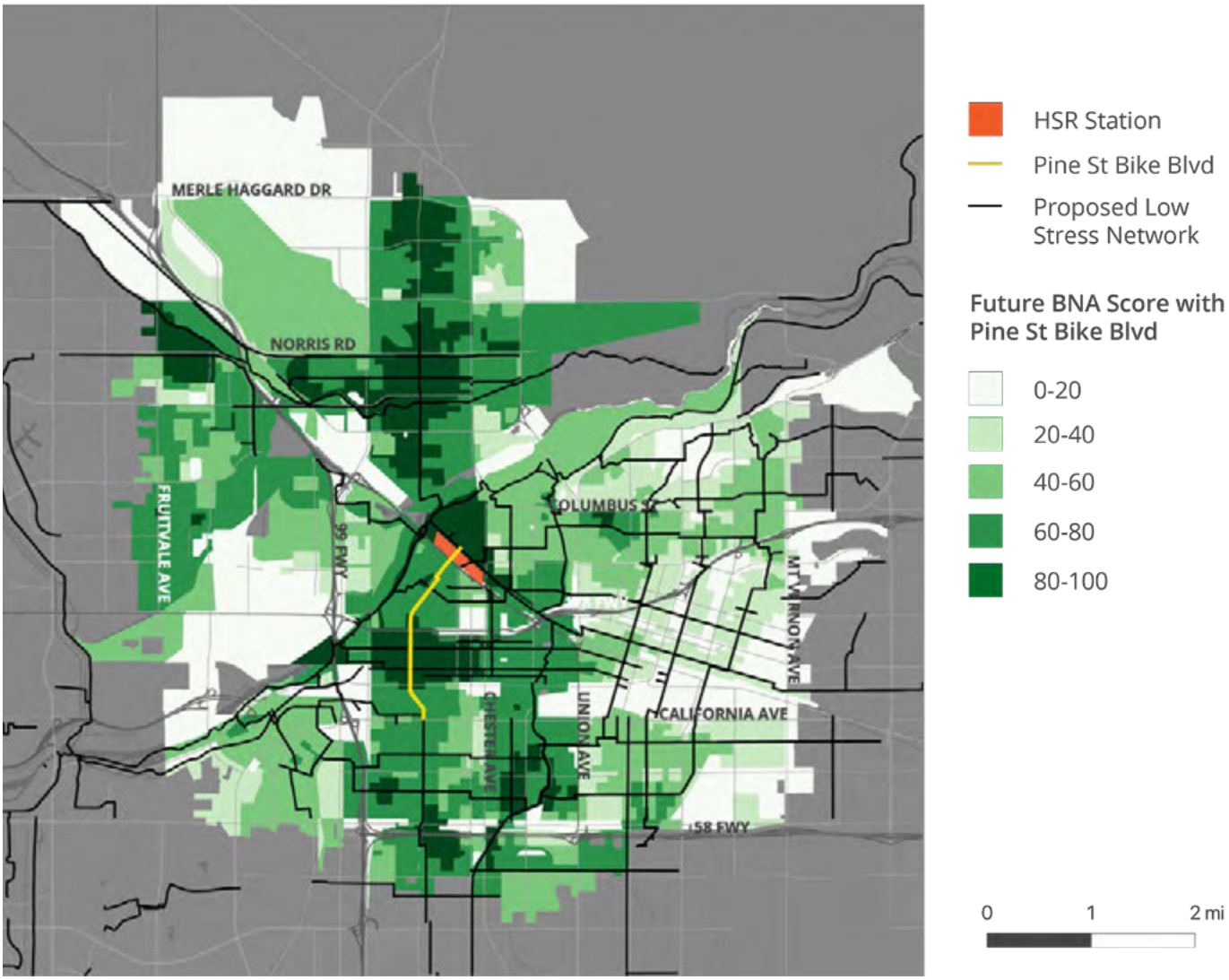



***Figure 42.*** *Pine Street Bike Boulevard Extension BNA Score*

## CALIFORNIA AVENUE/99 FREEWAY ALTERNATIVE BIKEWAY CONNECTIONS

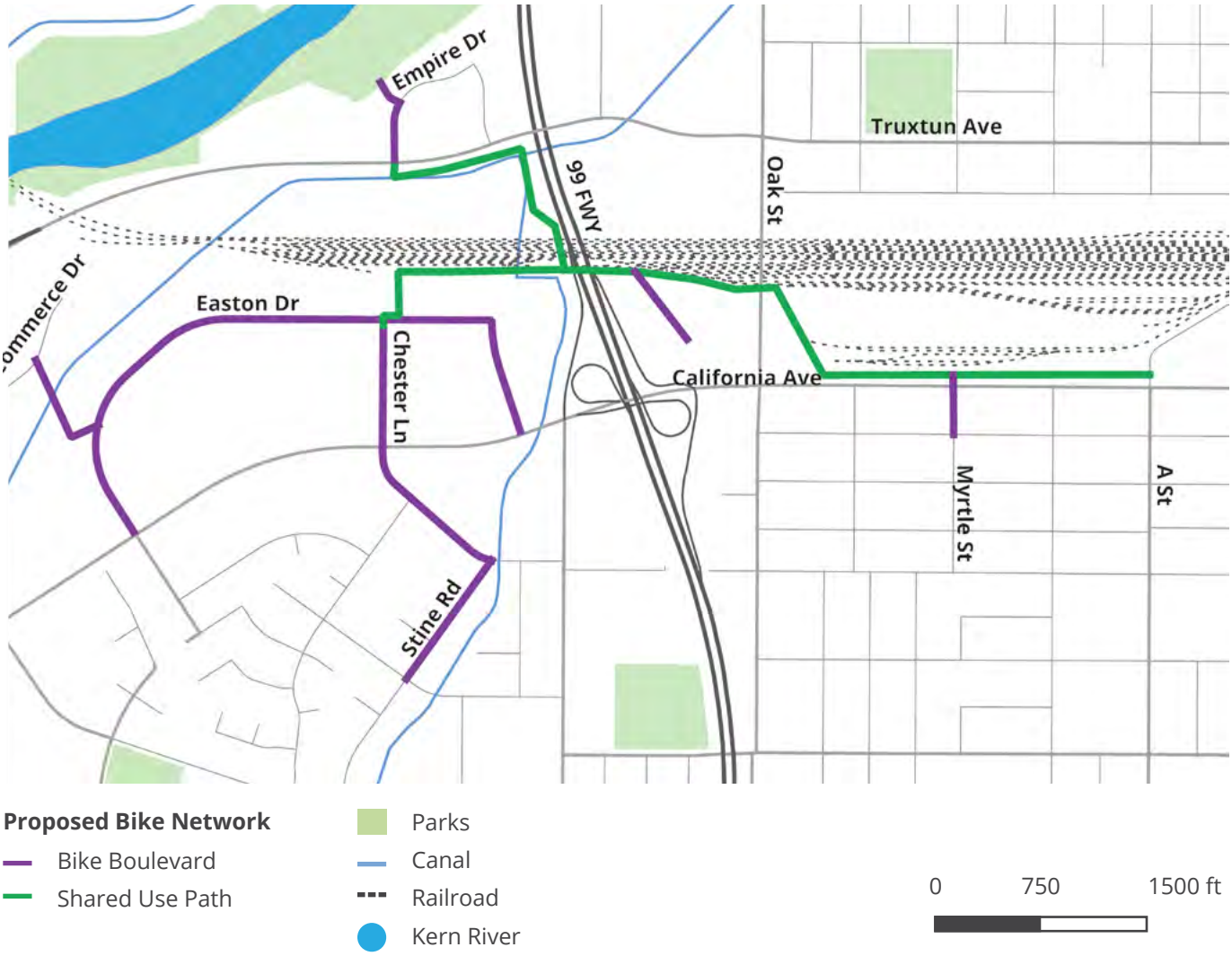



***Figure 43.*** *California Avenue/Hwy 99 Alternative Bikeway Connections Route*

This project proposes 1.7 miles of low-stress bike lanes, boulevards, and shared use paths. The project will increase the BNA score by 9 points, or a 22% increase in connectivity for adjacent neighborhoods. Improving the safety and availability of safe walking and biking routes will promote business while decreasing parking and traffic congestion. There are currently no alternatives to cyclists using collector streets of California Avenue and Mohawk Street.

Starting at the Kern River Parkway Trail at Yokuts Park, this project proposes bike boulevard treatments on Empire Drive and Bahamas Drive, with wayfinding encouraging cyclists to use a new protected intersection at Empire Drive and Truxtun Avenue. This will lead to a shared use path on the south side of Truxtun Avenue adjacent to city property that will route onto a bikeway along the canal.

Parallel to the 99 Freeway, this project recommends building a separate above-grade shared use bridge to cross the railroad tracks. The shared use path will utilize the path south of the tracks in the railroad right-of-way, traveling both east and west under the 99 Freeway/58 Freeway interchange bridge.

To the east along this railroad shared use path is full access to businesses at the California Avenue and Oak Street intersection. Further east, this shared use path will route under the existing Oak Street bridge to land at a protected intersection at California Avenue and Myrtle Street.

The shared use path from the railroad tracks traveling west will end at the intersection of Easton Drive and Chester Lane, with wayfinding to encourage cyclists to use the Chester Lane bike boulevard. To cross California Avenue, the intersection needs upgrades, including median refuge crossings, a rapid flashing beacon, and traffic calming along California Avenue.

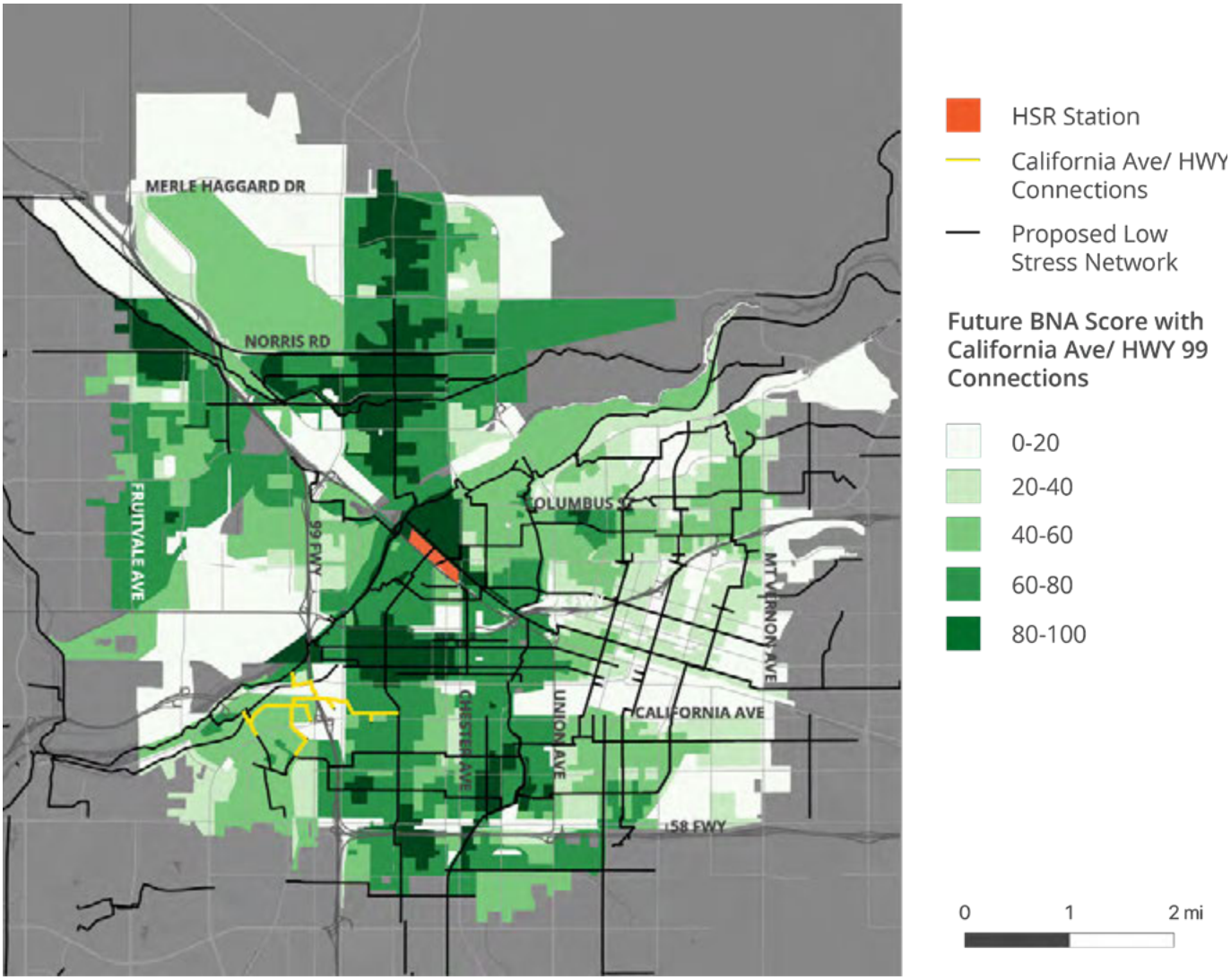



***Figure 44.*** *California Avenue/Hwy 99 Alternative Bikeway Connections BNA Score*

## FUTURE HIGH-SPEED RAIL STATION LOCAL BIKE CONNECTIONS


***Figure 45.*** *Future HSR Station Local Bike Connections Route*

HSR Location Bike Connections will directly improve the BNA score of the HSR station area and the overall connectivity of the downtown area. This project will increase the BNA score by 9 points, or a 22% increase in connectivity that will positively impact the multimodal convenience of the HSR station and system. Recommendations are simple: 0.5 miles of protected bike lanes that can be implemented as a quick build.

Improvements to the HSR station is a continuation of the shared use path adjacent to the HSR alignment and improves on the east and west connections into the station. The project includes a grade-separated crossing from the alignment trail at 40th Street for cyclists to enter the existing ballpark parking lot. This connection is vital to the redevelopment in the area.

To make the connection, a cycle track on Chester between 34th and 36th Streets and a shared use path along the 34th Street Bridge must seamlessly connect. This project also recommends a new signal at 36th Street and Chester Avenue.

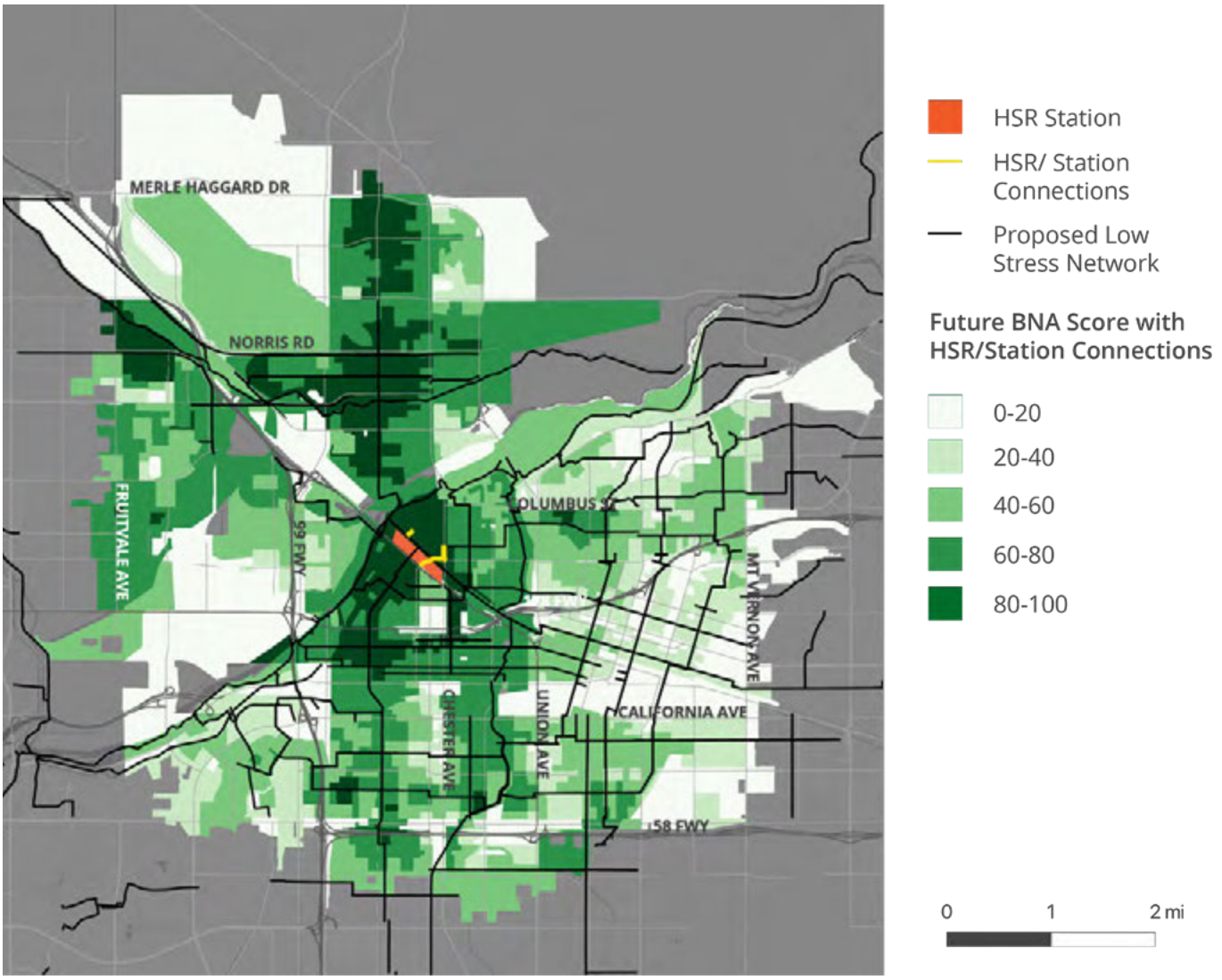



***Figure 46.*** *Future HSR Station Local Bike Connections BNA Score*

## KERN ISLAND CANAL EXTENSION

The Kern Island Canal Shared Use path will improve the BNA score by 9 points, or a 21% increase in connectivity to the low-stress network. Although this is not a quick-build project, it will drastically improve the connectivity between the HSR station and communities north of the Kern RIver. This area is isolated from the bike network, and it is near a more advanced segment of the Kern River Parkway Trail. There is no easy or intuitive way to exit the trail without entering Manor Street, where riders are forced to make a right turn alongside a high-speed street that connects Oildale to Northeast Bakersfield. This bridge under Manor Street on the Kern River Parkway is regularly flooded and includes a sharp, blind turn that is dangerous for two-way cycle traffic.

This project proposes a shared use path along the Kern Island Canal with wayfinding to the Kern River Parkway and a protected crossing with West Columbus Street. Traffic calming around this crossing and a rapid flashing beacon will ensure a low-stress crossing. With wayfinding, bike lanes to the adjacent residential areas to both the east and west will increase access to the trails.


***Figure 47.*** *Kern Island Canal Shared use Path Extension Route*

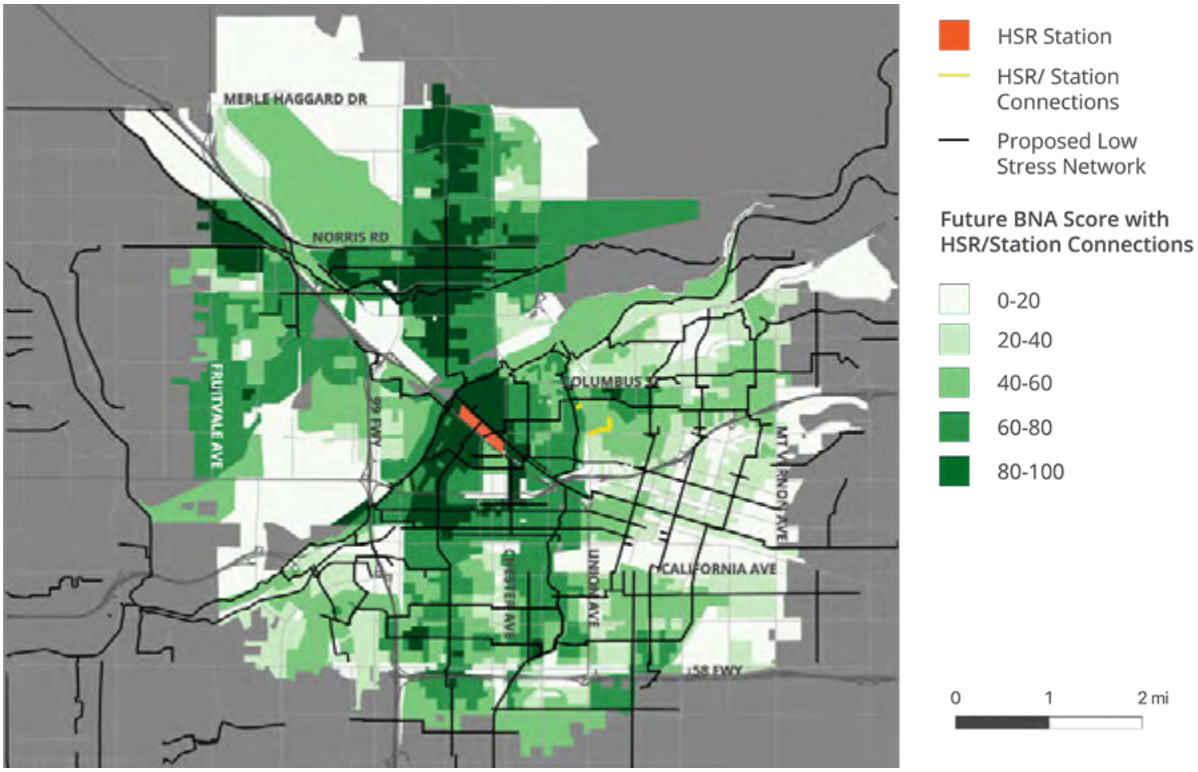



***Figure 48.*** *Kern Island Canal Shared use Path Extension BNA Score*

## ACACIA AVENUE TO THE KERN RIVER PARKWAY


**Proposed Bike Network**

Bike Boulevard
Shared Use Path
Parks
Canal

0 250 500 ft

***Figure 49.*** *Acacia Avenue Bike Boulevard Route*

The Acacia Avenue Bike Boulevard proposes 0.9 miles of protected bike lane and minor street crossing treatments. This will increase access to Bakersfield College from residents North of the River or using the Kern River Parkway who want to avoid busy Panorama Drive. This project will increase the BNA score by 8 points or 20%.

The County of Kern has proposed a shared use path from the Kern River Parkway Trail to Panorama Avenue. The project team recommends ensuring the slope of this path is comfortable for any rider (LTS1). To cross Panorama Avenue from this shared use path, a rapid flashing beach and median refuge island will route to Loma Linda Drive. Once on Loma Linda Drive, bike boulevard treatments including wayfinding, and traffic calming should be standard, with particular focus on the intersections of the route with Alta Vista Drive, River Boulevard, and Haley Street.

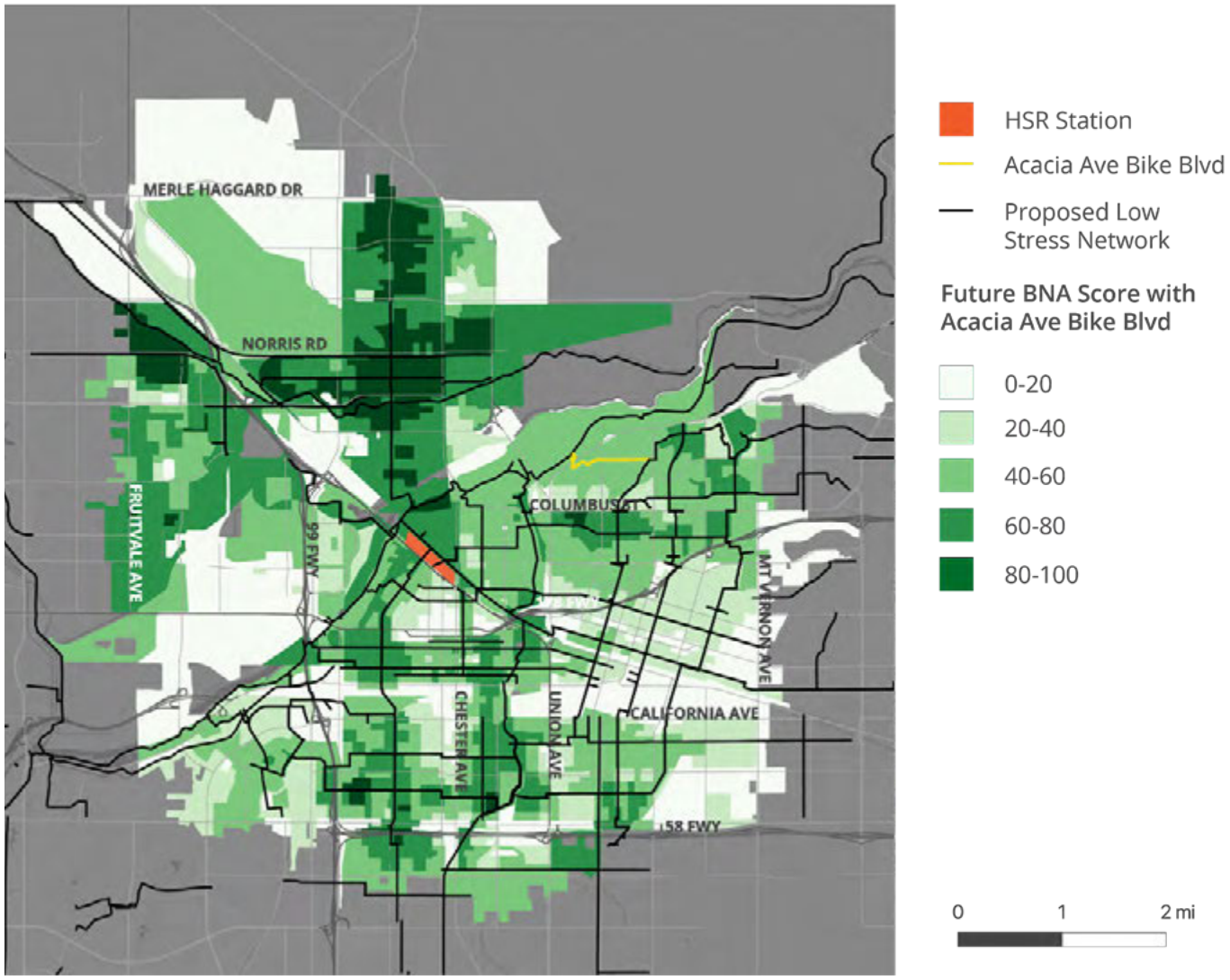



***Figure 50.*** *Acacia Avenue Bike Boulevard BNA Score*

## HAGEMAN FLYOVER BIKEWAY EXTENSION


***Figure 51.*** *Hageman Flyover Bikeway Extension Route*

The Hageman Flyover Bikeway Extension expands the adopted Hageman Flyover project providing greater low-stress access to Rosedale residents to enter safely into Downtown and the HSR station. It will improve the BNA score by 8 points, or a 20% increase in connectivity.

Starting from the HSR station, this project proposes a shared use path that will cross the river via Golden State Avenue along the HSR alignment shared use path, with wayfinding to the Kern River Parkway trail to travel east and west. Traveling west on the Kern River Parkway Trail, a new shared use path will guide users to the Kern River canal, to two-way cycle track north and south along Arrow Street, and a protected, lighted intersection at Arrow and Sillect Avenue. The two-way cycle track will be on Arrow Street and Rio Mirada and include the installation of a lighted intersection at Rio Mirada and Buck Owens Boulevard.

In Rosedale, a shared use path along with Hageman, a protected intersection on Hageman and Knudsen, and a protected intersection (not a light) at Knudsen and Basilica Drive with a pedestrian refuge island, and rapid flashing beacon.

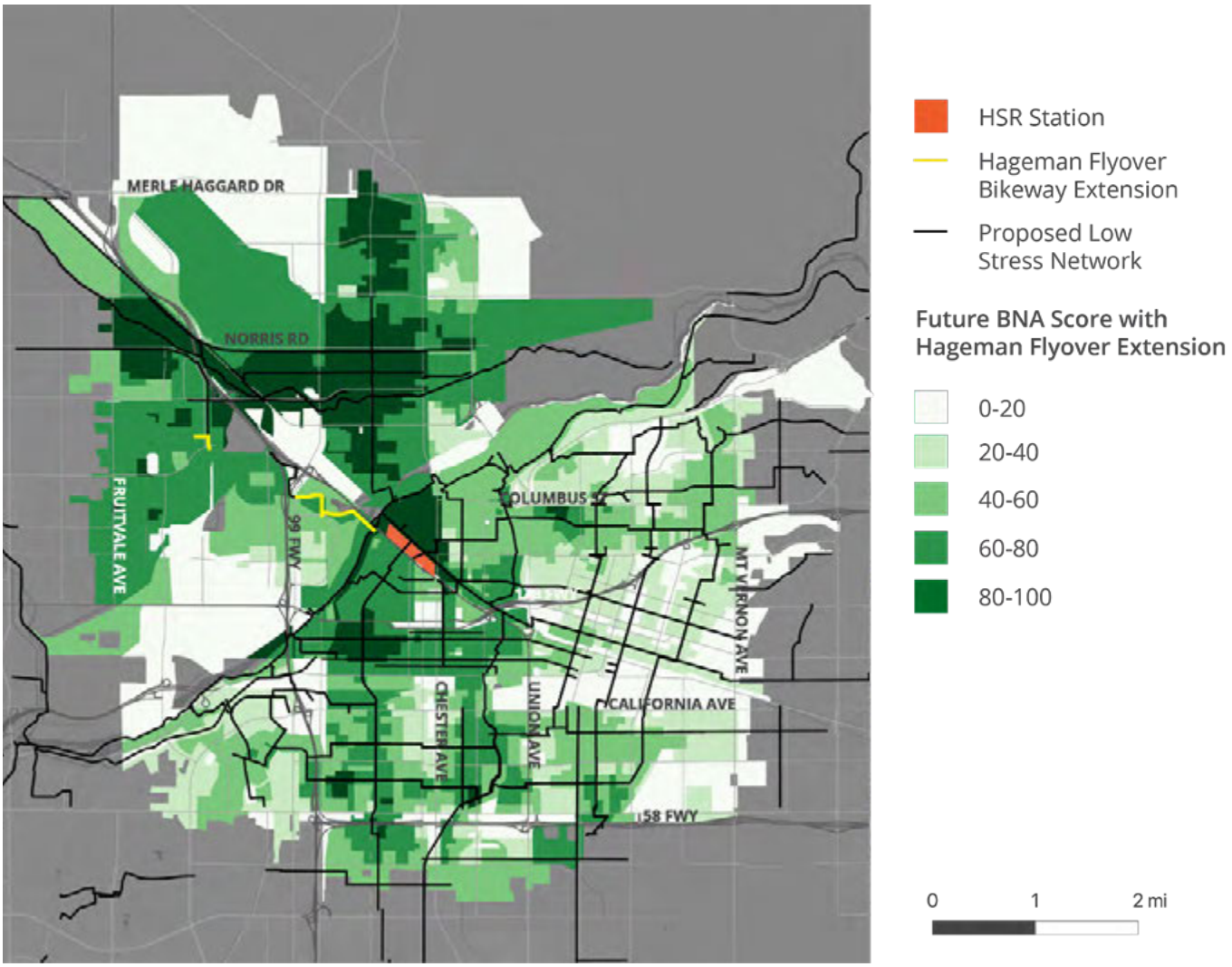



***Figure 52.*** *Hageman Flyover Bikeway Extension BNA Score*

## ROBERTS LANE BIKEWAY

The Roberts Lane Bikeway will improve BNA score by 7 points, or 17%, and is 0.3 miles of shared use path, pedestrian crossing treatments at Castaic and Roberts Lane, and signalized intersections at both Wilson Avenue and Roberts Lane, and Washington Avenue and Roberts Lane.

The Roberts Lane Bikeway includes a marked intersection with wayfinding of the two shared use paths (those on Olive Drive and Roberts Lane Bikeway) to encourage safe passage between vehicular traffic and crossing cycling traffic, with special consideration of the existing bridge crossing the Beardsley Canal. A protected intersection connecting the shared use paths on Roberts Lane to the protected bike lanes along Olive Drive includes flashing beacons and median refuge island fit for pedestrians and cyclists.

The intersections of Roberts Lane with Castaic Avenue, Wilson Avenue, and Washington Avenue may not each require a traffic light, but low-stress treatments such as roundabouts can be used.


***Figure 53.*** *Roberts Lane Bikeway Route*

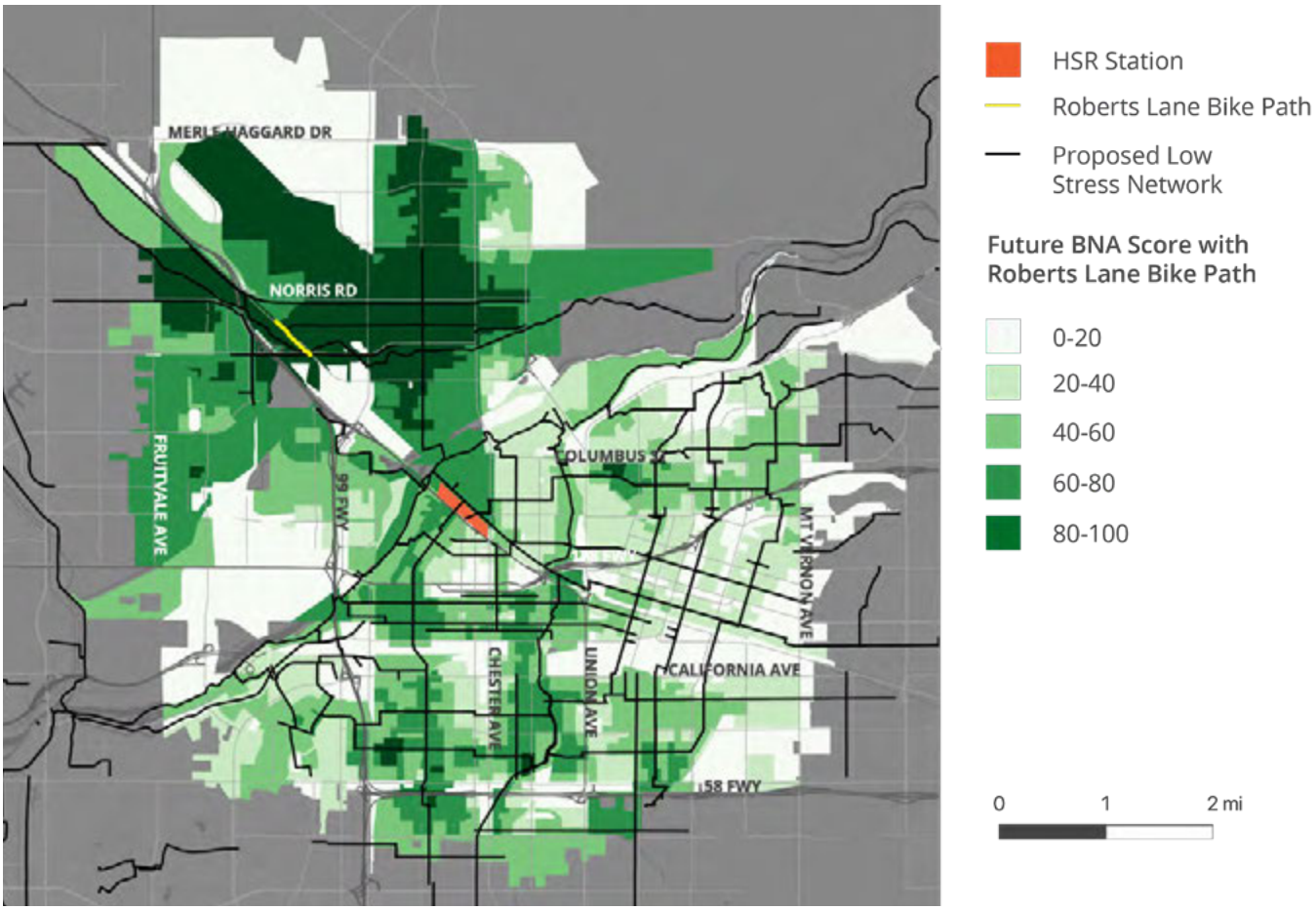



***Figure 54.*** *Roberts Lane Bikeway BNA Score*

# IMPLEMENTATION

## GENERAL CONSIDERATIONS OF IMPROVEMENTS

Implementing a bike network into an existing major street network is, no doubt, a complex process. It involves the identification of an overall network of connected bicycle improvements, combined with action on a project-by-project basis. Specific routes may be more challenging to implement than others because of engineering, politics, or traffic considerations.

One of the most critical aspects of the implementation strategy is ongoing and proactive public involvement. Several core groups should be closely involved in the process:

1. **Bicyclists** (including casual adult riders and children from all demographics)
2. **Non-cyclists** (including active transportations users and drivers)
3. **Property owners** whose land may be impacted by changes in channelization (e.g., elimination of parking)

Community engagement, throughout implementation, should be considered the starting point. Community feedback will prove not only vital to the implementation process but also the productive use of such improvements.

Community feedback and guidance throughout the different subparts of the street network should be considered when designing implementation. Major parts include:

- Major urban streets
- Minor urban street traffic
- Minor street/major street crossings
- Bicycle barriers
- Trail networks
- Transit connections
- Roadway bridge modifications
- Railroad crossings
- Traffic signals

- Drainage grates and utility covers
- Rural road shoulders
- Bicycle parking
- Maintenance

## IMPLEMENTATION DRIVERS

Within the context of constant public participation and guidance, ensuring that the network, and its accompanying routes, are low-stress is of critical importance. Low-stress design, as noted throughout this document, should be in the driver's seat of the implementation process. Moreover, low-stress improvements must be centered in the implementation of a comprehensive network.

It is imperative, in the planning stages of implementation, that planners consider the projects in this report as part of a connected bike network. Given the existing overall street network in all types of cities, it is easy for project administrators to conform their implementation to "one-off" improvements. Understandably, this is often a reaction to source funding limitations, which only provide capital for piecemeal development. But to plan this way, as described, can prove counterproductive to the implementation of safety improvements. Local and regional agencies need to prepare in the larger part of the whole, no matter limited funding opportunities. Finally, the safest possible option should be installed immediately for the greatest impact.

## QUICK AND EFFECTIVE IMPLEMENTATION

Bike projects, not to mention whole networks, can sometimes take years between the planning stage and construction. Several agencies across California are experimenting with ways to speed up the process: planning, design, approval, and environmental review are all run in tandem (where possible) to compress the delivery schedule. Decisions around materials used and flexibility in the initial design can also allow for the speeding up of projects. New state law this year signed by Governor Newsom in October 2020, SB 288, will add a number of climate-friendly infrastructure projects (mostly bike projects) to the CEQA exemption list. This will help prevent sustainable transportation projects from getting bogged down in laborious, time-intensive environmental review. Local agencies should take note to leverage this new law when feasible.

## STAKEHOLDERS AND RELEVANT JURISDICTIONS

There are four primary government agencies and jurisdictions for the recommended projects, they include:

- The City of Bakersfield
- The County of Kern
- Kern Council of Governments (Kern COG)
- The California High- Speed Rail Authority

## COST ESTIMATES

| Recommended Project Name | Cost (Segment + Intersection Treatments) |
|---|---|
| Kern Street Bike Boulevard | $15,335,777.87 |
| 30th/Pacific Street Bike Boulevard | $4,780,574.34 |
| Gage Street Bike Boulevard | $11,784,616.79 |
| Potomac Avenue Bike Boulevard | $6,163,788.58 |
| Virginia Street Bike Boulevard | $7,511,883.70 |
| Bank Street Bike Boulevard | $3,013,147.22 |
| Kentucky Street Bikeway Extension | $1,412,922.71 |
| Pine Street Bike Boulevard | $9,163,105.94 |
| California Ave/Highway 99 Bikeway Connections | $6,404,231.71 |
| Future HSR Station Local Bike Connections | $3,247,356.64 |
| Kern Island Canal Extension | $3,166,615.34 |
| Acacia Avenue Bike Boulevard | $505,563.25 |
| Hageman Flyover Bikeway Extension | $523,264.97 |
| Roberts Lane Bikeway | $525,000.00 |
| **Total Network Cost** | **$73,537,849.06** |

***Figure 55.*** *Cost estimates by project. For a full breakdown of costs, see appendix.*

## POTENTIAL FUNDING SOURCES

The Kern Region Active Transportation Plan is helpful in laying the basic foundation for funding sources that may be available for bicycle improvements. Rather than repeat or duplicate this groundwork, what follows is a supplement to it, particularly the ways in which funding may be more broadly accessed and secured for bike improvements.

**The Road Repair & Accountability Act**

The Road Repair & Accountability Act (2017) makes $5 billion a year available for transportation improvements in California. The 2018 Kern ATP notes the passage of the Act which primarily raises new funds " to make a dent in California's maintenance backlog". However, many new state funding sources were designed for a variety of new capital transportation uses, including the use of bike improvements/facilities. Increased funding for the ATP is noted, but not for other existing and new transportation programs. For example, the State Highway Operations and Protection Program (SHOPP) and the State Transportation

Improvement Program (STIP) are mentioned, but not the major influx of new funds that will be directed there. The state ATP did receive an additional 100 million per year, but that amount pales compared to the billions in new funding for the STIP and SHOPP. These programs need to be leveraged for bicycle improvements as well.

In addition to existing programs, state transportation programs were also developed to fund local projects. Newly developed programs such as the Local Partnership Program (LPP), Solutions for Congested Corridors (SCCP), among others, are also eligible for bicycle improvements. Most of these programs allow for capital improvements and are flexible for a wide variety of bicycle enhancements.

The new largest state funding sources from this act will go to the SHOPP and Local Streets and Roads (LSR) Program. The latter aims to provide approximately $1.5 billion per year to cities and counties for basic road maintenance, rehabilitation, and critical safety projects on the local streets and roads system. Local jurisdictions should take advantage of opportunities to add bicycle lanes and other markings when resurfacing and repaving streets. The SHOPP and LSR are perfectly set up for local agencies to make financially efficient uses of maintenance funds while simultaneously implementing bicycle capital improvements. For example, state maintenance funds can target the street network in ways that can be leveraged to improve overall street design.

**Potential State Funding Sources**

Although the Road Repair & Accountability Act does provide a significant source of all funding intended for transportation projects, there are also many other programs across state government that allow local jurisdictions to use bicycle improvements. Recently, the California Transportation Commission (CATC) released the below data to help navigate the variety of state funding sources that also allow bicycle improvements.

| PROGRAM | ADMINISTERING AGENCY | PURPOSE/DESCRIPTION |
|---|---|---|
| Sustainable Communities Planning Grants | Caltrans Division of Transportation Planning | The program includes $29.5 million to encourage local and regional planning that furthers state goals, including, but not limited to, the goals and best practices cited in the Regional Transportation Plan Guidelines adopted by the California Transportation Commission. |
| Affordable Housing and Sustainable Communities Program (AHSC) | Strategic Growth Council and Department of Housing and Community Development | The Program funds land-use, housing, transportation, and land preservation projects to support infill and compact development that reduce greenhouse gas emissions. The Program included $550M in its latest round. (California Climate Investments) |
| Urban Greening | California Natural Resources Agency | The Program supports the development of green infrastructure projects that reduce GHG emissions and provide multiple benefits. Must include at least one of the following:<br>• Sequester and store carbon by planting trees<br>• Reduce building energy use by strategically planting trees to shade buildings<br>• Reduce commute vehicle miles traveled by constructing bicycle paths, bicycle lanes or pedestrian facilities that provide safe routes for travel between residences, workplaces, commercial centers, and schools. (California Climate Investments) |

| PROGRAM | ADMINISTERING AGENCY | PURPOSE/DESCRIPTION |
|---|---|---|
| Transformative Climate Communities (TCC) | Strategic Growth Council and Department of Conservation | The Program funds community-led development and infrastructure projects that achieve major environmental, health, and economic benefits in California's most disadvantaged communities. (California Climate Investments) |
| Office of Traffic Safety Grant Program | Office of Traffic Safety | The Program provides annual funds to prevent serious injury and death resulting from motor vehicle crashes so that all roadway users arrive at their destination safely. Funds can be used for bicycle and pedestrian safety |
| Clean Mobility Options | Air Resources Board | The Program makes $20 million available for zero emissions shared mobility projects (such as car sharing, bike sharing, and on-demand sharing) in disadvantaged and low-income communities, including some tribal and affordable housing communities (California Climate Investments) |
| Sustainable Transportation Equity Project (STEP) | Air Resources Board | The Program makes $2 million available for planning and capacity building grants. Funding is intended to help lowincome and disadvantaged communities identify residents' transportation needs and prepare to implement clean transportation and land use projects.<br><br>The Program makes $20 million available for one to three implementation block grants to fund clean transportation and land use projects in disadvantaged communities. Funded projects will work together to increase community residents' access to key destinations so they can get where they need to go without the use of a personal vehicle (California Climate Investments) |
| Transit and Intercity Rail Capital Program (TIRCP) | CalSTA and Caltrans Division of Rail and Mass Transportation | The TIRCP provides grants from the Greenhouse Gas Reduction Fund (GGRF) to fund transformative capital improvements that will modernize California's intercity, commuter, and urban rail systems, and bus and ferry transit systems, to significantly reduce emissions of greenhouse gases, vehicle miles traveled, and congestion. |
| Local Partnership Program (LPP) | California Transportation Commission | The primary objective of this program is to provide funding to counties, cities, districts, and regional transportation agencies in which voters have approved fees or taxes dedicated solely to transportation improvements or that have imposed fees, including uniform developer fees, dedicated solely to transportation improvements. Funding includes $200M/year to improve aging Infrastructure, Road Conditions, Active Transportation, Transit and rail, Health and Safety Benefits |

| PROGRAM | ADMINISTERING AGENCY | PURPOSE/DESCRIPTION |
|---|---|---|
| Local Streets and Roads (LSR) Program | California Transportation Commission | The purpose of the program is to provide approximately $1.5 billion per year to cities and counties for basic road maintenance, rehabilitation, and critical safety projects on the local streets and roads system. |
| Solutions for Congested Corridors (SCCP) | California Transportation Commission | The purpose of the program is to provide funding to achieve a balanced set of transportation, environmental, and community access improvements to reduce congestion throughout the state. This statewide, competitive program makes $250 million available annually for projects that implement specific transportation performance improvements and are part of a comprehensive corridor plan by providing more transportation choices while preserving the character of local communities and creating opportunities for neighborhood enhancement. |
| Highway Safety Improvement Program (HSIP) | Caltrans Local Assistance/ FHWA | The Program funds work on any public road or publicly owned bicycle or pedestrian pathway or trail, or on tribal lands for general use of tribal members, that improves the safety for its users. Project maximum funding- $10M. Solicitation varies from annually to semi-annually. |
| State Highway Operations and Protection Program (SHOPP) | Caltrans Office of SHOPP Management | The Office of SHOPP Management is responsible for planning, developing, managing and reporting the fouryear SHOPP portfolio of projects. The Program is the State Highway System's "fix it first" program that funds repairs and preservation, emergency repairs, safety improvements, and some highway operational improvements on the State Highway System. |
| State Transportation Improvement Program (STIP) | California Transportation Commission | The STIP is the biennial five-year plan adopted by the Commission for future allocations of certain state transportation funds for state highway improvements, intercity rail, and regional highway and transit improvements. Local agencies should work through their Regional Transportation Planning Agency (RTPA), County Transportation Commission, or Metropolitan Planning Organization (MPO), as appropriate, to nominate projects for inclusion in the STIP. |
| Congestion Mitigation and Air Quality Improvement (CMAQ) Program | FHWA | The purpose of the CMAQ program is to provide a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. The program supports surface transportation projects and other related efforts that contribute air quality improvement and provide congestion relief. |

***Figure 56.*** *Potential state funding sources from CATC's table "FUNDING PROGRAMS THAT MAY INCLUDE ACTIVE TRANSPORTATION ELEMENTS" See link for more details*

## POTENTIAL LOCAL FUNDING SOURCES

**City General Funds**
Cities and counties may spend general funds as they see fit. Any bicycle, pedestrian, or trails project could be funded through general funds and then matched with other funds.

**Business Improvement Districts**
Bicycle and pedestrian improvements can often be included as part of business improvement and retail district beautification. Similar to benefit assessments, Business Improvement Districts (BIDs) collect levies on businesses to fund area-wide improvements that help businesses and improve customer access. These districts may include provisions for bicycle improvements such as bicycle parking or shower and clothing locker amenities, sidewalk improvements, and pedestrian crossing enhancements.

**Benefit Assessment Districts**
Bike paths, bicycle lanes, bicycle parking, and related facilities can be funded as part of a local benefit assessment district. However, defining the benefit district's boundaries may be difficult since the bikeways will have citywide or regional benefit. Sidewalks, trails, intersection crossings, and other pedestrian improvements can also be funded through benefit assessments.

**Property Taxes and Bonds**
Cities and counties can sell bonds to pay for bikeways, pedestrian facilities, and any amenities related to these facilities. A supermajority of two-thirds of voters in that jurisdiction must vote to levy property taxes to repay the bonds.

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Kern Region Active Transportation Plan. Kern Council of Governments and Alta Planning + Design. 2018.

Urban Bikeway Design Guide. National Association of City Transportation Officials. 2012. https://nacto.org/publication/urban-bikeway-design-guide/

A Portrait of California: California Human Development Report 2014-2015

Kern Community Health Assessment

American Heart Association

SRTS: Promoting Active Transportation

Natl Recreation and Parks Assn

SRTS Air Quality and Environment

Central Valley Transportation By the Numbers: TRIP Report Aug 2018

# APPENDIX

| Adopted Network Full Buildout Baseline Score: 41 | Bike Network Analysis (BNA) | | | Segment/Corridor Project Mileage and Costs | | | | Intersections and Crossing Treatments | |
|---|---|---|---|---|---|---|---|---|---|
| **Recommended Project Name** | **Projected Score in Points** | **Score Change in Points** | **Score Improvment (%)** | **Segment Proposed Mileage** | **Segment Primary Amenity Type** | **Cost per lane mile** | **Segment Total Cost** | **# of intersection treatments** | **Intersections estimated cost** |
| Kern Street Bike Boulevard | 56 | 15 | 38% | 4.6 | Bike Boulevard | $575,000.00 | $2,625,777.87 | 16 | $12,710,000.00 |
| 30th/Pacific Street Bike Boulevard | 56 | 15 | 37% | 4.1 | Bike Boulevard | $575,000.00 | $2,345,574.34 | 19 | $2,435,000.00 |
| Gage Street Bike Boulevard | 55 | 14 | 34% | 4.7 | Bike Boulevard | $575,000.00 | $2,679,616.79 | 14 | $9,105,000.00 |
| Potomac Avenue Bike Boulevard | 54 | 13 | 31% | 6.6 | Bike Boulevard | $575,000.00 | $3,768,788.58 | 15 | $2,395,000.00 |
| Virginia Street Bike Boulevard | 53 | 12 | 29% | 3.3 | Bike Boulevard | $575,000.00 | $1,891,883.70 | 8 | $5,620,000.00 |
| Bank Street Bike Boulevard | 52 | 11 | 26% | 4.6 | Bike Boulevard | $575,000.00 | $2,623,147.22 | | $390,000.00 |
| Kentucky Street Bikeway Extension | 52 | 11 | 26% | 3.5 | Class II Bike Lane | $90,000.00 | $312,922.71 | 3 | $1,100,000.00 |
| Pine Street Bike Boulevard | 51 | 10 | 25% | 1.2 | Bike Boulevard | $575,000.00 | $663,105.94 | 8 | $8,500,000.00 |
| California Avenue/Highway 99 Bikeway Connections | 50 | 9 | 22% | 1.7 | Bike Boulevard | $575,000.00 | $979,231.71 | 6 | $5,425,000.00 |
| Future High Speed Rail Station Local Bike Connections | 50 | 9 | 22% | 0.5 | Class II Bike Lane | $90,000.00 | $47,356.64 | 4 | $3,200,000.00 |
| Kern Island Canal Extension (Columbus Street to Kern River Bike Path) | 49 | 9 | 21% | 0.1 | Shared-use Path | $900,000.00 | $116,615.34 | 2 | $3,050,000.00 |
| Acacia Avenue Bike Boulevard | 49 | 8 | 20% | 0.9 | Protected Bike Lane | $180,000.00 | $165,563.25 | 4 | $340,000.00 |
| Hageman Flyover Bikeway Extension | 49 | 8 | 20% | 0.7 | Protected Bike Lane | $180,000.00 | $123,264.97 | 5 | $400,000.00 |
| Roberts Lane Bikeway | 48 | 7 | 17% | 0.3 | Shared-use Path | $900,000.00 | $270,000.00 | 3 | $255,000.00 |
| **$73,537,849.06** | | | | **36.6** | | | **$18,612,849.06** | | **$54,925,000.00** |
| **Estimated Total Recommended Low Stress Network Cost** | | | | **Proposed mileage** | | | **Proposed mileage costs** | | **Proposed intersection costs** |

| Recommended Project Name | Intersection or Crossing Location | Proposed Treatment | Unit Cost | Miles | Treatment Cost |
|---|---|---|---|---|---|
| Kern Street | East California Ave, Kern Street | Protected intersection with median refuge island | $85,000.00 | 1 | $ 85,000.00 |
| | 11th and Kern Street | Mini Traffic Circle | $250,000.00 | | |
| Estaimted project cost for intersection treatments | East 18th and Kern | Mini Traffic Circle | $250,000.00 | | |
| $12,710,000.00 | East 19th and Kern | Mini Traffic Circle | $250,000.00 | | |
| | Kentucky Street and Kern Street | Mini Traffic Circle | $250,000.00 | | |
| | Sumner Street and Kern St | Install protected intersection and stop signs | $85,000.00 | | |
| | Old Town Kern (north) | At-grade railroad crossing (but probably above-grade) | $3,000,000.00 | 1 | $3,000,000.00 |
| | Old Town Kern (south) | Above-grade railroad crossing | $3,000,000.00 | 1 | $3,000,000.00 |
| | Monterey and Kern St | Install signal and protected intersection | $100,000.00 | | |
| | Niles and Kern St | Install signal and protected intersection | $100,000.00 | | |
| | Oregon to Niles on Kern Street | Change to back-in diagonal parking | | | |
| | 30th/Pacific/178 Freeway | Cyclist/pedestrian bridge | $5,000,000.00 | 1 | $5,000,000.00 |
| | Flower Street and Kern Street | Enhanced intersection improvments | $85,000.00 | | |
| | Bernard and Kern Street | Enhanced intersection improvements | $85,000.00 | | |
| | Columbus/Tulare St. | Protected pedestrian crossing | $85,000.00 | 1 | $ 85,000.00 |
| | Skyline, Acacia and River Blvd | Enhanced intersection improvments | $85,000.00 | | |
| 30th/Pacific | Elm Street | Enhanced crossing improvements | $85,000.00 | | |
| | Beech and Drake Street | Mini traffic circle | $250,000.00 | | |
| Estaimted project cost for intersection treatments | Hubbard and Beech Street | Mini traffic circle | $250,000.00 | | |
| $2,435,000.00 | Hubbard and Pine Street | Mini traffic circle | $250,000.00 | | |
| | F Street and 28th Street | Convert to protected intersection | $85,000.00 | | |
| | H Street and 28th Street | Install protected intersection | $85,000.00 | | |
| | 28th Street east of Chester Ave. | Change to back-in diagonal parking | | | |
| | K Street and 28th | Enhanced intersection improvments | $85,000.00 | | |
| | N Street and Golden State | Install protected intersection | $85,000.00 | | |
| | 30th and N Street | Enhanced intersection improvments | $85,000.00 | | |
| | Q Street and 30th Street | Install protected intersection | $85,000.00 | | |
| | 30th and Q Street | Install protected intersection | $85,000.00 | | |
| | Pacific Street and Alta Vista | Traffic diversion | | | |
| | Baker Street and Pacific | Install protected intersection | $85,000.00 | | |
| | King Street and Pacific | Mini traffic circle | $250,000.00 | | |
| | Gage Street and Pacific | Mini traffic circle | $250,000.00 | | |
| | Virginia Street and Pacific | Mini traffic circle | $250,000.00 | | |
| | Beale Street and Pacific | Install protected intersection | $85,000.00 | | |
| | Mount Vernon Ave and Pacific | Install protected intersection | $85,000.00 | | |
| Gage/Owens St | Princeton and Bucknell Street | Enhanced intersection improvments | $85,000.00 | | |
| | University and Bucknell Street | Protected intersection with median refuge island | $100,000.00 | | |
| Estaimted project cost for intersection treatments | Columbus/Nelson Street/Bucknell | NACTO Offset Intersection | | | |
| | Knotts St/Gage St | Mini Traffic circle | $250,000.00 | 1 | $ 250,000.00 |
| $9,105,000.00 | Knotts Street to Drury Lane/178 Freeway | Cyclist/pedestrian bridge | $5,000,000.00 | | |
| | Bernard Street | Install Cycle Track (less than 1 mile) | $100,000.00 | 1 | $ 100,000.00 |
| | Gage Street and Flower Street | Install protected intersection | $85,000.00 | | |
| | NIles and Gage St | Install signal and protected intersection | $100,000.00 | | |
| | Monterey and Gage St | Install signal and protected intersection | $100,000.00 | | |
| | Gage Street bridge | Above-grade railroad crossing | $3,000,000.00 | 1 | $3,000,000.00 |
| | Gage and East Truxtun Avenue | Protected intersection with median refuge islands | $100,000.00 | | |
| | Owens and East California Ave | Protected intersection with median refuge islands | $100,000.00 | 1 | $ 100,000.00 |
| | Owens and Virginia Avnue | Enhanced intersection improvments | $85,000.00 | | $ - |
| | Owens and East Brundage Lane | NACTO Offset Intersection | | | |
| Potomac Avenue | Garnsey Lane and Real Road | Mini traffic circle | $250,000.00 | | |
| | Saunders Park multiuse trail | Install Multiuse trail | | | |
| | Palm Street and Whetherly Drive | Enhanced intersection improvements | $85,000.00 | | |
| Estaimted project cost for intersection treatments | Palm Street from Real Road to Olive Street | Install cycle track (less than 1 mile) | $100,000.00 | | |
| | Palm and Oak Street | Upgrade to protected intersection | $85,000.00 | | |
| $2,395,000.00 | Dracena Street/6th Street and H Street | NACTO Offset intersection | $85,000.00 | | |
| | Chester Ave and 6th Street | Install signal and protected intersection | $100,000.00 | | |
| | P Street and 6th Street | Install protected intersection | $85,000.00 | | |
| | Union Ave and 8th/East 8th Street | NACTO Offset intersection | | | |
| | Potomac and South King Street | Install mini traffic circle | $250,000.00 | | |
| | Potomac and Dr. MLK Jr. Blvd | Install signal and protected intersection | $100,000.00 | | |
| | Washington Street | Enhanced intersection improvments | $85,000.00 | 1 | $ 85,000.00 |
| | Beverly Drive | Enhanced intersection improvments | $85,000.00 | 1 | $ 85,000.00 |
| | Mt. Vernon and Potomac | Upgrade to protected intersection | $85,000.00 | | |
| | Railroad crossing | At-grade railroad crossing | $1,000,000.00 | 1 | $1,000,000.00 |
| Virginia Ave to BC | Virginia Street and Lake Street Canal Crossing | Bridge over Canal | $5,000,000.00 | 1 | $5,000,000.00 |
| | University Avenue and Occidental | Install protected intersection | $85,000.00 | | |
| Estaimted project cost for intersection treatments | Noble and Occidental | Install mini traffic circle | $250,000.00 | | |
| $5,620,000.00 | Columbus and Occidental Street | Install protected intersection with median refuge island | $100,000.00 | | |
| | Height Street Bridge | Install shared use path | | | |
| | Bernard Street and Camino Real | Install protected intersection | $85,000.00 | | |
| | Virginia Street and Flower Street | Unspecfied traffic calming | | | |
| | Brown Street and East California Ave | Install signal and protected intersection | $100,000.00 | | |
| Kentucky Street | Summer Street to Union Avenue Loop/Kentucky Street | At-grade railroad crossing | $1,000,000.00 | 1 | $1,000,000.00 |
| Estaimted project cost for intersection treatments | Beale Ave | Underpass enhancements | $100,000.00 | 1 | $ 100,000.00 |
| $1,100,000.00 | Kentucky and Baker Street | Unspecified traffic calming | | | |
| Pine St | HSR Station crossing Golden State (south) | Grade-separated shared use path | $3,000,000.00 | 1 | $3,000,000.00 |
| | 21st and Pine | Install traffic calming, median refuge islands | $100,000.00 | | |
| Estaimted project cost for intersection treatments | 19th and Pine | Install traffic calming, median refuge islands | $100,000.00 | | |
| | 18th and Pine | Install traffic calming, median refuge islands | $100,000.00 | | |

| | | | | | |
|---|---|---|---|---|---|
| $8,500,000.00 | Pine Street from 18th to Truxtun Ave | Change to back-in diagonal parking | | | |
| | Truxtun and Pine Street | Install signalized and protected intersection | $100,000.00 | | |
| | 16th Street to A Street bridge | Cyclist/pedestrian bridge | $5,000,000.00 | | |
| | A Street and California Avenue | Install sigalized and protected intersction | $100,000.00 | | |
| California Avenue/99 Freeway Interchange | California Avenue and Myrtle Street | Install protected intersection | $85,000.00 | 1 | $ 85,000.00 |
| | Truxtun and Empire Drive | Install protected intersection | $85,000.00 | | |
| Estaimted project cost for intersection treatments | Bridge crossing railroad and under 99 freeway | Grade-separated shared use path | $5,000,000.00 | | |
| $5,425,000.00 | California Avenue and Chester Lane | Install protected intersection | $85,000.00 | | |
| | Garnsey Lane and North Stine Road | Install traffic calming and protected intersection | $85,000.00 | | |
| | Easton Drive and California Avenue | Install protected intersection | $85,000.00 | | |
| Kern Island | Kern River Parkway to Elm Street | Canal Bridge and shared use path | $3,000,000.00 | 1 | $ 3,000,000.00 |
| Estaimted project cost for intersection treatments | Columbus Street and Shared use path | Install protected intersection with rapid crossing beacon | $50,000.00 | | |
| $3,050,000.00 | | | | | |
| Acacia Ave | Loma Linda and Panorama Drive | Install protected intersection | $85,000.00 | | |
| | Alta Vista Drive | Install protected intersection | $85,000.00 | 1 | $ 85,000.00 |
| Estaimted project cost for intersection treatments | El Cielo | Install protected intersection | $85,000.00 | 1 | $ 85,000.00 |
| $340,000.00 | Haley Street | Install protected intersection | $85,000.00 | | |
| Hageman Flyover | Golden State Bridge from North of HSR (existing) | Install shared use path on existing | | 1 | $ - |
| | Arrow Street to Rio Mirada | Install cycle track (less than 1 mile) | $100,000.00 | | |
| Estaimted project cost for intersection treatments | Rio Mirada and Buck Owens Blvd | Install signalized and protected intersection | $100,000.00 | | |
| $400,000.00 | Hageman and Knudsen | Install signalized and protected intersection | $100,000.00 | | |
| | Knudsen and Basilicata Drive | Install protected intersction with median refuge islands | $100,000.00 | | |
| Roberts Lane | Castaic Way and Roberts | Install protected intersection | $85,000.00 | 1 | $ 85,000.00 |
| Estaimted project cost for intersection treatments | Wilson Ave | Install protected intersection | $85,000.00 | | |
| $255,000.00 | Washington Ave | Install protected intersection | $85,000.00 | | |
| Bank St | 2nd Street, Union and Texas Street | NACTO Offset intersection | $20,000.00 | 1 | $ 20,000.00 |
| | Palm Street Bridge at the 99 Freeway | Install shared use path on existing | | 1 | $ - |
| Estaimted project cost for intersection treatments | 2nd/H St | Pedestrian Treatments | $85,000.00 | 1 | |
| $390,000.00 | 2nd/Chester Ave | Install signalized and protected intersection | $100,000.00 | 1 | |
| | Wetherly Drive and Palm Street | Unspecified traffic calming | | | |
| | Bank Street and A Street | Install protected intersection and traffic calming | $85,000.00 | | |
| | Chester and A Street | Install signalized and protected intersection | $100,000.00 | | |
| HSR Station Area | 40th Street from HSR Alignment multiuse trail | Grade separated crossing | $3,000,000.00 | | |
| | Chester Avenue from 34th to 36th Streets | Install cycle track (less than 1 mile) | $100,000.00 | | |
| Estaimted project cost for intersection treatments | 34th Street Bridge | Install shared use path on existing | | | |
| $3,200,000.00 | 36th Street and Chester Ave | Install signalized and protected intersection | $100,000.00 | | |