A

Appendix A: Design Guide

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01
Introduction

Purpose

The Fremont Active Transportation Design Guide is intended to serve a variety of purposes in the development of Fremont's street network. First, the guide is intended to build consistency in the design and planning of streets by formalizing treatments and approaches for various street contexts. Designers, engineers, and planners will be able to reference the guide to apply consistent treatments when working on any City street project.

Second, the guide will be a resource for the public by providing graphics and collateral that describe commonly used street treatments and their intended functions. By educating the public and developing a consistent vernacular of street treatments, the City can more effectively engage the public in the planning and design of City corridors.

Last, the guide is intended to enhance the standard for streets throughout the City by establishing a progressive design standard that will allow streets to efficiently serve users of all ages and abilities. While there is national guidance available on the design of urban streets, such as the National Association of City Transportation Officials (NACTO) *Urban Bikeway Design Guide*, there are a variety of unique situations and contexts to account for. This guide is designed to specifically respond to Fremont's unique context, physical constraints, maintenance concerns, and organizational structure.

DISCLAIMER

This best practices guide was developed based on national design standards and accepted industry practices, in particular the American Association of Highway Transportation Officials (AASHTO) guidance, Federal Highway Administration (FHWA) guidance, and the NACTO guidance. The manual is not intended as a legal standard, and all design guidance should be considered with engineering judgment and discussed with City staff.

What Is an All Ages and Abilities (AAA) Network?

Fremont adopted its *Bike Master Plan* in July 2018, setting the ambitious goal to create a safe, convenient, connected, and comfortable bicycling network for people of all ages and abilities. Around the same time, the *Alameda Countywide Active Transportation Plan* (2019) set a vision for the county transportation system to "inspire people of all ages and abilities to walk and bicycle for everyday transportation, recreation, and health, by providing a safe, comfortable, and interconnected network which links to transit and major activity centers, and by supporting programs and policies that encourage biking and walking."

With both the City and County working toward the creation of strong networks for all ages and abilities (AAA), there is great support in the region for these types of projects.

So what exactly is an AAA network? An AAA network is a network of facilities that are well-connected, comfortable, and safe for individuals of all ages and abilities. This means everyone from an eight- to an eighty-year-old can navigate a community by walking, biking, or rolling with the same level of confidence.

Cities that refer to guidance and design criteria from organizations like the NACTO are leading the way in designing streets that work toward creating AAA networks. Building AAA facilities helps cities to improve traffic safety, reduce congestion, improve air quality and public health, provide better and more equitable access to jobs, and boost the local economy.

IMAGE: FREMONT.GOV

All Ages & Abilities Facilities Are...

Safe

More people will choose to use active modes of travel if they have safe places for walking, biking, or rolling. In turn, more people walking, biking or rolling creates a safer street environment.

Comfortable

Comfortable facilities encourage more people to walk, bike, or roll, and to continue to bike and roll time after time. Facilities that are comfortable will attract more individuals that typically might not feel comfortable walking, biking, or rolling, such as women, children, and seniors.

Equitable

A lack of investment in safe infrastructure in low-income communities and communities of color forces people to choose to use challenging routes to walk, bike, or roll, like on the sidewalk or going against the flow of traffic, where dedicated infrastructure would provide a safer option. Applying AAA facilities creates a clear, safe choice for everyone walking, biking, or rolling.

Less Stressful

Two primary causes of stress for those who are walking, biking, and rolling are vehicular traffic speed and volume. If speeds and volumes are reduced along a corridor even by a small amount, actual safety and perceived safety along the corridor will be improved.

More Enjoyable for All

Having a safe, comfortable space to walk, bike, or roll without fear of conflict or stress caused by motor vehicles makes the choice to use an alternative mode of transportation the enjoyable choice.

For More Guidance:

- NACTO Designing for All Ages & Abilities
- ACTC AAA Bikeway Guidance
- Caltrans DIB 89-02 Class IV Bikeway Guidance
- Caltrans DIB 94 Complete Streets: Contextual Design Guidance
- Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Design Needs of Pedestrians

Everyone that goes outside is considered a pedestrian at some point of their journey, and therefore, safe, comfortable pedestrian facilities should be a priority in every city. Fremont's pedestrian transportation network should be designed for users of all ages and abilities. Each experience level and mode requires unique design considerations for making transportation facilities safe and enjoyable for everyone who uses them.

The types and volumes of pedestrians on a street will depend on the surrounding land use/density, key destinations, the time of day, day of the week, and a series of other characteristics. Pedestrian types and volumes will also depend on the space made available for them and whether or not the space is comfortable and accessible.

The table below outlines various pedestrian network user types and factors that may influence how to design accommodating facilities. This includes a wide range of pedestrians, including people who are seniors, people with disabilities, and people who use wheelchairs. For these groups, it is important to consider factors like longer crossing intervals, good visibility of pedestrians waiting to cross at the curb ramp, and frequent benches and other amenities for stopping to take a break.

For best practices in designing pedestrian facilities, the Public Right-of-Way Accessibility Guidelines (PROWAG) should be referenced. This guide ensures that sidewalks, pedestrian street crossings, pedestrian signals, and other facilities for pedestrian circulation and use that fall in the public right-of-way are easily accessible by all pedestrian types.

	USER TYPE	SPEED OF TRAVEL	CONSIDERATIONS
	CHILDREN	1 to 3 mph	• Need wider areas for movement • Comfortable on sidewalks and facilities that are grade separated from vehicles and fast active users
	TYPICAL WALKERS	1 to 3 mph	• Need wider areas for traveling in groups or walking dogs • Comfortable on sidewalks and facilities that are grade separated from vehicles and fast active users
	WHEELCHAIR USERS	1 to 3 mph (non-motorized) 3-5 mph (motorized)	• Comfortable on sidewalks and paths that are grade separated from vehicles and active users • Need path of travel unobstructed by street furniture or signal poles • Need wider sidewalks to complete a turn-around movements

Design Needs of Bicyclists and Other Micromobility Users

Until recently, bike facilities have typically been designed exclusively for a standard bicycle size. However, as new micromobility devices have grown in popularity, traditional bicycle facilities have evolved to accommodate additional users. The table below highlights unique speeds and considerations needed for four key bikeway facility users.

To design effective facilities for these users, it is important to understand how these users operate and how their device influences that operation. Micromobility users, by nature of their smaller wheels and overall device, are more impacted by poor facility design, construction, and maintenance practices than motor vehicle drivers or people using bicycles. They lack the protection from roadway hazards provided by an automobile's structure and safety features.

Additionally, varying device sizes and speeds need to be taken into consideration. For example, cargo bikes are longer in length than a standard bicycle with space to store cargo or transport people. This means more space is needed on the bikeway, including at median refuge islands and curb ramps. Designing for turns on a bikeway may also need to be adjusted.

Another factor to consider in facility design is user speed. With the rise in electric micromobility device use, average speeds of micromobility users has increased. This creates a greater need to provide separated spaces for pedestrians and micromobility vehicle users.

By understanding the unique characteristics and needs of bicyclists and other micromobility users, a facility designer can provide quality facilities and minimize user risk.

	USER TYPE	SPEED OF TRAVEL	CONSIDERATIONS
	CASUAL AND NEW CYCLISTS	6 to 12 mph	• Prefer riding on off-street facilities • Less critical to have a facility that is separated from pedestrians
	E-BIKE USERS	16 to 20 mph	• Most prefer fewer crossings, separated facilities, and room to pass slower cyclists • Opportunities for shared mobility docking stations with charging stations
	E-SCOOTER USERS	Up to 20 mph	• Stand-up and seated versions, e-skateboards, hoverboards, balance boards • Access to on-street corrals, racks in the furnishing zones, shared mobility parking zones
	EXPERIENCED CYCLISTS	12 to 25 mph	• Very experienced cyclists may choose to use roadways over dedicated bikeways • Most prefer fewer crossings, separated facilities, and room to pass slower cyclists

02
Corridor Treatments

Pedestrian Treatments

Introduction

Sidewalks should be more than areas to travel; they should provide places for people to interact. There should be places for standing, visiting, and sitting. Sidewalks should contribute to the character of neighborhoods and business districts, strengthen their identity, and be an area where adults and children can safely participate in public life.

Sidewalks and Accessibility

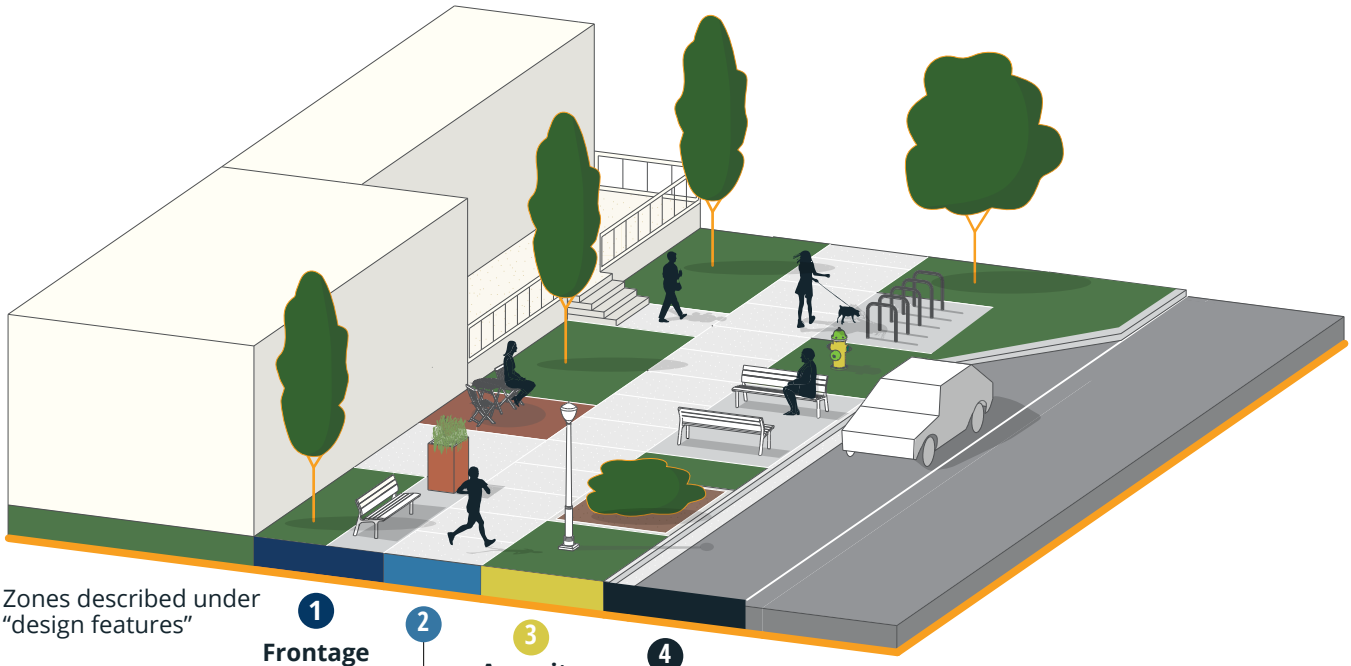
Accessibility is critical to consider when implementing sidewalks. It is important to provide adequate width along a sidewalk corridor; for example, two people should be able to walk side-by-side and pass a third comfortably. In areas of high demand, sidewalks should contain adequate width to accommodate the high volumes and different walking speeds of pedestrians. Pages 9 and 10 discuss typical uses, features, benefits, and other aspects of sidewalks.

IMAGE: GOOGLE EARTH

Sidewalks and Accessibility

Sidewalks

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel separated from vehicle traffic. Providing adequate and accessible facilities can lead to increased numbers of people walking, improved accessibility, and the creation of social space.



Design Features

Sidewalks are typically composed of the following four zones:

1. Frontage Zone: The frontage zone allows pedestrians a comfortable "shy" distance from the building fronts, fencing, walls and vertical landscaping. It provides opportunities for window shopping, to place signs, planters, or chairs
2. Pedestrian Through Zone: The pedestrian through zone is the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects. Wide pedestrian zones are needed in areas or where pedestrian flows are high
3. Amenity Zone: The amenity zone, also called the furnishing or landscaping zone, buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, signs, and other street furniture are properly located. When context and space allows, this is the ideal zone to include stormwater infrastructure and plantings such as bioswales and infiltration basins, as well as shade trees
4. Enhancement zone: The curbside lane can act as a flexible space to further buffer the sidewalk from moving traffic, and may be used for a bike facility. Curb extensions and bike corrals may occupy this space where appropriate

Typical Use

- Wider sidewalks should be installed near schools, high-demand transit stops, or where high pedestrian concentrations exist.
- Sidewalks should be continuous on both sides of urban commercial streets, and should be required in areas of moderate residential density (1-4 dwelling units per acre).
- When retrofitting sidewalk network gaps, gaps near transit stops, schools, parks, public buildings, and other areas with high pedestrian volumes should be highest priority.
- If a clear space bus stop is included on a sidewalk, an eight ft by five ft clear space is required for accessible passenger boarding/alighting at the front door location, per Americans with Disabilities Act (ADA) requirements.

Materials + Maintenance

- Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped boulevard.
- Non-concrete materials may be considered for sidewalks associated with private development projects, though surfaces should be firm, stable, and slip-resistant.
- Ensure accessibility and properly maintain all surfaces regularly.
- Colored, patterned, or stamped concrete can add distinctive visual appeal.

Key Benefits

- Provides a space for all people to access destinations.
- Creates the opportunity for placemaking through unique street furniture, trees and other plantings, public art, and signage that adds identity to a corridor.

Further Considerations

- The ADA requires a four ft clear width in the pedestrian zone plus five ft passing areas every 200 ft, though four ft is typically only recommended as an absolute minimum in very constrained situations.

IMAGE: CITY OF FREMONT

For More Guidance:

- NACTO Urban Street Design Guide
- Guide for the Planning, Design, and Operation of Pedestrian Facilities
- Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way
- AC Transit Transit-Supportive Design Guidelines

Off-Street Facilities

Introduction

Off-Street facilities are paved pathways intended for two-way, non-motorized travel such as walking, biking, or rolling. Their location off of the street makes them the highest comfort facility for all users, and they are heavily used for recreation in addition to transportation.

Class I Bikeways

Class I bikeways, referred to as shared use paths, are paved facilities for the exclusive use of pedestrians, bicyclists, or other micromobility users. These facilities are separated from vehicle traffic completely and often run through parks or along riparian, canal, or railroad corridors.

Pages 23 through 26 discuss typical uses, features, benefits and other aspects of:

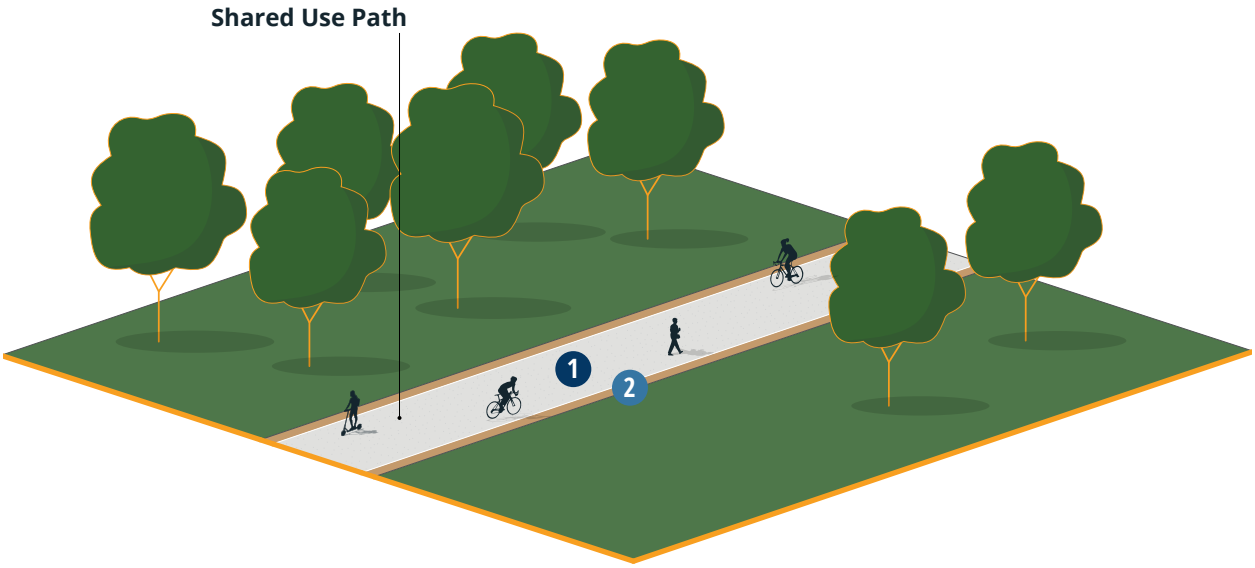
- Shared Use Paths
- Shared Use Path Transitions

IMAGE: ALTA

Shared Use Paths - Class I

Shared Use Paths

A shared use path allows for two-way, off-street active transportation and recreational users, such as pedestrians, joggers, skaters, wheelchair users, caregivers with strollers, and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles.



Design Features

1. Minimum width of a shared use path is eight ft; this width is only recommended in low-traffic situations.
2. Two ft minimum clear zone should be maintained on either side of the trail.
   - 10 ft is recommended in most situations and is adequate for moderate to heavy use.
   - 12 ft is recommended in areas with high foot and bike traffic. Where there is heavy pedestrian traffic, especially in urban areas, a separate walking track (five ft minimum) should be considered to separate uses.
   - A yellow dashed centerline is typically not recommended, but can be used in high conflict areas.


IMAGE: GLS ARCHITECTURE

Typical Use

- Shared use paths can be included in urban areas as well as rural or remote areas and can be incorporated into planned development projects.
- They can be considered as part of a regional trail (>three miles), a community connector trail (one to three miles) or a neighborhood trail (less than one mile).
- Shared use paths work well along direct corridors such as in an abandoned rail corridor, along an active rail corridor, in a river and/or utility corridor, along a flood control channel, or along a roadway.

Key Benefits

- Provide an off-street location for long-distance travel.
- Can provide a more natural and recreational experience than an on-street facility might be able to provide.
- Allows bicyclists or other micromobility users to safely ride side by side (depending on the width of the shared use path).

Materials + Maintenance

- Asphalt is the most common surface for shared use paths.
- The use of concrete for paths has proven to be more durable over the long term.
- Saw cut concrete joints rather than troweled improve the experience of path users.
- Distinctly-colored paving materials can help define a shared use path through urban areas.

Further Considerations

- Frequent access points from the local road and sidewalk network should be included to provide plenty of access onto and off of the path.
- Directional signage should be included along a shared use path to indicate to users where they are on the corridor.
- Shared use paths should encounter limited at-grade crossings with streets or driveways.
- Terminate the shared use path in a location that is easily accessible from the street system.
- To be useful for transportation, paths work best when connected to an on-street network that is highly comfortable for riders.

For More Guidance:

AASHTO
Guide for the Development of Bicycle Facilities

NACTO
NACTO Urban Bikeway Design Guide

City of Fremont
Fremont Trails Strategy Plan

Shared Use Paths - Class I

Shared Use Path Transitions

Safe and comfortable transitions between off-street trails and on-street bikeways should be provided where two facilities connect. Particular attention should be given to ensuring that transitions comply with ADA standards and protect low-vision pedestrians from unknowingly entering an uncontrolled roadway environment.

A commonly used method for making this transition smooth and effective is using a ramp to bring the bicyclist or micromobility device user from the elevated shared use path to street level. More specifics on this type of treatment can be found on page 38, Bicycle and Pedestrian Queuing Space.

The diagram on the following pages lays out a process for how to handle a shared use path transitioning to an on-street facility in different scenarios.

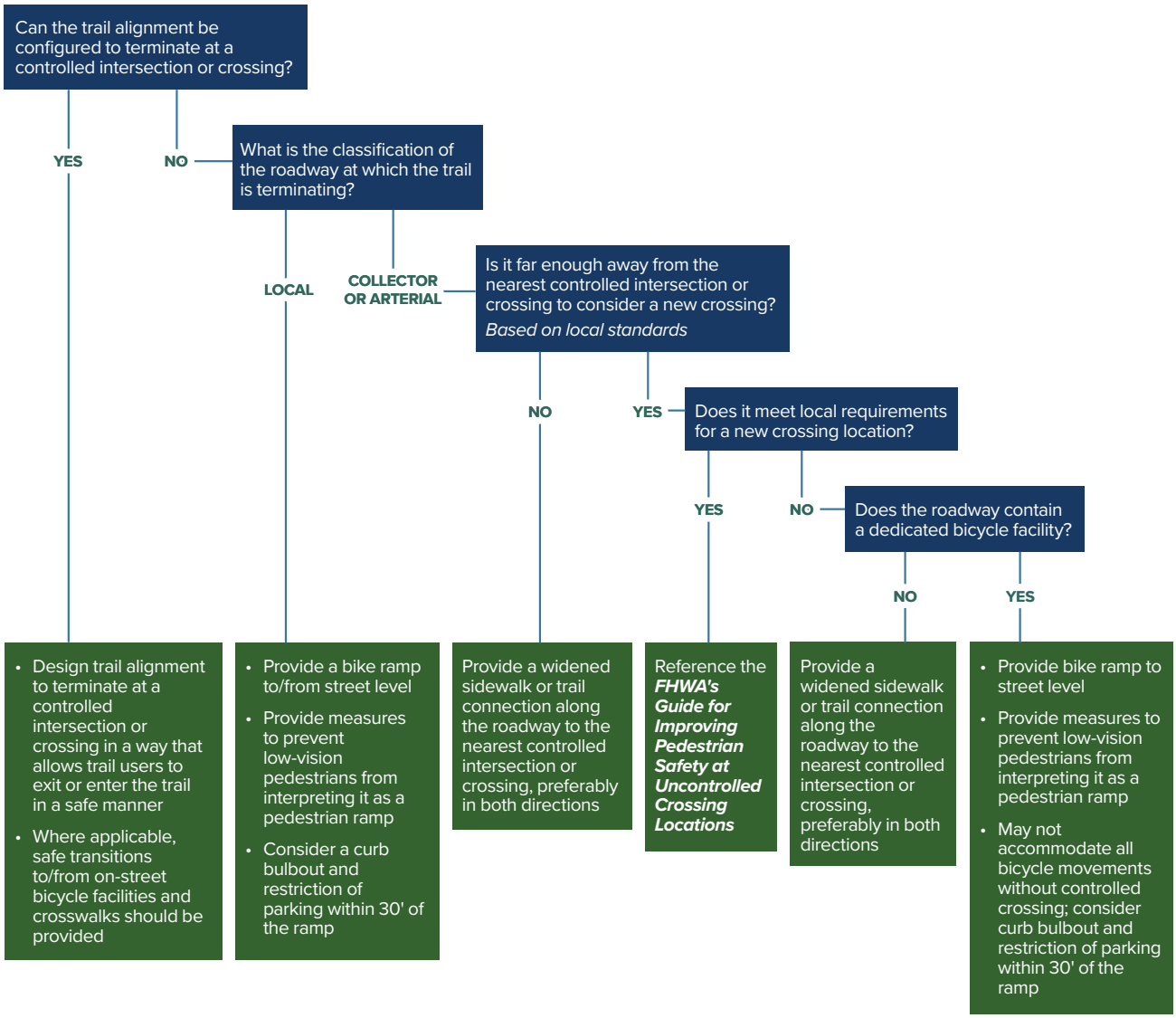
IMAGE: CITY OF FREMONT

For More Guidance:

Fremont Trails Strategy Plan

Caltrans DIB 94 Complete Streets: Contextual Design Guidance

When a shared use path terminates at a roadway...



Bikeways

Introduction

Selecting the most appropriate bicycle facility type for a given roadway can be challenging, due to the range of factors that influence bicycle users' comfort and safety. There is a significant impact on bicycling comfort when the speed differential between bicyclists and motor vehicle traffic is high and/or motor vehicle traffic volumes are high. **Class I bikeways, or shared use paths, are discussed in the following section on off-street facilities (page 22).**

Class II Bikeways

A Class II bikeway is a dedicated area on the roadway for bicyclists designated by striping, signage, and pavement markings. Bicycle lanes are intended to delineate the right-of-way for bicyclists and motorists and to provide more predictable movements that will be made by both groups. Pages 13 and 14 discuss typical uses, features, benefits, and other aspects of the Class II bikeways known as buffered bike lanes.

Class III Bikeways

A Class III bikeway, or shared facility, is a shared roadway condition that serve the purpose of either providing continuity to other bicycle facilities, or designating an alternate, more comfortable bicycle route off of a major corridor. Pages 15 and 16 discuss typical uses, features, benefits, and other aspects of the Class III bikeways known as neighborhood bikeways.

IMAGE: GOOGLE EARTH

IMAGE: ALTA

Class IV Bikeways

Separated Bikeways (Class IV) have a raised element such as a curb, plastic bollard, or parking that separates and protects the bicycle lane from auto traffic, or may be a bikeway that is raised to curb level. They are a key element of a AAA network due to their comfort and safety benefits. They are also known as protected bike lanes or cycle tracks. These are intended to feel as comfortable as a path that is fully removed from traffic. Pages 17 through 20 discuss typical uses, features, benefits, and other aspects of Class IV Bikeways or the following treatments:

- One-Way Separated Bike Lanes - In-Street (Bollard/Curb/Parking-Protected)
  Sidewalk-Level (Raised)
- Two-Way Separated Bike Lanes - In-Street (Bollard/Curb/Parking-Protected)
  Sidewalk-Level (Raised)


IMAGE: FREMONT.GOV

Facility Selection

The Alameda County Transportation Commission (ACTC) recently issued an All Ages and Abilities Policy that sets the highest expectation for safety and comfort on the Countywide Bikeways Network as an effort to ensure that those of all ages and physical abilities are safe and feel safe walking, biking, rolling, and using transit. The ACTC identified the NACTO framework as the standard for contextual facility selection.

As a starting point to identify a preferred contextual facility, NACTO regularly updates a guidance table that provides recommendations on how to select a preferred bikeway type given a specific roadway scenario (the current version of this **Contextual Guidance** chart can be found on page 21). A preferred bikeway type is recommended based on a series of factors, including target motor vehicle roadway speeds, volumes, and number and directions of motor vehicle lanes. Additional key operational considerations include high or low volume of curbside activity, shared roadway conditions, frequent motor vehicle congestion, and more. While this facility selection table serves as a guide and starting point for facility selection, it is not a substitute for engineering judgment or for coordinating and discussing with City staff.

Choosing an All Ages & Abilities Bicycle Facility - NACTO

Contextual Guidance for Selecting All Ages & Abilities Bikeways

Roadway Context				All Ages & Abilities Bicycle Facility
Target Motor Vehicle Speed*	Target Max. Motor Vehicle Volume (ADT)	Motor Vehicle Lanes	Key Operational Considerations	
Any		*Any*	*Any of the following:* high curbside activity, frequent buses, motor vehicle congestion, or turning conflicts‡	**Protected Bicycle Lane**
< 10 mph	Less relevant	No centerline, or single lane one-way	Pedestrians share the roadway	**Shared Street**
≤ 20 mph	≤ 1,000 – 2,000		< 50 motor vehicles per hour in the peak direction at peak hour	**Bicycle Boulevard**
≤ 25 mph	≤ 500 – 1,500			
	≤ 1,500 – 3,000	Single lane each direction, or single lane one-way	Low curbside activity, or low congestion pressure	**Conventional or Buffered Bicycle Lane, or Protected Bicycle Lane**
	≤ 3,000 – 6,000			**Buffered or Protected Bicycle Lane**
	Greater than 6,000			**Protected Bicycle Lane**
	Any	Multiple lanes per direction		
Greater than 26 mph†	≤ 6,000	Single lane each direction	Low curbside activity, or low congestion pressure	**Protected Bicycle Lane, or Reduce Speed**
		Multiple lanes per direction		**Protected Bicycle Lane, or Reduce to Single Lane & Reduce Speed**
	Greater than 6,000	*Any*	*Any*	**Protected Bicycle Lane, or Bicycle Path**
High-speed limited access roadways, natural corridors, or geographic edge conditions with limited conflicts		*Any*	High pedestrian volume	**Bike Path with Separate Walkway or Protected Bicycle Lane**
			Low pedestrian volume	**Shared-Use Path or Protected Bicycle Lane**

* While posted or 85th percentile motor vehicle speed are commonly used design speed targets, 95th percentile speed captures high-end speeding, which causes greater stress to bicyclists and more frequent passing events. Setting target speed based on this threshold results in a higher level of bicycling comfort for the full range of riders.

† Setting 25 mph as a motor vehicle speed threshold for providing protected bikeways is consistent with many cities' traffic safety and Vision Zero policies. However, some cities use a 30 mph posted speed as a threshold for protected bikeways, consistent with providing Level of Traffic Stress level 2 (LTS 2) that can effectively reduce stress and accommodate more types of riders.[18]

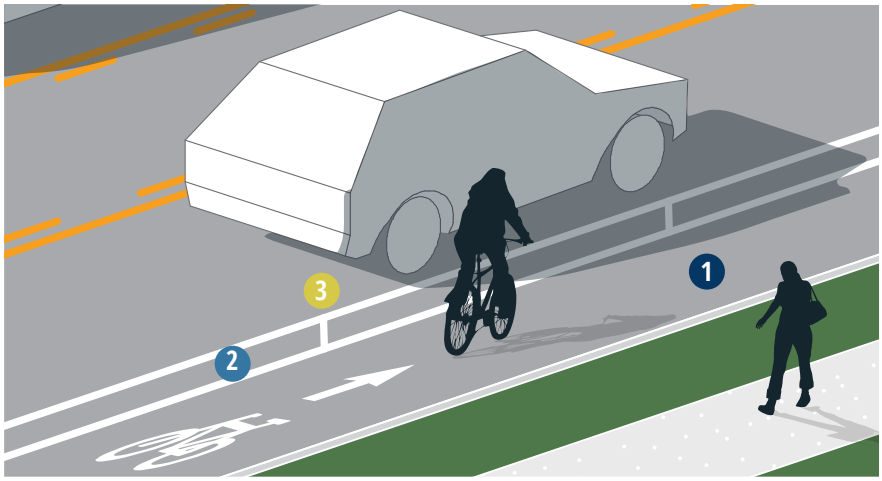
‡ Operational factors that lead to bikeway conflicts are reasons to provide protected bike lanes regardless of motor vehicle speed and volume.

Note: this selection guide is just one consideration and may be updated as guidance is updated.
(Check latest guidance and collaborate coordinate with city)

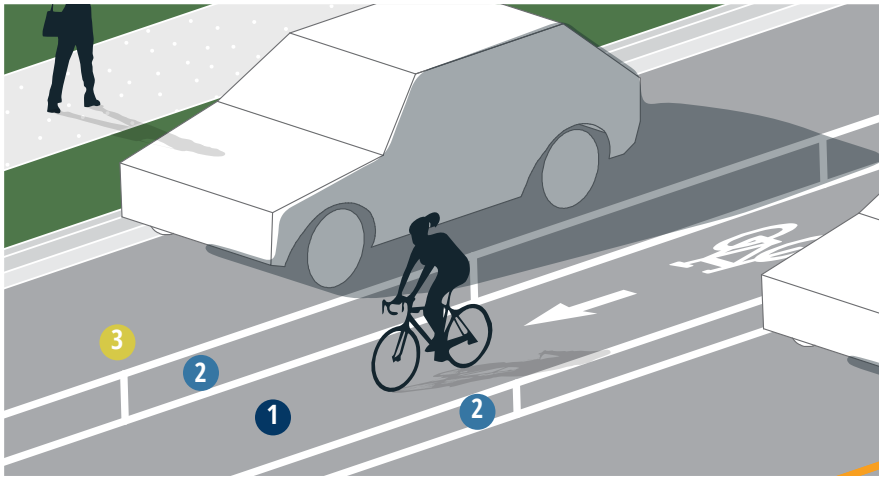
Bike Lanes - Class II

Buffered Bike Lanes

Buffered bike lanes (Class II), are bike lanes that have a striped buffer between the bike lane and vehicle travel lanes. The buffer provides separation and allows bikes to ride further away from car doors when curb parking is present.



Standard Buffered Bike Lane



Buffered Bike Lane with Parking Buffer

Design Features

1. Minimum width of the bike lane is five ft. This width does not include the buffer.
2. Buffered area should be marked with two solid white lines and should be no less than three ft wide except in constrained areas.
3. The buffer should have interior diagonal hatching or chevron markings if three ft wide or wider.

- For clarity at driveways or minor street crossings, consider utilizing intersection tracking, or conflict markings.
- The R81 (CA) "Bike Lane" sign is optional, but recommended in most contexts.

Typical Use

- Anywhere a conventional bike lane is being considered, but especially at the higher end of the speed and volume ranges.
- While conventional bike lanes are most appropriate on streets with lower to moderate speeds (≤ 30 mph), buffered bike lanes provide additional value on streets with higher speeds (+30 mph) and high volumes or high truck volumes.
- On streets with extra lanes or lane width.
- Appropriate for skilled adult riders on most streets.

Key Benefits

- Provides greater distance between moving motor vehicles and/or parked vehicle doors and bicyclists.
- Provides a comfortable width for bicyclists to ride/pass in when needed.
- Appeals to a wider audience of bicycle and other micromobility users than a standard bike lane would.
- Excess vehicle lane space that is applied to the buffer zone reduces overall vehicle lane width; studies have proven narrower lanes can reduce vehicle speeds.

Materials + Maintenance

- Painted buffers can be implemented as an interim treatment in advance of physically separated bike lanes. With proper design, vertical elements can be easily added to a buffer area to elevate a Class II facility to a Class IV facility.
- If there is high parking lane usage, consider allocating some or all of the buffer space to the parking lane side to create a buffer for the “door zone”.

Further Considerations

- Consider narrowing travel lanes (11 ft maximum) to maximize bike lane and buffer width.
- Bike lane striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway.
- Bike lanes should be maintained so that there are no pot holes, cracks, uneven surfaces or debris .
- Manhole covers within bike lanes should be adjusted to be flush with the pavement when repaving occurs.
- Ensure bike lane entrance is not so wide that it appears as a regular travel lane.

For More Guidance:

NACTO Urban Bikeway Design Guide

FHWA Bikeway Selection Guide

Caltrans DIB 94 Complete Streets: Contextual Design Guidance

Neighborhood Bikeways - Class III

Neighborhood Bikeways

Neighborhood bikeways, also commonly referred to as bicycle boulevards or neighborhood greenways/byways, are residential streets with very low motor vehicle volumes and speeds, designed to give bicycle travel priority. These streets use a series of traffic calming devices at intersections and along corridors to keep motor vehicle traffic slow.

Traffic Circle

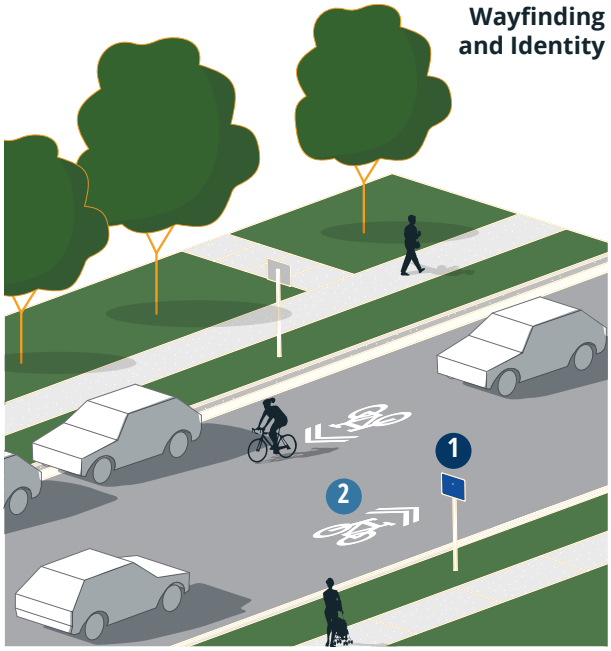
Design Features

- Minimum treatments necessary to designate a street as a neighborhood bikeway

1. Wayfinding and identity signs
2. Pavement markings,
3. Traffic calming elements such as speed humps, raised intersections, or traffic circles

- Implement volume control treatments based on the context of the neighborhood bikeway, using engineering judgment .
- Intersection crossings should be designed to enhance comfort and minimize delay for bicyclists of diverse skills and abilities.

IMAGE: ALTA



Typical Use

- On low-volume, low-speed streets. Utilize traffic calming to maintain or establish low volumes and discourage vehicle cut through / speeding.
- Follow a desire line for bicycle travel that is ideally long and relatively continuous (2-5 miles).

Key Benefits

- Provides a slower speed environment for biking, typically near a major thoroughfare corridor.
- Can host neighborhood branding and identity features like trees, wayfinding signage, public art, and green infrastructure.
- Keeps traffic calm on residential streets.

Materials + Maintenance

- Neighborhood bikeways require few additional maintenance requirements to local roadways.
- Signage, signals, and other traffic calming elements should be inspected and maintained according to local standards.

Further Considerations

- Neighborhood bikeway retrofits to local streets are typically located on local collectors that connect with arterials at signalized intersections.
- Neighborhood Bikeway treatments can deter motorists from driving on a street.

For More Guidance:

NACTO Urban Bikeway Design Guide

FHWA Bikeway Selection Guide

Neighborhood Bikeways - Class III

Shared Lane Markings (SLMs)

Shared lane markings (often abbreviated to SLMs and also commonly referred to as sharrows) are not to be used as standalone bike treatments, but can be applied at intersections to indicate proper lane positioning and serve as a wayfinding element. They also alert motorists to the presence of bicyclists.

Key Benefits

- Provides direction for people riding bicycles through wide intersections.
- Underscores right of people riding bicycles to occupy the travel lane when no clear bikeway is present.
- Signals to drivers to look for bicyclists.


IMAGE: ALTA

Typical Use

- At intersections with bikeways on one or more approaches.
- Neighborhood bikeways where bicycle priority may be unclear.

Design Features

- Placed in the travel lane where bicycles can safely and comfortably occupy shared space with vehicles, either giving direction to a bikeway or giving the lane.

Further Considerations

- Inadequate on its own; use in conjunction with other treatments.

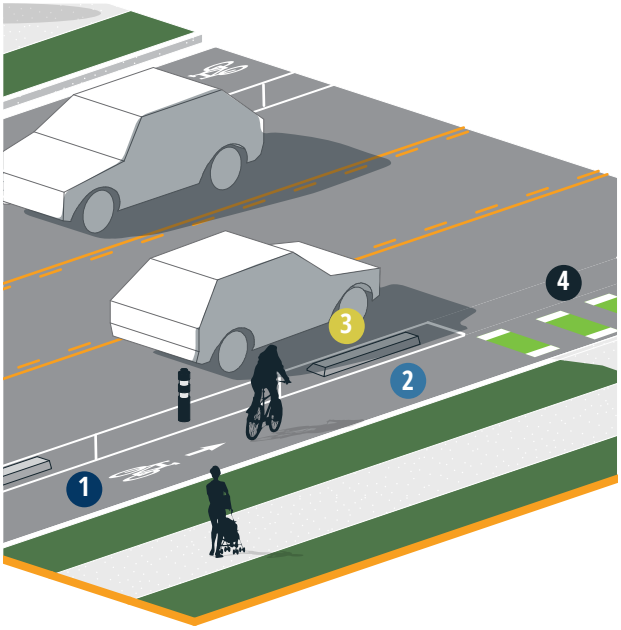
For More Guidance:

NACTO Urban Bikeway Design Guide

Separated Bikeways - Class IV

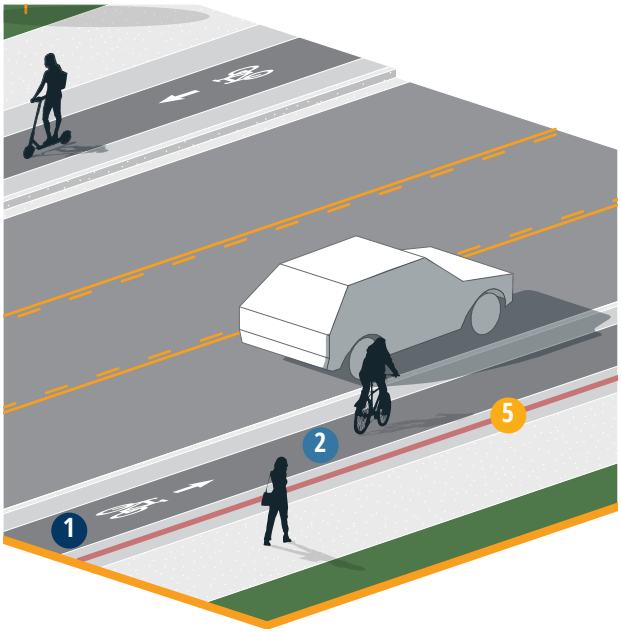
One-Way Separated Bike Lanes

A one-way separated bike lane is an exclusive bike and micromobility facility that combines the experience of a separated path and on-street conventional bike lane infrastructure. These facilities are physically separated from motor traffic and buffered from the pedestrian space. Separated bike lanes can take multiple forms, but share common elements including exclusive space for bicyclists and other micromobility users, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.



In-Street Bike Lane (Bollard/Curb)

Bikeway facilities separated from vehicle traffic by a vertical element between the bikeway and the vehicular travel lane. These can include flexible posts, bollards, planters, extruded curbs, or on-street parking and share the same elevation as adjacent travel lanes.



Sidewalk-Level Bike Lane (Raised)

Bikeway facilities at the same elevation as the sidewalk to provide separation from vehicle traffic. A raised buffer space between the bike lane and the travel lane (where feasible) provides an additional layer of separation.

Design Features

1. Pavement markings, symbols, and/or arrow markings must be placed at the beginning of the bikeway and at designated intervals along the facility.
2. Minimum bike lane width is five ft, seven ft is preferred to facilitate safe passing behavior and the minimum necessary for the mini street sweeper. Buffers should be two ft minimum, three to four ft preferred.
3. Maximize effective operating space by placing curbs/delineator posts as far from the through space as practicable, while discouraging vehicles from entering.
4. Include green conflict marks at crossing points like intersections or driveways.
5. Include landscaping or tactile warning features between the sidewalk-level bike lane and pedestrian zone to create a clear division for visually impaired individuals.

Typical Use

- Along streets on which conventional bicycle lanes would cause many bicyclists to feel stress due to the same factors mentioned for one-way bikeways.
- Along streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Work best on one-way streets; single direction motor vehicle travel minimizes potential conflict with bicyclists.
- Recommended for corridors with fewer driveway and intersection conflicts.

Materials + Maintenance

- Bikeway striping and markings will require higher maintenance where vehicles frequently traverse them at intersections and driveways.
- Green conflict markings (if used) will also generally require higher maintenance due to vehicle wear.
- Access points along an on-street facility should be provided for street sweeper vehicles to enter/exit the bikeway.
- Composite and reboundable delineator systems offer more durability.

Key Benefits

- Relatively simple to retrofit on a roadway without changing the curb and gutter location (in-street option).
- Vertical separation (by way of elevation or vertical elements) provides additional protection and comfort for people on bicycles and other mobility devices.
- Reduces conflicts with vehicles parked or waiting in the bike lane.

Further Considerations

- A retrofit in-street separated bikeway has a relatively low implementation cost compared to road reconstruction by making use of existing pavement, drainage, and parking lane. However, annual maintenance or replacement costs should be considered depending on separation device used (plastic: less durable, higher maintenance costs, concrete curbs: more durable lower maintenance costs).
- Gutters, drainage outlets, and utility covers should be designed/configured as to not impact bicycle travel.
- Parking should be prohibited within 30 ft of intersections and driveways to improve visibility; clearly indicate parking prohibition through the use of a red curb, signs, or other tools.
- Consider additional design features to deter drivers from entering separated bike lanes, due to their width.

For More Guidance:

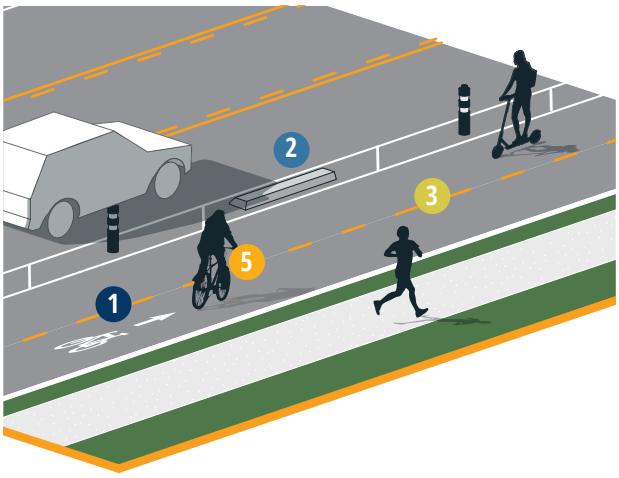
NACTO Urban Bikeway Design Guide

FHWA Bikeway Selection Guide

Separated Bikeways - Class IV

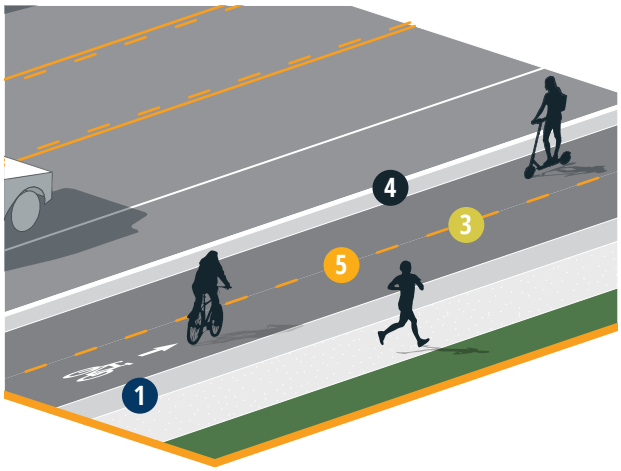
Two-Way Separated Bike Lanes

Two-way separated bikeways are physically separated bikeways that allow bicycle movement in both directions. Two-way facilities are included on one side of the road, and function well on one-way streets.



In-Street Bike Lane (Bollard/Curb)

Bikeway facilities separated from vehicle traffic by a vertical element, such as flexible posts, bollards, planters, extruded curbs, or on-street parking between the bikeway and the vehicular travel lane. These bikeways share the same elevation as adjacent travel lanes. A center stripe divides the two directions of travel.



Sidewalk-Level Bike Lane (Raised)

Bikeway facilities at the same elevation as the sidewalk to provide separation from vehicle traffic. A raised buffer space between the bike lane and the travel lane (where feasible) provides an additional layer of separation. A center stripe divides the two directions of travel.

Design Features

1. Pavement markings, symbols, and/or arrow markings must be placed at the beginning of the bikeway and at intervals along the facility based on engineering judgment.
2. Maximize effective operating space by placing curbs/ delineator posts as far from the through space as practicable.
3. 12 ft lane width is recommended for a two-way facility; width can be eight ft minimum where there are constraints.
4. When placed adjacent to parking, the parking buffer should be three ft wide to allow for passenger loading and to prevent door collisions.
5. Yellow striped center lane should be included to indicate two-way movement.


IMAGE: ALTA

Typical Use

- Along streets on which conventional bicycle lanes would cause many bicyclists to feel stress due to the same factors mentioned for one-way bikeways.
- Along streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Work best on one-way streets; single direction motor vehicle travel minimizes potential conflict with bicyclists.
- Recommended for corridors with fewer driveway and intersection conflicts.

Materials + Maintenance

- Bikeway striping and markings will require higher maintenance where vehicles frequently traverse them at intersections and driveways.
- Green conflict markings (if used) will also generally require higher maintenance due to vehicle wear.
- Access points along an on-street facility should be provided for street sweeper vehicles to enter/exit the bikeway.
- Composite and reboundable delineator systems offer more durability.

Key Benefits

- Relatively simple to retrofit on a roadway without changing the curb and gutter location.
- Provides higher level of protection and comfort for people on bicycles.

Further Considerations

- A retrofit in-street separated bikeway has a relatively low implementation cost compared to road reconstruction by making use of existing pavement, drainage, and parking lane. However, annual maintenance or replacement costs should be considered depending on separation device used (plastic: less durable, higher maintenance costs, concrete curbs: more durable lower maintenance costs).
- Gutters, drainage outlets, and utility covers should be configured to not impact bicycle travel.
- Parking should be prohibited within 30 ft of intersections and driveways to improve visibility; clearly indicate parking prohibition through the use of a red curb, signs, or other tools.
- Consider additional design features to deter drivers from entering two-way facilities due to their width.
- Consider additional design features to deter drivers from entering two-way facilities at intersections, due to their width. Also, at intersections where the two-way facility transitions to one-way facilities.

For More Guidance:

NACTO Urban Bikeway Design Guide

FHWA Bikeway Selection Guide

03
Intersection Treatments

Uncontrolled Intersections

Introduction

Crossing major streets can pose a significant barrier to the safety, comfort, and quality of the experience for a person walking, biking, or rolling.

Crossings should be direct and intuitive for all users. Treatments may vary depending on how many lanes need to be crossed and the speed and volume of motor vehicle traffic traveling along the intersecting street. The following types of treatments should be considered based on the characteristics of the intersection.

Geometric Features

Where crossing complexity is low and signalization is not required, the following treatments can be considered:

- Curb Extensions
- Median Refuges


IMAGE: ALTA

Pedestrian Crossing Enhancements

At intersections with numerous lanes, high vehicular travel speeds and/or volumes, stopping traffic will be necessary to ensure safety. Here, using FHWA Safe Transportation for Every Pedestrian (STEP) as guidance, the following signal treatments should be considered in addition to the geometric features already outlined:

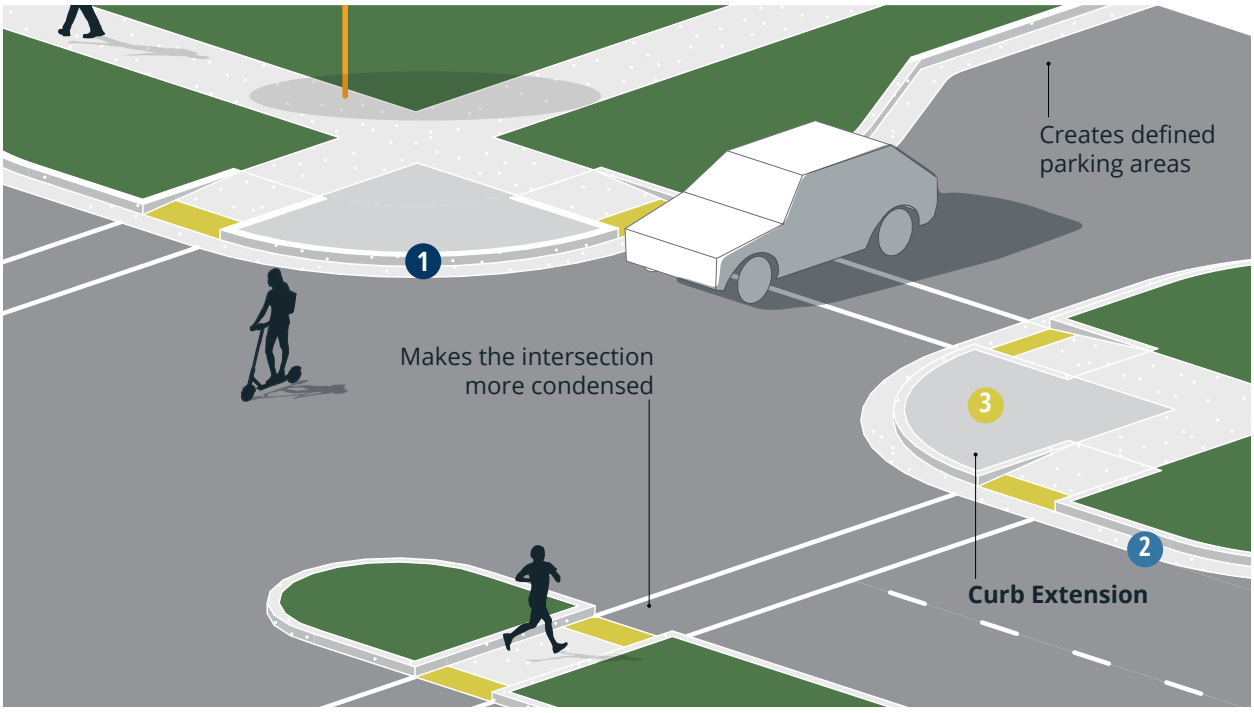
- Pedestrian Crosswalk Beacons or Rectangular Rapid Flashing Beacons (RRFBs)
- Pedestrian Crosswalk Signals or Pedestrian Hybrid Beacons (PHBs)

IMAGE: ALTA

Geometric Features

Curb Extensions

Curb extensions minimize pedestrian exposure during crossing by shortening crossing distance and giving pedestrians a better chance to see and be seen before committing to crossing. They are appropriate for any crosswalk where it is desirable to shorten the crossing distance and there is a parking lane adjacent to the curb.



Design Features

1. For purposes of efficient street sweeping, the minimum radius for the reverse curves of the transition is 10 ft and the two radii should be balanced to be nearly equal.
2. Curb extension design should facilitate adequate drainage.
3. Planted curb extensions may be designed as a bioswale, a vegetated system for stormwater management.

- In most cases, the curb extensions should be designed to transition between the extended curb and the running curb in the shortest practicable distance.

Typical Use

- At signalized and unsignalized intersections with marked crosswalks.
- At an intersection with visibility constraints, to position pedestrians where they can best be seen by oncoming traffic.
- At an intersection within a school zone on a walking route.

Key Benefits

- Shortens the crossing distance for those crossing at the intersection.
- Slows down motorists turning around the corners.
- Prevents motorists from parking too close to the intersection.
- Provides space for beautification features such as landscaping, public art, or paving materials that match other areas along the roadway to create a cohesive corridor.

Further Considerations

- Curb extensions are only appropriate where there is an on-street parking lane and where transit and bicyclists would be traveling outside the curb edge for the length of the street.
- The turning needs of larger vehicles, such as school buses or emergency vehicles, need to be considered in curb extension design, especially at intersections with significant truck/bus traffic. Mountable aprons should be considered where necessary.
- Do not block bicycle lanes or shoulders being used by bicyclists with a curb extension.
- Curb extensions should be considered based on land use context.


IMAGE: ALTA

For More Guidance:

NACTO Urban Street Design Guide

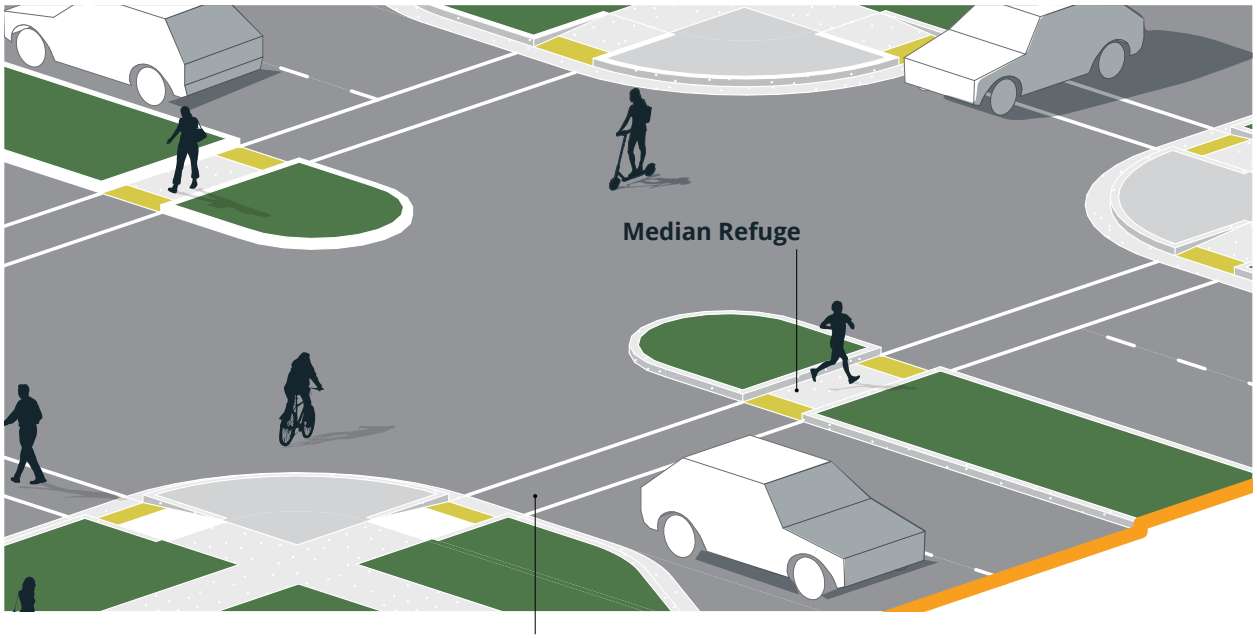
FHWA Pedestrian Safety Guide and Countermeasure Selection System

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Geometric Features

Median Refuges

Median refuges or "islands" are protected areas across a roadway or in an intersection that allow pedestrians and/or bicyclists to cross a street in stages, reducing exposure, increasing visibility, and improving overall safety.



Pedestrians can cross one lane or one direction of traffic at a time, wait on the refuge for traffic to clear in the other direction, then continue crossing

Design Features

- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- The island should be at least six ft wide (four ft min, eight ft ideal) to be a legal refuge and be wider to accommodate cargo bikes or bikes with child trailers.
- When installed at a mid-block crossing, the island should be supplemented with a marked, high-visibility crosswalk.
- If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Shrubs and ground plantings should be no higher than 36", though 18" is preferred.

Typical Use

- Refuge islands are desirable for pedestrian crossings on roads with three or more travel lanes, especially where speed limits are 35 mph+ and/or where annual average daily traffic (AADT) is 9,000 or higher.
- Can be applied on any roadway with a left turn center lane or median that is at least six ft wide.
- On multi-lane roadways, consider including active warning beacons for improved yielding compliance.

Key Benefits

- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- The island should be at least six ft wide (four ft min, eight ft ideal) to be a legal refuge and be wider to accommodate cargo bikes or bikes with child trailers.
- When installed at a mid-block crossing, the island should be supplemented with a marked, high-visibility crosswalk.
- If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Shrubs and ground plantings should be no higher than 36", though 18" is preferred.

Further Considerations

- Cut-through median refuge islands are preferred over curb ramps to better accommodate wheel chairs users.
- Illuminate or highlight islands with street lights, signs, or reflectors to enhance visibility for motorists.

For More Guidance:

NACTO Urban Bikeway Design Guide

FHWA Pedestrian Safety Guide and Countermeasure Selection System

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Pedestrian Crossing Enhancements

Pedestrian Crosswalk Beacon

Pedestrian crosswalk beacons or rectangular rapid flashing beacons (RRFBs) are user-actuated, illuminated devices designed to increase motor vehicle yielding compliance at crossings of multi-lane or high-volume roadways.

Design Features

- Beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic signals.
- Beacons shall initiate operation based on pedestrian or bicyclist actuation and shall cease operation at a predetermined time after actuation or, with passive detection, after the pedestrian or bicyclist clears the crosswalk.


IMAGE: CITY OF FREMONT

Typical Use

- At marked crosswalks where increased pedestrian visibility is needed.

Key Benefits

- Motorists are more likely to yield at a crosswalk if a beacon is activated.
- Provide a good option for more effective midblock crossings.
- Can be easily integrated with a median refuge.

Further Considerations

- Pedestrian or median refuge islands are not a critical element of an pedestrian crosswalk beacon application, but when refuge islands are included, an additional beacon can be installed as part of this median.
- Reference FHWA uncontrolled crossing guidance related to volumes, lanes, and other countermeasures to include with these treatments.

IMAGE: FREMONT.GOV

For More Guidance:

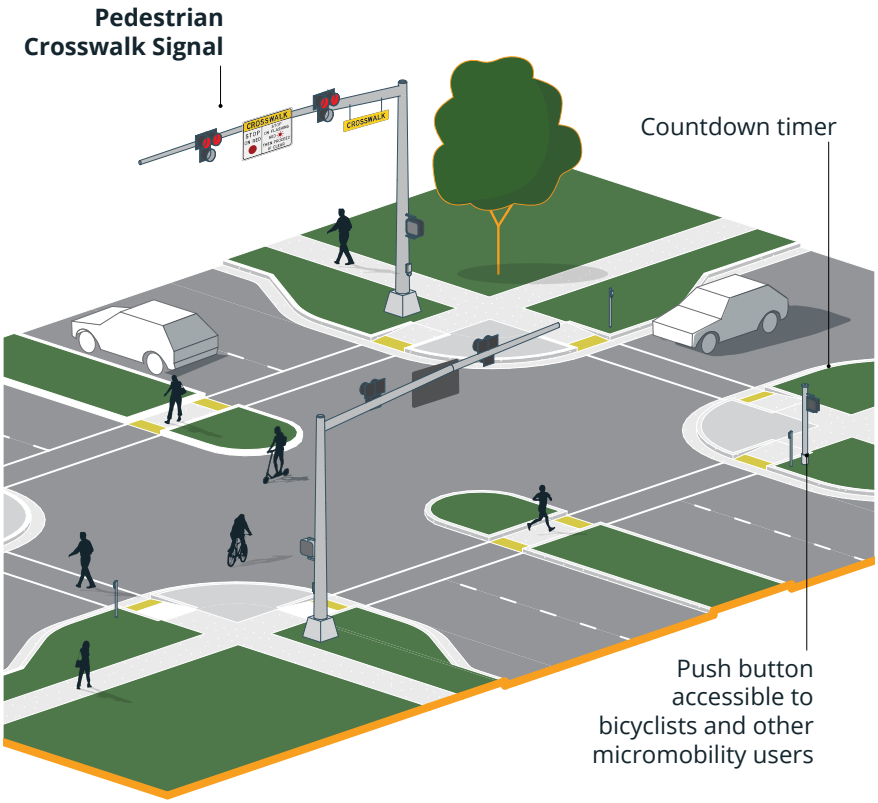
NACTO Urban Bikeway Design Guide

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Pedestrian Crossing Enhancements

Pedestrian Crosswalk Signal

Pedestrian crosswalk signals or Pedestrian Hybrid Beacons (PHBs), are used to improve non-motorized crossings of major streets. A hybrid beacon consists of a signal head with two red lenses over a single yellow lens on the major street, and a pedestrian signal head for the crosswalk.



How to Operate a Pedestrian Crosswalk Signal

1. Push button is pressed by an individual or group walking, biking, or rolling.
2. Pedestrian Crosswalk Signal is activated, turning from yellow to red.
3. Motorists must yield as those who are walking, biking, or rolling cross the street during the crossing countdown timer phase.
4. Pedestrian Crosswalk Signal turns off once crossing countdown is complete and motorists can continue through the intersection.

Design Features

- If installed within a signal system, traffic engineers should evaluate the need for the pedestrian crosswalk signal to coordinate with other signals.
- Parking/other sight obstructions should be prohibited at least 100 ft in advance of and at least 20 ft beyond the marked crosswalk to provide adequate sight distance.
- Pedestrian crossings signals are typically activated by push buttons, but may also be triggered by infrared, microwave or video detectors. Maximum delay for signal activation should be two minutes, with minimum crossing times determined by roadway width.
- R10-23A signs and W11-2S (Crosswalk) signs are used in Fremont.

Typical Use

- At unsignalized intersections with high volumes of pedestrians; pedestrian crosswalk signal warrants require fewer pedestrians crossings than full traffic signals.
- At an intersection within a school zone on a walking route.
- Pedestrian crosswalk signals may be suitable and less expensive than full signalization.

Key Benefits

- Stops the flow of traffic so people who are walking, biking, or rolling are able to cross the street mid-block or at intersections where a full signal is not warranted.
- If street-accessible push buttons are included, the beacon can easily be activated by both pedestrians and bicyclists/other micromobility users.

Further Considerations

- Per the Federal Highway Administration (FHWA), bicycle signals may not be combined with a pedestrian crosswalk signal. Bicycles must use the pedestrian signal indication.
- Blankout signs that restrict conflicting motor vehicle movements from the minor cross-street are recommended to be present and active during beacon operation to reduce potential conflicts.
- Pedestrian crossings may be on both sides of the street as there is no FHWA prohibition.
- Surrounding land use, spatial constraints, and project budget dictate pedestrian crosswalk signal application.

For More Guidance:

NACTO Urban Bikeway Design Guide

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Signalized Intersections

Introduction

Crossing streets with existing traffic signals can be made safer and easier for people walking, bicycling, or using other micromobility devices through geometric features and signal enhancements. The elements included on the following pages are standard elements of intersections in Fremont, and should be applied based on guidance from Caltrans and City of Fremont standards.

Geometric Features

Geometric features, or physical changes to the intersection, can be implemented during roadway reconstruction to include:

- Bicycle and Pedestrian Queuing Space
- Accessible Curb Ramps

Signal Enhancements

Signal enhancements give more time and priority to pedestrians and bicyclists/ other micromobility users to cross the intersection. These include:

- Accessible Pedestrian Signals (APS)
- Bike and Pedestrian Detection
- Leading Pedestrian/Bike Intervals (LPIs/LBIs)

IMAGE: CITY OF FREMONT

IMAGE: ALTA

Geometric Features

Bicycle and Pedestrian Queuing Space

Providing adequate space for both bicyclists and pedestrians to queue before crossing the street is critical in making a roadway comfortable for all users. Where feasible, Fremont takes the approach of mixing corners, or bringing both bicyclists and pedestrians to a shared space when crossing the street to enhance visibility. These mixed areas should provide enough space for multiple people to comfortably wait before crossing the intersection.

Key Benefits

- Provides a comfortable space for all roadway users to queue when waiting to cross at an intersection.
- Takes bicyclists out of the right turning vehicle conflict zone.
- Makes it easier for motorists to see bicyclists and pedestrians that will be crossing the street since they are in the same location.


IMAGE: CITY OF FREMONT

Typical Use

- Adequate queuing space should be provided at all intersections if possible, but is most critical on high-volume corridors.
- Mixing corners should be used where high volumes of pedestrians and bicyclists are expected.

Design Features

- Bicyclist queuing area should be at least six ft long to accommodate typical bicycle length.
- Bike ramps should include pavement markings and a detectable warning strip at the top of ramps.

Further Considerations

- Pedestrian queuing area should allow two pedestrians to be standing side by side.

For More Guidance:

NACTO Urban Bikeway Design Guide

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Geometric Features

Accessible Curb Ramps

Accessible curb ramps allow all sidewalk users safe access to intersection or midblock crossings by providing a sloped ramp to the grade level of the crossing. The slope of this ramp should be compliant with current ADA standards (maximum 1:10 or 10%, and ideally 1:12 or 8%). In Fremont, separate directional curb ramps (bi-directional ramps) for each crosswalk at an intersection should be provided rather than having a single ramp at a corner for both crosswalks.

Key Benefits

- Provides fair access to all destinations for people with mobility challenges or that are using wheeled devices.
- Detectable warning strips remind all pedestrians of the transition between the sidewalk and the street.


IMAGE: WESTERN CITY

Typical Use

- Provide an accessible connection between the sidewalk and an intersection or other locations where sidewalk users may need to have access.

Design Features

- The level landing at the top of a ramp should be at least four ft long and at least the same width as the ramp itself.
- The curb ramp edge should be marked with a detectable warning surface (also known as truncated domes) to alert people with visual impairments.

Further Considerations

- Curb ramps should remain clear of obstacles.
- No new pole, utility or other impediment should be placed in the curb ramp return areas.
- Existing conflicting elements should be moved as opportunities and budgets allow.

For More Guidance:

San Francisco Better Streets Plan

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Signal Enhancements

Accessible Pedestrian Signals (APS)

Accessible pedestrian signals (APS) are devices that communicate information about the WALK and DON'T WALK intervals at signalized intersections in non-visual formats (audible and vibrotactile) to pedestrians who are blind or who have low vision. APS are often in the form of a push button, but some versions can be activated by the wave of a hand through an infrared sensor to minimize touch.

Key Benefits

- Reduces the frequency of crossings started during the "DON'T WALK" phase.
- Gives all individuals a more accurate judgment of the onset of the WALK interval.
- Sighted pedestrians also begin to cross faster when an APS is in place.

IMAGE: ALTA

Typical Use

- At signalized intersections with high volumes of pedestrian traffic.
- Typically installed upon request along specific corridors by individuals or groups who are blind or visually impaired.

Design Features

- An APS appears as a box attached to a post at the crossing.
- Pushbutton-integrated APS should be placed between 1.5 and 6 ft from the edge of the curb.
- APS make different sounds to indicate different parts of the crossing phase.

Further Considerations

- If two APS pushbuttons are installed on one poll, messages identifying the intersection/street to be crossed are needed to be sure users know which direction to listen for in the message.
- Wave activation can occasionally be falsely triggered, leading to long crossing phases without anyone crossing.

For More Guidance:

NCHRP APS Guide Best Practices

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Signal Enhancements

Bike and Pedestrian Detection

Bike and pedestrian detection devices are used at intersections to trigger a signal change, allowing the activating bicyclist or pedestrian to cross the intersection. Detection can be both active (by push button, like in the case of the APS, described on the previous page) or passive (through in-pavement loops, videos, microwaves, etc.).

Key Benefits

- Improves the efficiency of travel and reduces delay for those who are walking, biking, or rolling.
- Discourages red light running by bicyclists without causing drastic delay for motorists.
- Can be used to prolong a current green phase in addition to triggering a change to green.

IMAGE: FHWA BIKESAFE

Typical Use

- In the travel lane on intersection approaches without bike lanes.
- At intersections with bicycle signal heads or bicycle-specific phasing.
- In bike lanes on actuated intersection approaches.
- In left turn lanes with actuated left-turn signals where bicyclists may also be turning left.

Design Features

- Detection types:
  Loop: Induction loop embedded in pavement
  Video: Aimed at bicyclist approaches; calibrated to detect bicyclists
  Microwave: Microwave radar that picks up non-background targets
  Push-button: User-activated button mounted on a pole facing the street

Further Considerations

- If detectors are not provided within a bike lane or other dedicated space, signage/stencils should be used to alert bicyclists on where to position themselves to be detected.
- Type of detection (active vs. passive) will need to be determined on a case-by-case basis.

For More Guidance:

NACTO Urban Bikeway Design Guide

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Signal Enhancements

Leading Pedestrian/Bike Intervals (LPIs/LBIs)

An LPI or LBI activates the pedestrian/bike crossing signal in advance of the light turning green to allow pedestrians and bicyclists to begin crossing the intersection before motor vehicles, enhancing their visibility.

Key Benefits

- Gives vulnerable roadway users (those not in motor vehicles) a head start across the intersection.
- Enhances visibility of pedestrians and reinforces their right-of-way over turning vehicles.

Signal Phases:

A: Motor vehicle movements stopped in all directions
Pedestrian and bike signals activated

B: Motor vehicle straight movement activated
Pedestrian and bike signals still activated

C: Motor vehicle straight movement stopped, turning movement activated
Pedestrian and bike signals stopped

Typical Use

- At intersections where heavy turning traffic creates conflicts for crossing pedestrians.
- Applied where both pedestrian volumes and turning volumes are high.
- Where crossing bikes on a bikeway conflicts with turning traffic, a leading bicycle interval should be used along with an LPI.

Design Features

- LPIs are typically paired with No Right Turn on Red restrictions.
- Depending on crossing distance, LPIs should give pedestrians a head start of 3-7 seconds.
- If ped volumes are high/ distance is long, consider up to 10 seconds.
- Adding curb extensions can further enhance the effectiveness of an LPI.

Further Considerations

- LPIs have been shown to reduce pedestrian-vehicle collisions by as much as 60%[1].
- AB 2264 made changes to CVC 21450.5 that affect state intersections; once Caltrans establishes guidance/standards, these will apply to the City's and County's standards.

For More Guidance:

NACTO Urban Street Design Guide

NACTO Don't Give Up at the Intersection

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

[1] *A.C. Fayish and Frank Gross "Safety effectiveness of leading pedestrian intervals evaluated by a before–after study with comparison groups," Transportation Research Record No. 2198 (2010): 15–22*

Bikeway Treatments at Intersections

Introduction

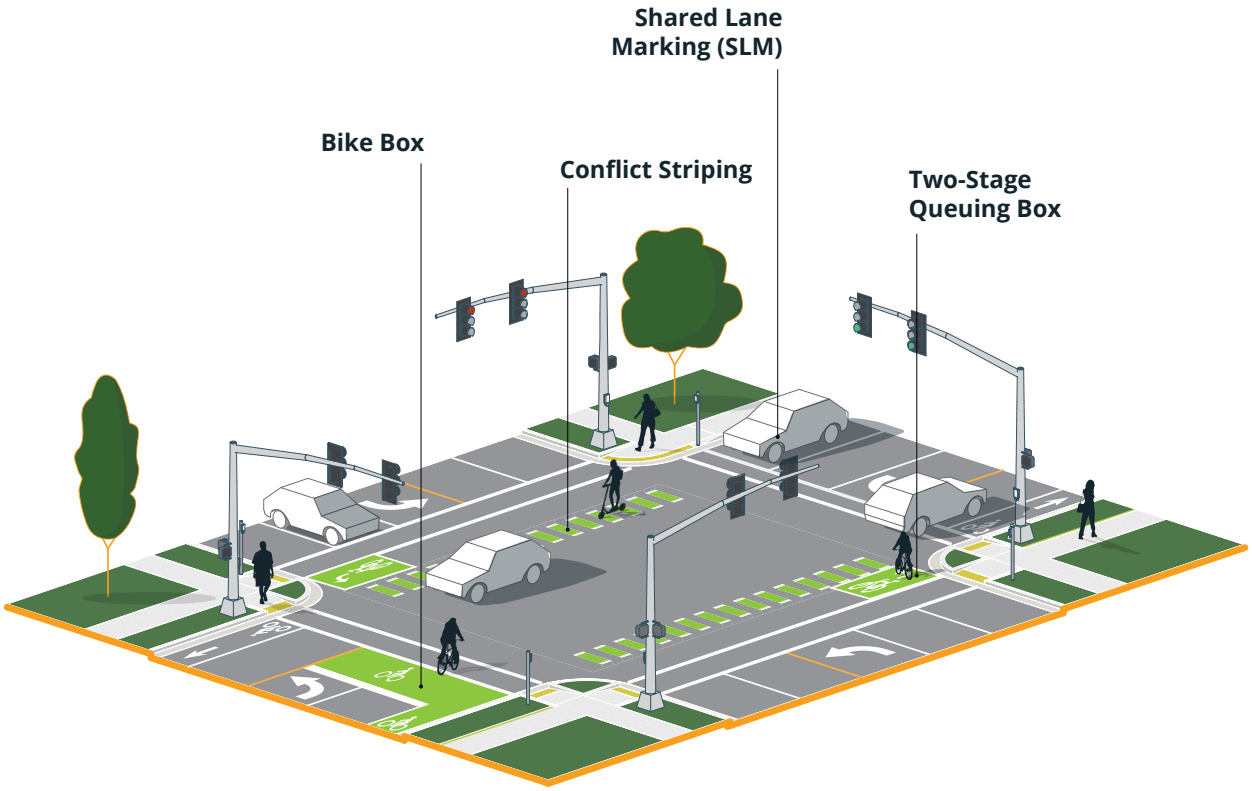
Bikeway treatments at intersections should minimize conflict between bicyclists and other micromobility users and motor vehicles by improving visibility, establishing a clear right-of-way, and enhancing eye contact and awareness with competing modes. Successful bikeway treatments can resolve queuing and merging maneuvers for bicyclists.

Intersection design should consider existing and anticipated bicyclist, pedestrian, and motorist movements. The type of treatment required for bicyclists at an intersection will depend on the bicycle facility type leading up to the intersection, whether multiple bicycle facilities are intersecting, the adjacent street function, and land use.

Intersection Bikeway Treatments

The configuration of a safe intersection for bicyclists may include elements such as color, signage, pavement markings, and dedicated space. These elements include:

- Bike Box
- Two-Stage Queuing Box
- Conflict Striping
- Shared Lane Markings



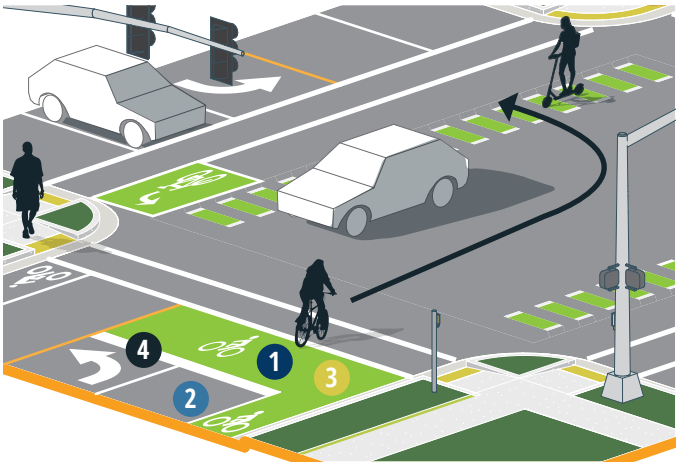
Intersection Bikeway Treatments

Bike Box

A bike box is a designated space at the front of a traffic lane at a signalized intersection that provides bicyclists with a space to wait in front of vehicle traffic during a red signal phase. This allows bicyclists to enter the intersection first on a green light.

Key Benefits

- Allows bicyclists to get a head start traveling through the intersection.
- Increases bicyclist visibility to motorists and reduce the danger of right "hooks" by providing a clear space for bicyclists to wait at a signalized intersection.
- Facilitates easier left turns for bicyclists if bike box spans entire intersection.



Bicyclist queues in green area during red light, then gets to enter the intersection ahead of motorists when light turns green.

Typical Use

- At signalized intersections with high volumes of bicyclists and/or motor vehicles.
- Where there are likely right or left-turning conflicts between motorists and bicyclists.
- Where a left turn is necessary to follow a designated bike route.

Design Features

1. A bike box is typically 10-16 ft deep and can span anywhere from one lane of traffic to all the way across the intersection.
2. A 25-50 ft ingress lane can be included leading up to the box.
3. Colored pavement should be used to highlight the box.
4. Include a stop bar.

Further Considerations

- Egress lane or markings should be used to show where bicyclists will be traveling.
- Right turns on red should be prohibited in locations where bike boxes are used.
- Colored pavement can be costly to maintain; place markings between motor vehicle tire tracks.

For More Guidance:

NACTO Urban Bikeway Design Guide

Intersection Bikeway Treatments

Two-Stage Queue Boxes

Two-stage turn queue boxes offer bicyclists a safe way to make left turns at multi-lane signalized intersections from a right-side cycle track or bike lane. On right-side cycle tracks, bicyclists are often unable to merge into traffic to turn left due to physical separation, making the provision of two-stage left turn boxes critical. Design guidance for two-stage turns apply to both bike lanes and cycle tracks.

Key Benefits

- Makes left turns more safe and comfortable for bicyclists.
- Reduces turning conflicts between bicyclists and motorists.
- Provides a formalized queuing space for bicyclists turning; prevents conflicts that come when bicyclists queue in the bike lane or crosswalk.

Bicyclist queues in green area to turn left during red light, then gets to enter the intersection ahead of motorists when light turns green.

Typical Use

- While typically used at signalized intersections with high volumes of bicyclists, two-stage queue boxes can also be used at unsignalized intersections to simplify turns.

Design Features

- Approximately 10 ft wide, 6.5 ft deep minimum; size will vary depending on context.
- Colored pavement should be used to highlight the box.
- Pavement marking should include a bicycle stencil and turn arrow.

Further Considerations

- Two-stage turns provide more comfortable turns for bicyclists, but can also result in vehicle delay.
- "No turn on red" should be used to prevent vehicles from entering the box if aligned in front of a thru-right turn lane. They should not be placed in front of dedicated right turn lanes.

For More Guidance:

NACTO Urban Bikeway Design Guide

Intersection Bikeway Treatments

Conflict Striping

Green-colored conflict striping should be included within a bicycle lane where conflicts may occur, such as driveway entrances and at intersections where motorists will be turning right over the bike lane. Striping increases the visibility of the facility and reinforces priority of bicyclists in conflict areas.

Key Benefits

- Adds visual cue for motorists reminding them to look for bicyclists.
- Provides a continuous marked facility for bicyclists.

Conflict striping at driveway entrances, reduces conflicts between bicycle facility users and motor vehicles.

Typical Use

- Predominantly used at intersections where a bicycle facility continues through the intersection and motor vehicles may be turning.
- Can also be used at entrances or exits of driveways where motor vehicles will be crossing over the bicycle facility.

Design Features

- Conflict markings are typically striped like a crosswalk with green interiors and white stripes on the outsides of each box.

Further Considerations

- Since these conflict stripes are in locations where frequent movement is occurring, maintaining markings should be a high priority.

For More Guidance:

NACTO Urban Bikeway Design Guide

Protected Intersection Treatments

Introduction

The level of treatment required for bicyclists and other micromobility vehicles at an intersection will depend on a variety of factors, such as the bicycle facility type used, whether bicycle facilities are intersecting, and the adjacent street function and land use. In many situations where multiple bicycle facilities are coming together at an intersection, there are high volumes of bicyclists using the intersection, or there are common conflict points, a protected intersection is the safest design choice.

Protected intersections create physical separation between bicyclists and motor vehicles, improving safety and minimizing conflict between roadway users. They should be designed in such a way that they are intuitive to use, provide clear right-of-way assignment, and allow all roadways users to see each other as they move through the intersection.

Protected Intersections

While the goal of all protected intersections is to create a safe space for all modes of travel to cross a roadway, there are two primary types that Fremont uses for new intersections or intersection redesigns, including:

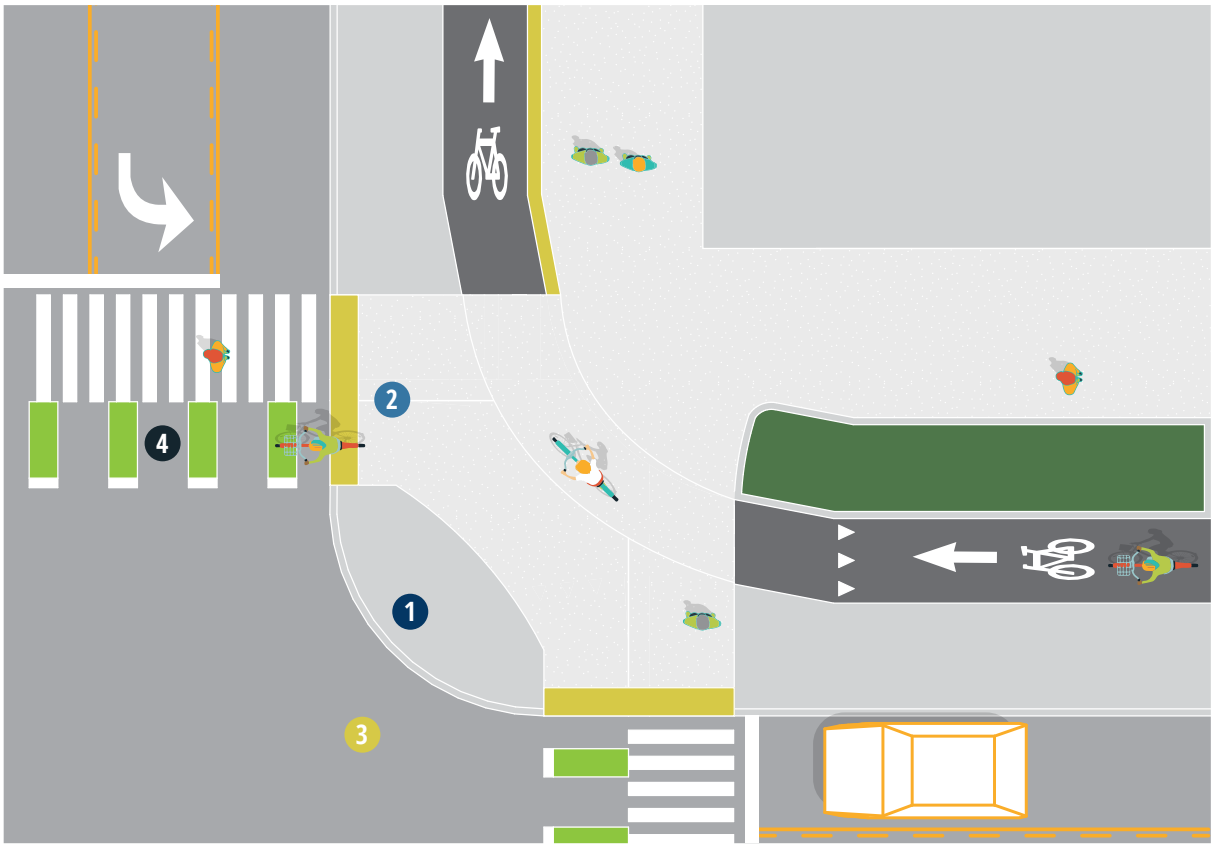
- Sidewalk-level Shared Use Space (preferred)
- Street-Level Protected Intersections (at constrained intersections)

IMAGE: WESTERN CITY

Protected Intersections

Sidewalk-level Shared Use Spaces (Preferred)

When it comes to safe intersection crossings for bicyclists, intersections with sidewalk-level shared use spaces are the preferred treatment in Fremont. The numbers on the graphic below correlate with the elements described at right under Design Features.



Design Features

Elements that are key to a safe sidewalk-level shared use space:

1. **Corner Refuge Island:**
Corner islands separate bicycles from motor vehicles, prevent motor vehicles from encroaching on the bikeway, and create a protected area for bicyclists waiting to turn; they also reduce crossing distances and slow down motorist turning speeds.

2. **Forward Bicycle and Pedestrian Queuing Area:**
This area, protected by the corner refuge island, provides a space for pedestrians and bicyclists to wait that is in clear view of waiting motorists; it also allows pedestrians and bicyclists to enter the intersection ahead of motorists when the light turns green. This area should be at least six ft in length.

3. **Motorist Yield Zone:**
As a motorist navigates around the corner refuge island, there is a space for them to yield as bicyclists or pedestrians enter the intersection.

4. **Intersection Crossing Markings:** Markings provide directional guidance to bikes in the intersection and alert motorists to the presence of bicyclists.

Typical Use

- Sidewalk-level shared use spaces should be considered at intersections where bicycle facilities are crossing or running adjacent to high-traffic roads.
- They can be applied when either in-street or sidewalk-level bicycle facilities are present, and can also be applied to neighborhood bikeway crossings situationally.

Key Benefits

- Unlike at conventional intersections, bicyclists and other micromobility users are not forced to merge or mix with vehicle traffic.
- Visibility of bicyclists and other micromobility users is enhanced through space dedicated for them to wait and cross at the intersection in advance of a right turning vehicle.
- Protected intersections typically make the crossing distance shorter for pedestrians.

Further Considerations

- Sidewalk-level shared use spaces can be used at any intersection where enhanced bike comfort is desirable.
- Variants can be applied where there is no bike facility on the intersecting street, as well as streets with two-way protected bike lanes.
- An additional variation of a sidewalk-level shared use spaces is detailed on page 38, “Bicycle and Pedestrian Queuing Space”. This variant features a shared ramp for pedestrians and bicyclists. On the other side of the intersection, they are then ramped back down to street level.
- Consider a right turn only phase for vehicles to help offset any potential impacts to vehicle operations.


IMAGE: SF STREETSBLOG

For More Guidance:

NACTO Don’t Give Up at the Intersection

MassDOT Separated Bike Lane Planning & Design Guide

Alta Evolution of the Protected Intersection

Protected Intersections

Street-Level Protected Intersections (At Constrained Intersections)

When intersections create constraints that minimize the potential for a protected raised intersection, street-level protected intersections can be used. The numbers on the graphic below correlate with the elements described on the next page under Design Features.

Design Features

Elements key to a safe street-level protected intersection are similar to those included in a raised intersection, but slightly different.

1. **Corner Refuge Island:** Corner islands separate bicycles from motor vehicles, prevent motor vehicles from encroaching on the bikeway, and create a protected area for bicyclists waiting to turn; they also reduce crossing distances and slow motorist turning speeds.
2. **Forward Bicycle Queuing Area:** The area (at least six ft in length) protected by the corner refuge island provides space for bicyclists to wait that is in clear view of waiting motorists; it also allows bicyclists to enter the intersection ahead of motorists when the light turns green.
3. **Motorist Yield Zone:** As a motorist navigates around the corner refuge island, there is a space for them to yield as bicyclists or pedestrians enter the intersection.
4. **Pedestrian Queuing Space:** A designated space for pedestrians to wait to cross the street separated from bicyclists and other micromobility users' queuing space.
5. **Pedestrian Crossings of Bikeway:** Pedestrian crossings should align with crossings in the street, and remind bicyclists to yield to pedestrians.
6. **Intersection Crossing Markings:** Markings provide directional guidance to bikes in the intersection and alert motorists to the presence of bicyclists.

Typical Use

- Street-Level protected intersections should be considered at intersections where bicycle facilities are crossing or running adjacent to high-traffic roads.
- Street-level protected intersections are alternative ways to create a protected intersection involving an in-street crossing.
- Street-level protected intersections should be applied in constrained situations, or on a case-by-case basis where sidewalk-level shared use spaces may not be the best fit.

Further Considerations

- Protected intersections can be used at any intersection where enhanced bike comfort is desirable.
- Variants can be applied where there is no bike facility on the intersecting street, as well as streets with two-way protected bike lanes.

Key Benefits

- Unlike at conventional intersections, bicyclists are not forced to merge or mix with vehicle traffic.
- Visibility of bicyclists and other micromobility device users is enhanced through the spaces dedicated for them to wait and to cross at the intersection.
- Protected intersections typically make the crossing distance shorter for pedestrians.

For More Guidance:

NACTO Don't Give Up at the Intersection

MassDOT Separated Bike Lane Planning & Design Guide

Alta Evolution of the Protected Intersection

04
Streetscape

Streetscape

Introduction

Using the right streetscape elements can make a street environment more comfortable, safe, and attractive for all roadway users. While elements needed will vary by corridor due to surrounding land use, the streetscape elements discussed in this section are the primary elements that should be considered.

Fremont has developed several community plans that should be used as starting points for additional streetscape projects throughout the Fremont area including the City Center, Downtown, and the Warm Springs/South Fremont Community Plans. These plans include more information about the treatments described in this section, but also include recommendations like characteristics of the roadway space, street furniture and trees to include, transit stop placement, and more. The plans also include example street cross sections that can be used broadly throughout Fremont to create a cohesive urban environment.


IMAGE: ALTA


IMAGE: GOOGLE EARTH


IMAGE: ALTA

Streetscape Elements

The following streetscape elements are critical components of Fremont's street network, impacting the pedestrian realm, bike facilities, crossing treatments, and travel lanes:

- Landscaping and Stormwater Management
- Street Lighting
- Bike Parking

Streetscape Elements

Landscaping and Stormwater Management

Landscaping and stormwater management along a street don't just function as a method for retaining/managing stormwater and creating a cooling effect, but they also support the social nature of the street by beautifying and creating a corridor identity.

Key Benefits

- Helps to mitigate the urban heat island effect.
- Provides space for stormwater to drain and be reused through bioretention.
- Provides an opportunity to create an identity for a corridor if unique landscaping and stormwater management treatment types are used on different corridors.

IMAGE: FLOWS TO BAY

Typical Use

- In Fremont, stormwater infrastructure (retention, swales, landscaping) should be incorporated into City street and public space design.
- Street trees should be used to offer shade, improve air quality, and provide a visual buffer between the roadway and sidewalk.

Design Features

- Utilities should be sited separately from the bioretention facility to maintain access to both infrastructure systems and prevent conflicts.
- Locating bioretention facilities where width allows can accomplish infiltration while providing opportunities for tree canopy.

Further Considerations

- Co-locate bioretention facilities with other street design strategies, such as curb extensions or bike lane buffers.
- Street reconstruction offers opportunities for bioretention.
- Landscaping needs to be designed/maintained to be compatible with sidewalks and bikeways.

For More Guidance:

NACTO Urban Street Stormwater Guide

Fremont City Center Community Plan + Downtown Community Plan

Fremont Warming Springs/South Fremont Plan

Streetscape Elements

Street Lighting

Appropriate lighting makes the street safer for all roadway users, be it pedestrians, bicyclists, or motorists. When all user types are present and pedestrian activity is high, lighting becomes especially important as it improves visibility––particularly at intersections.

Key Benefits

- Illuminates all roadway users, improving visibility.
- Makes a corridor feel safer to all roadway users.
- Creates a vertical delineation between the roadway and the pedestrian space and/or bikeway.
- Provides an opportunity to create an identity for a corridor if unique lighting types are used on different corridors.

Typical Use

- In areas with high volumes of pedestrians, bicyclists, and other micromobility users.

Design Features

- Select a light scale that fits the corridor (pedestrian vs. highway).
- Horizontal and vertical illuminance (measure of how much light is falling on a surface per unit area) both help roadway users to see more objects, but must be balanced to avoid glare.

Further Considerations

- Avoid creating light trespass, or excess light falling onto areas not intended to be lit.
- Consider how the tone of light will impact roadways users.

For More Guidance:

FHWA Pedestrian Lighting Primer

Fremont City Center Community Plan + Downtown Community Plan

Fremont Warming Springs/South Fremont Plan

Streetscape Elements

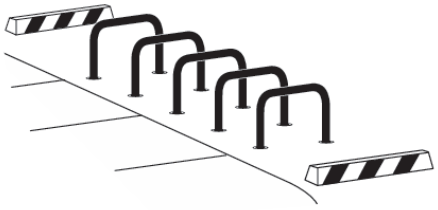
Bicycle Parking

Proper bicycle parking creates a space for individuals to safely park their bike while stopping in an area just as car parking spaces do, making using a bicycle for transportation feel more comfortable. In Fremont, bicycle parking is required for all projects that require motor vehicle parking.

Short Term Parking

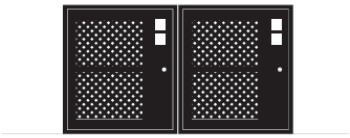
INVERTED U

POST & RING

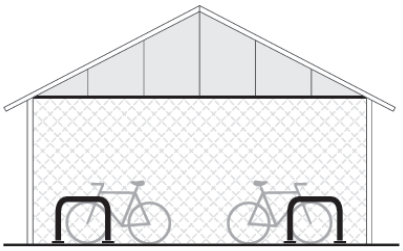


CORRAL

Long Term Parking



BIKE LOCKERS



SHELTERED SECURE ENCLOSURE

Key Benefits

- Creates a designated space for bicycles to be parked, preventing bicycles from blocking sidewalks or other transversable areas when locked to signs/trees/other streetscape objects.
- Provides an opportunity to create an identity for a corridor if unique bike rack types are used on different corridors.

IMAGE: SFMTA

Typical Use

- Bicycle parking is most critical in areas where heavy bicycle traffic is anticipated, such as in commercial areas, near parks or other recreation destinations, or at daily destinations such as schools, offices, libraries, grocery stores, and other frequently visited destinations.
- Bicycle parking is a vital and easy way to make bicycling more convenient for more people.
- Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination.

Bicycle Parking Standards

Fremont Municipal Code

- The City provides bicycle standards in its Municipal Code; the Transportation and Planning team are working to update these standards and guidance to better reflect changes in land use, vehicle parking, and requirements around Transit-oriented developments (TODs).

Design Features

- Bicycle rack installation requires attention to detail in order to get it right; it may go unused if a rack is not more appealing to users than the nearest sign post.
- The variety of bicycle sizes, shapes, and attachments continues to increase, so good bike parking should be prioritized to accommodate all types.

Short term bicycle parking:

- Short term bicycle parking is bicycle parking for those visiting a place for up to a few hours. It mostly consists of bike racks. Users of short-term bike parking tend to be infrequent visitors, so the bike parking needs to be self-explanatory and convenient. It should be within 50 ft of the entry of the building it is serving, placed in a high-visibility area, and as weather protected as possible.
- For short term bike parking, a typical Inverted-U Rack works best, and comfortably fits two bikes. Inverted-U racks should be centered in a 36” (24” minimum) x 96” (72” minimum) area.

Long term bicycle parking:

- Long term bicycle parking is for those spending longer amounts of time at a place (a workday or work shift, or at a multi-family residential building).
- Long term bicycle parking is designed to be more secure than short term parking and provides enclosed space for one or more bikes.
- Types of long-term bicycle parking include lockers (around 40” x 78” x 6’) for two bikes, cages, and bike rooms.

For More Guidance:

Fremont Municipal Code 18.183.135

APBP Essentials of Bike Parking

B

Appendix B: Funding Sources

Table B-1 summarizes commonly available federal, state, and local funding and the types of costs they can be used for. The City of Fremont may pursue funding from these sources to implement the ATP.

Potential Active Transportation Funding Opportunities

Table B-1

Funding Program	Funding Source	Biking and Walking Infrastructure Implementation	Maintenance and Operations
Federal			
Active Transportation Infrastructure Investment Program	Federal Highway Administration (FHWA)	X	
Bridge Formula Program (BFP)	FHWA	X	
Carbon Reduction Program	FHWA	X	
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	FHWA	X	
Federal Lands Access Program (FLAP)	FHWA	X	
Federal Lands Planning Program (FLPP)	FHWA	X	
Highway Safety Improvement Program (HSIP)	FHWA	X	
National Highway Performance Program (NHPP)	FHWA	X	
National Scenic Byways Program	FHWA	X	
Nationally Significant Federal Lands and Tribal Projects (NSFLTP) Program	FHWA	X	
Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program	FHWA	X	
Railway-Highway Crossings (Section 130) Program	FHWA	X	
Recreational Trails Program	FHWA	X	
Surface Transportation Block Grant (STBG) Program	FHWA	X	
Transportation Alternatives (TA) Set-Aside, Surface Transportation Block Grant Program	FHWA	X	
Tribal Transportation Program Safety Fund (TTPSF)	FHWA	X	
Areas of Persistent Poverty Program	Federal Transit Administration (FTA)	X	
Metropolitan and Statewide and Nonmetropolitan Transportation Planning	FTA	X	

Funding Program	Funding Source	Biking and Walking Infrastructure Implementation	Maintenance and Operations
Pilot Program for Transit-Oriented Development Planning	FTA	X	
Urbanized Area Formula Grants	FTA	X	
Choice Neighborhoods Implementation Grants	U.S. Department of Housing and Urban Development (HUD)	X	
Community Development Block Grants	HUD	X	
Nationally Significant Freight and Highway Projects Program (NSFHP)	U.S. Department of Transportation (U.S. DOT)	X	
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	U.S. DOT	X	
Reconnecting Communities Pilot Grant Program	U.S. DOT	X	
Safe Streets and Roads for All (SS4A) Grant Program	U.S. DOT	X	
Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program	U.S. DOT	X	
Land and Water Conservation Fund	U.S. National Park Service	X	
Rivers, Trails, and Conservation Assistance Program	U.S. National Park Service	X	
State			
Clean Mobility Options Pilot Program	California Air Resources Board	X	
Coastal Conservancy Grants	California Coastal Conservancy	X	
Proposition 117 – Habitat Conservation	California Department of Parks and Recreation (DPR)	X	
Roberti-Z'Berg-Harris (RZH) Grant Program – Prop. 40	DPR	X	X
Statewide Park Development and Community Revitalization Program	DPR	X	
Environmental Enhancement and Mitigation (EEM) Program	California Natural Resources Agency	X	
Urban Greening Program	California Natural Resources Agency	X	

Funding Program	Funding Source	Biking and Walking Infrastructure Implementation	Maintenance and Operations
Affordable Housing and Sustainable Communities (AHSC) Program	California Strategic Growth Council	X	
Transformative Climate Communities (TCC) Program	California Strategic Growth Council	X	
Traffic Safety Grants	California Office of Traffic Safety	X	
Local Partnership Program	California Transportation Commission	X	X
Local Streets and Roads program	California Transportation Commission	X	X
Solutions for Congested Corridors Program (SCCP)	California Transportation Commission	X	
State Transportation Improvement Program (STIP)	California Transportation Commission	X	
Active Transportation Program (ATP)	California Department of Transportation (Caltrans)	X	
Local Highway Safety Improvement Program (HSIP)	Caltrans	X	
Sustainable Transportation Planning Grant Program	Caltrans	X	
Clean California Local Grant Program	Caltrans	X	X
Transportation Development Act (TDA) Article 3 (SB 821)	Caltrans/MTC	X	
County/Regional			
Measure BB	Alameda County Transportation Commission (Alameda CTC)	X	
Comprehensive Investment Plan (CIP) Funding	Alameda CTC	X	
Bay Trail Grants	Association of Bay Area Governments	X	
Transportation Fund for Clean Air	Bay Area Air Quality Management District	X	
Safe Routes to BART	Bay Area Rapid Transit	X	
Community Action Resource and Empowerment (CARE) Program	Metropolitan Transportation Commission (MTC)	X	
Transportation Development Act (TDA) Article 3 (SB 821)	Caltrans/MTC	X	
One Bay Area Grant	MTC	X	X

Funding Program	Funding Source	Biking and Walking Infrastructure Implementation	Maintenance and Operations
Safe Routes to Transit to Bay Trail	MTC	X	
Local			
Capital Facilities Fee	City of Fremont	X	X
Development Agreements	City of Fremont	X	X
General Fund	City of Fremont	X	X
General Obligation Bonds	City of Fremont	X	X
Park Facilities Fee	City of Fremont	X	X
Sales Tax Revenues	City of Fremont	X	X
Traffic Impact Fees	City of Fremont	X	X

C

Appendix C: Existing Conditions Memorandum

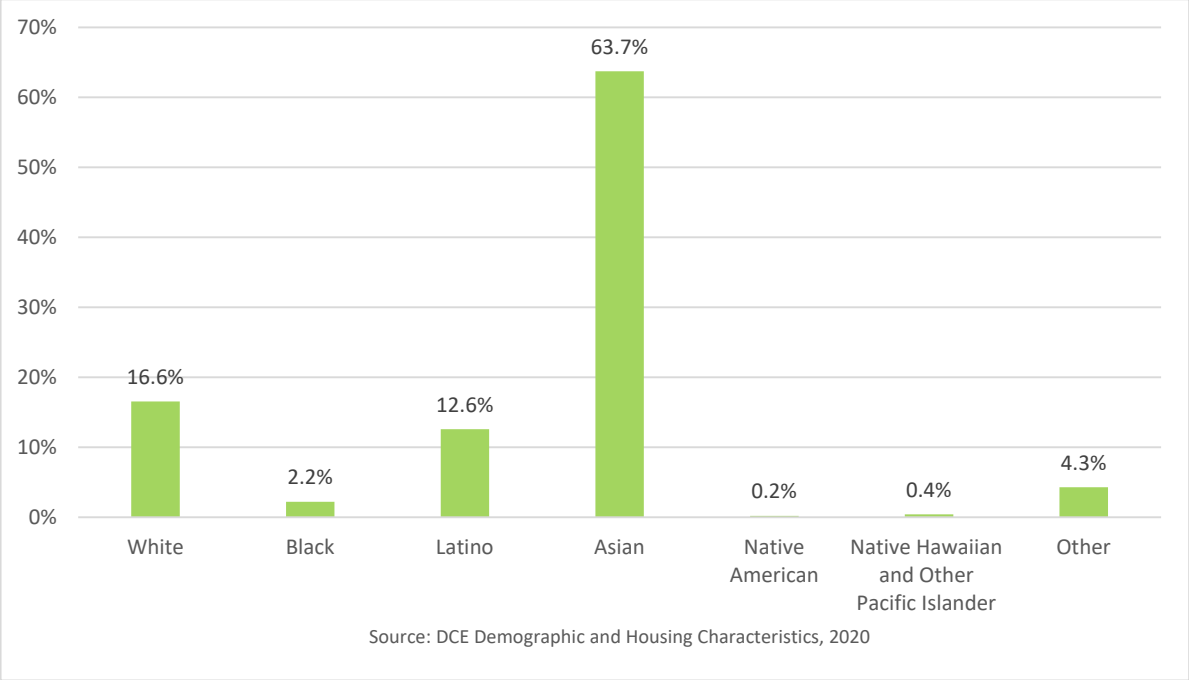
Existing Conditions and Infrastructure

An analysis of Fremont's current travel patterns, strengths, and challenges is critical to decisions about which active transportation projects and programs the City should pursue.

Demographics

The City of Fremont is the fourth largest city in the San Francisco Bay Area with a total population of 230,504 residents. The median household income is $162,336 and 64% of households have attained a bachelor's degree or higher. Most Fremont residents identify as Asian, which includes Indian, Chinese, Filipino and other Asian nationalities, with nearly half of those identifying as Asian Indian. 16% of residents identify as White and 12% identify as Latino which is significantly lower when compared to the larger California estimates demographic breakdown of 35% White and 40% Latino. About a third of households speak Asian and Pacific Islander languages at home while 37% of household speak only English at home. 10% of households in Fremont do not speak English or are limited English-speaking households. The median age in Fremont is 39 years old and a fourth of the residents are below 19 years of age.

Figure 1: Race/Ethnicity of Fremont Residents



Source: DCE Demographic and Housing Characteristics, 2020

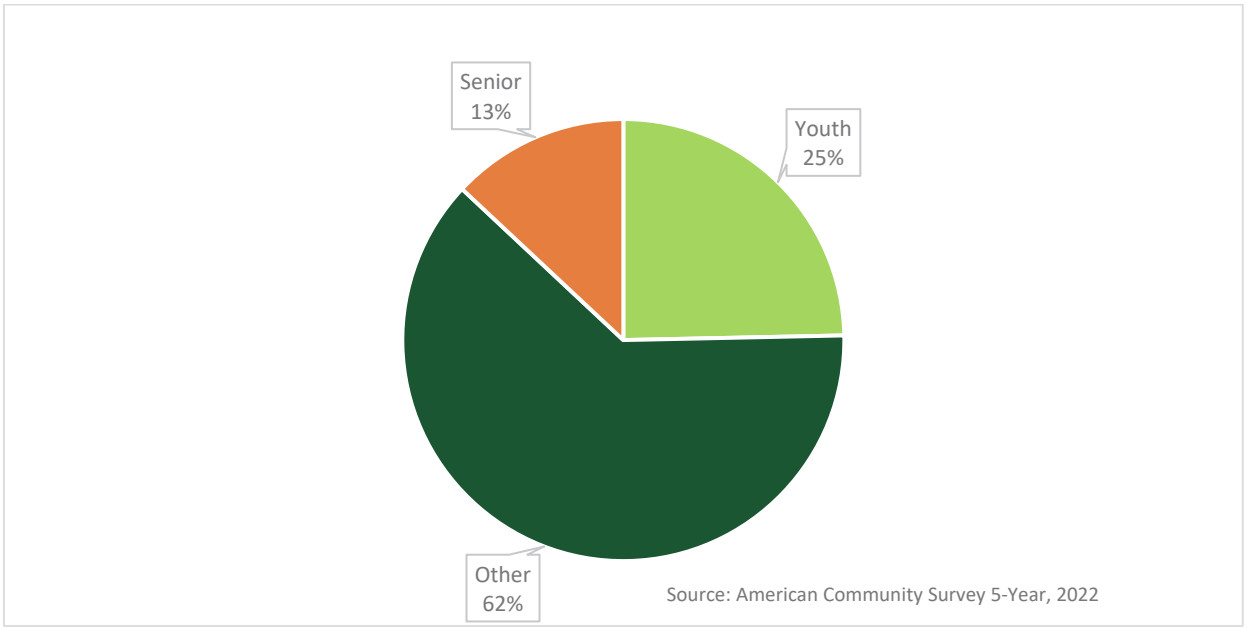


Figure 3: Fremont population share by age group

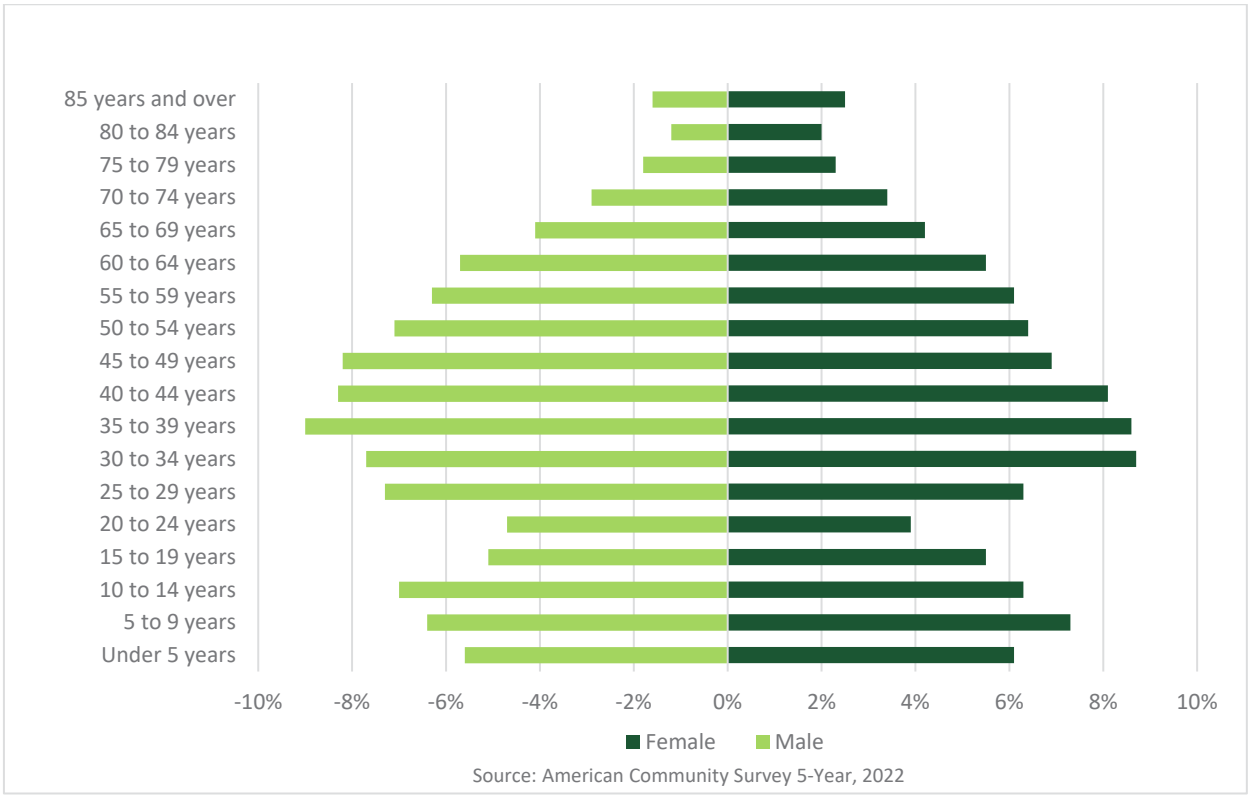
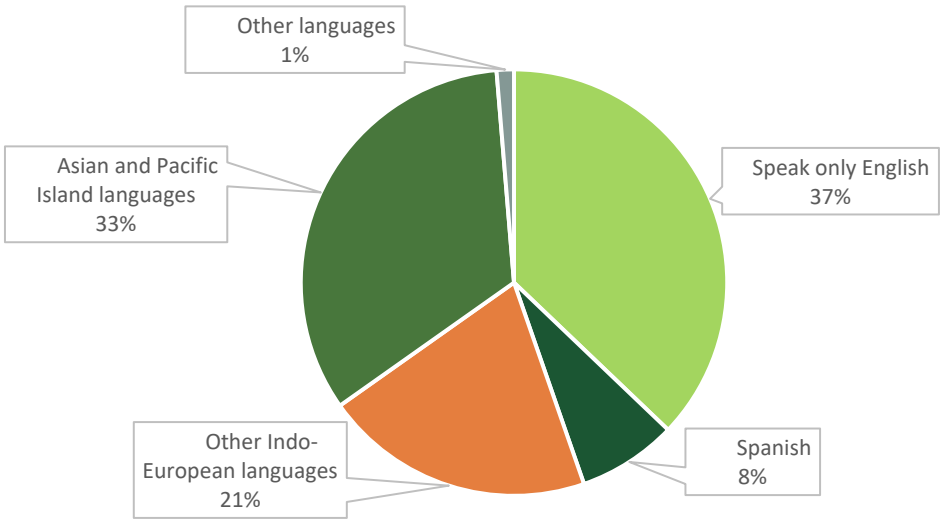


Figure 4: Fremont languages spoken at home

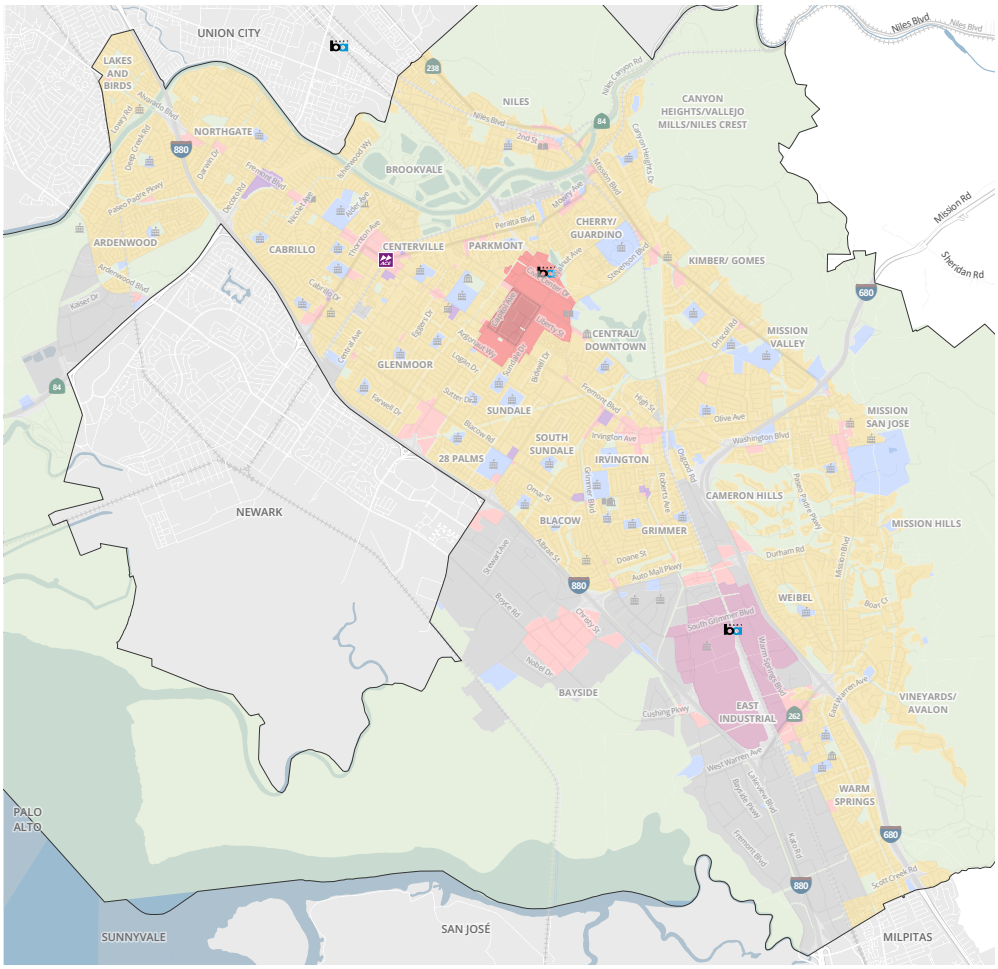


Source: American Community Survey 5-Year, 2022

Land Use

Fremont's current land use is a mix of residential, commercial, industrial, and mixed-use framed by the open space hills to the east (Map 1: Land Use). Areas zoned residential are the most prevalent land use type. Most concentrated commercial districts are located in the downtown district near Fremont BART Station, while the Warm Springs Innovation District near the Warm Springs BART Station is quickly developing. Other retail destinations, such as the Pacific Commons Shopping Center, are located near Interstate 880. Fremont also has several Priority Development Areas, including along Fremont Boulevard and in the Warm Springs Innovation District, which are designated by the Metropolitan Transportation Commission as future transit-oriented growth areas.

Map 1
Land Use



Zoning
- Residential
- Commercial
- City Center
- Downtown District
- Warm Springs Innovation District
- Mixed Use
- Public Facilities
- Open Space
- Industrial
- Right of Way / Railroad

Destinations + Boundaries
- School
- BART Station
- Centerville ACE Station
- City Boundary

Source: Fehr & Peers, City of Fremont

N 0 1 Mile

Transportation

Fremont's proximity to Silicon Valley, quality schools, and regional transportation options make it an attractive place to live and work. Fremont has easy access to Interstates 680 and 880 and regional rail transport lines, including BART, ACE, and Amtrak. However, Fremont's central location between Silicon Valley, the East Bay, and the TriValley creates a "Triangle of Traffic" along regional corridors that run through the City (I-880, I-680, and the Niles Canyon/Dumbarton Corridor). The regional "Triangle of Traffic" burden is exacerbated when commuters use local streets to bypass traffic on the interstates. This amplifies the bicycle level of traffic stress on local cross-city streets such as Fremont Boulevard and Mission Boulevard, discouraging people from choosing active modes of travel. Moreover, the interstates and the railroad tracks have few crossing points and run north-south across the city, dividing the city, isolating neighborhoods, and obstructing the active transportation network. Similarly, local waterways such as Alameda Creek create geographic barriers in the active transportation network.

Fremont residents choose to drive alone for more than half of all work commute trips, as shown in

Figure 6. Additionally, less than 2% chose to walk or bike to work and about 3% took public transit. Previous resident surveys, however, show that commuters who take public transit to work walk or bike to the transit stations or bus stops, indicating that the share of people who walk or bike in Fremont may be higher than what is reported. About 13.6% of residents in this survey reported walking at least a few times a week or every day to transit, and 12.5% reported biking at least a few times a week or every day to transit.

Figure 6: Fremont Commute Mode Share, 2021

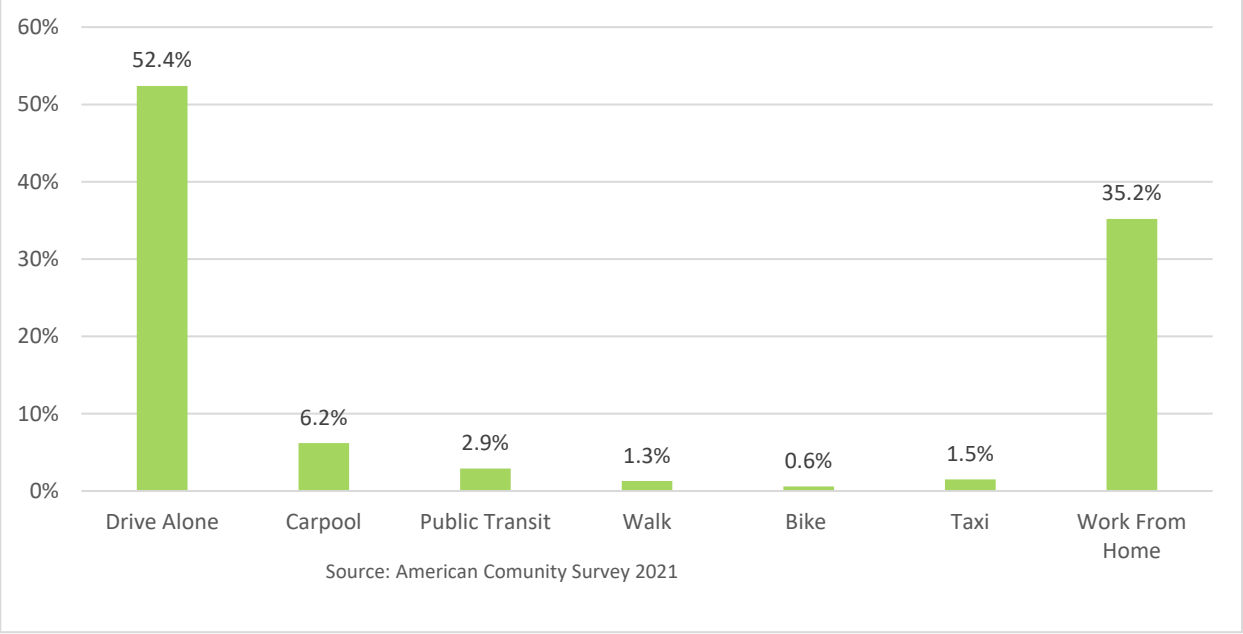


Figure 7 shows how Fremont's cross-city arterials serve as key routes for low-income individuals, both regional commuters and residents. Low-income individuals are disproportionately burdened by travel costs since it takes up a higher share of their income and are more likely to not have access to vehicles, forcing them to depend on active modes of travel or transit. Understanding the Low-Income Tip Network can help inform investments that better support Fremont's most vulnerable commuters.

Using data modeled by Replica Places, more than 2,000 low-income daily trips are made on Fremont Boulevard, Capitol Avenue, Stevenson Boulevard, and Mowry Avenue. These corridors provide key north-south and east-west connections with links to popular destinations such as shopping centers, transit stations, schools, and industrial areas. Additional corridors that also see higher volumes of low-income trips but are not as popular are Thornton Avenue, Washington Boulevard, Blacow Road, and Paseo Padre Parkway. Identifying active transportation improvements along these corridors that do not jeopardize travel times for public transit is critical for supporting low-income travelers.

The City should continue making strategic investments to expand these sustainable transportation options, which is supportive of the ambitious carbon reduction goals set by the 2023 Climate Action Plan and mode share goals set by the 2019 Mobility Action Plan. This includes focusing active transportation projects around areas of high growth and density, such as the Warm Springs BART transit village. Ridership at Warm Springs BART grew by over 570% in the last five years, with monthly station exits increasing from 4,220 to 28,310 (BART, May 2019/2024). By capturing more local trips through active modes, the City has the potential to reduce congestion for those residents who must drive.

It is important to note that the 2020 COVID-19 pandemic dramatically shifted commute trends across the US. During that time, many schools transitioned to remote learning and many office jobs transitioned to work from home, with hybrid work schedules continuing to persist through 2024. The overall trend of people working from home continues to decline as companies encourage employees to return to the office, providing an opportunity to capture commute trips previously taken by car.

Figure 3

Low-Income Trip Network Volumes

Northeast and Central Fremont

Low-income trips are defined as those made by individuals living in a household with an income below 200% of the federal poverty level. Low-income trips may start or end outside of Fremont.

Modeled trip data is provided by Replica Places for a typical weekday in Fall 2022.

Low-Income Daily Trips
- More than 2,000 trips
- 1,001 to 2,000 trips
- 501 - 1,000 trips
- Fewer than 500 trips

Destinations + Boundaries
- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, Replica Places

N 0 1 Mile

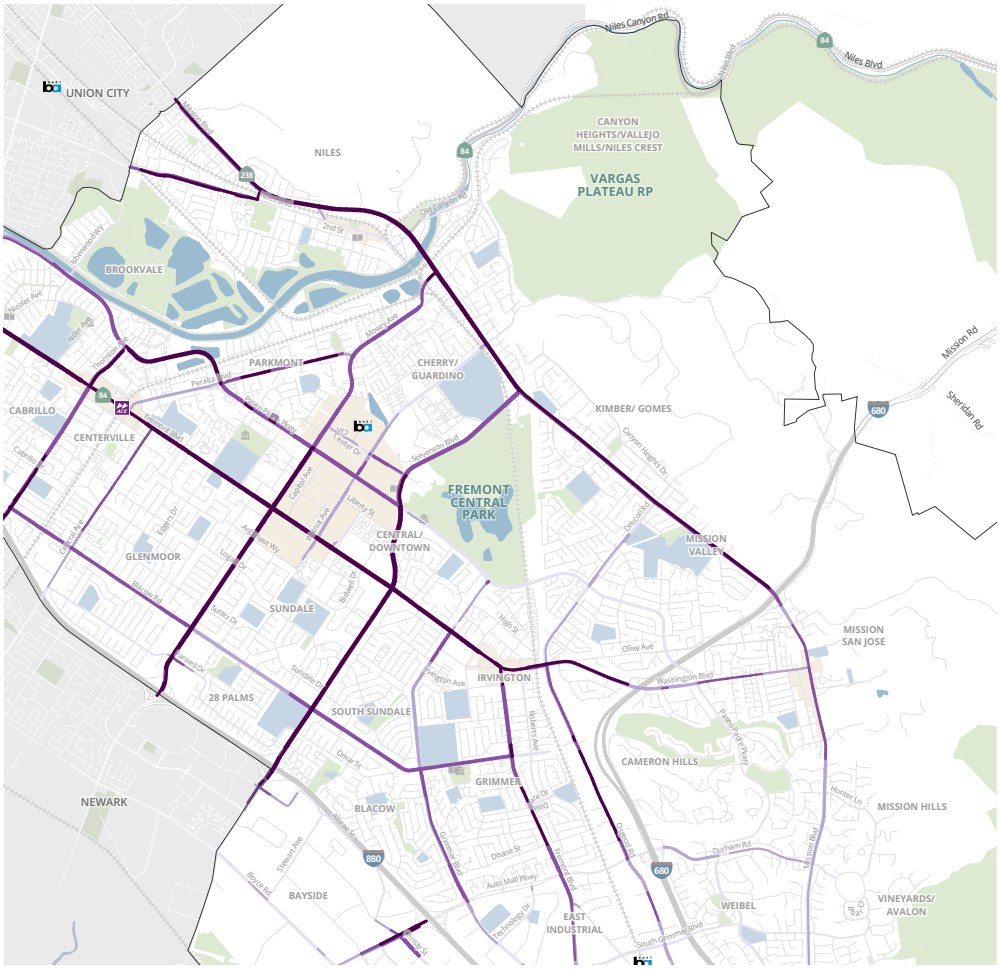


Figure 3

Low-Income Trip Network Volumes

Northwest Fremont

Low-income trips are defined as those made by individuals living in a household with an income below 200% of the federal poverty level. Low-income trips may start or end outside of Fremont.

Modeled trip data is provided by Replica Places for a typical weekday in Fall 2022.

Low-Income Daily Trips
- More than 2,000 trips
- 1,001 to 2,000 trips
- 501 - 1,000 trips
- Fewer than 500 trips

Destinations + Boundaries
- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, Replica Places

N 0 1 Mile

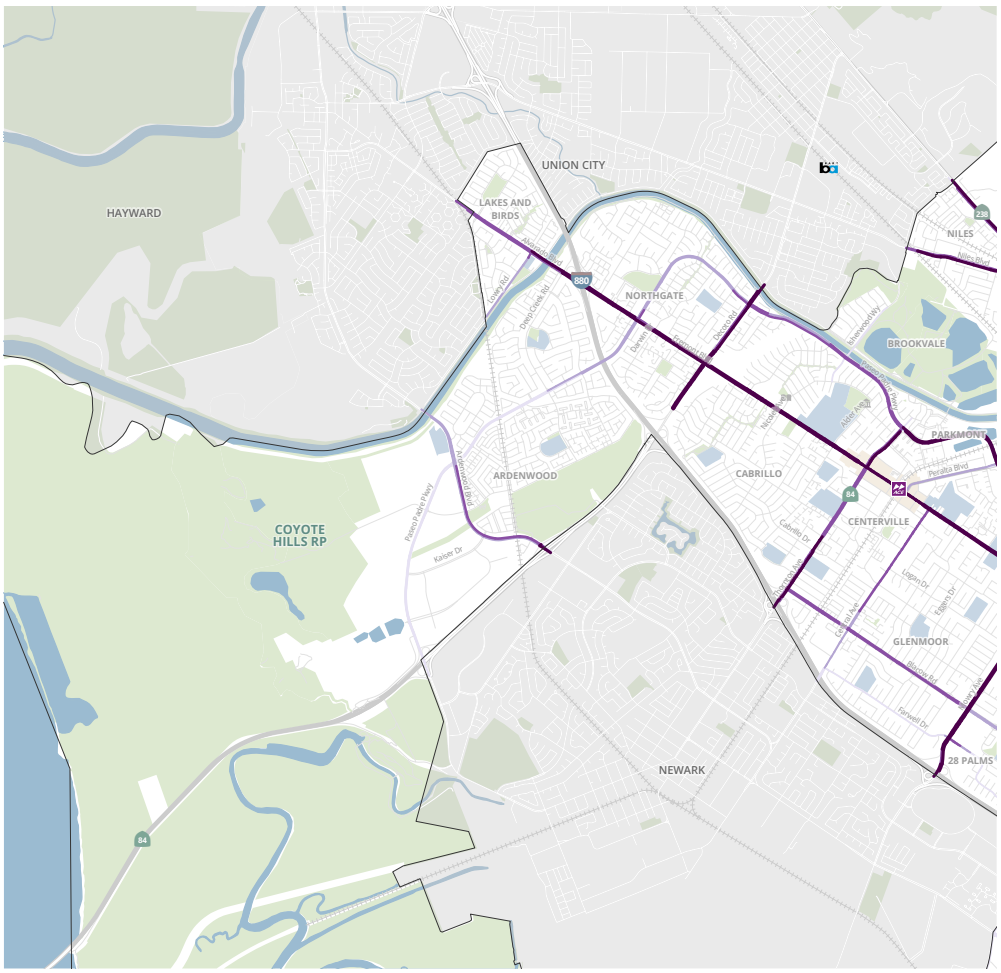


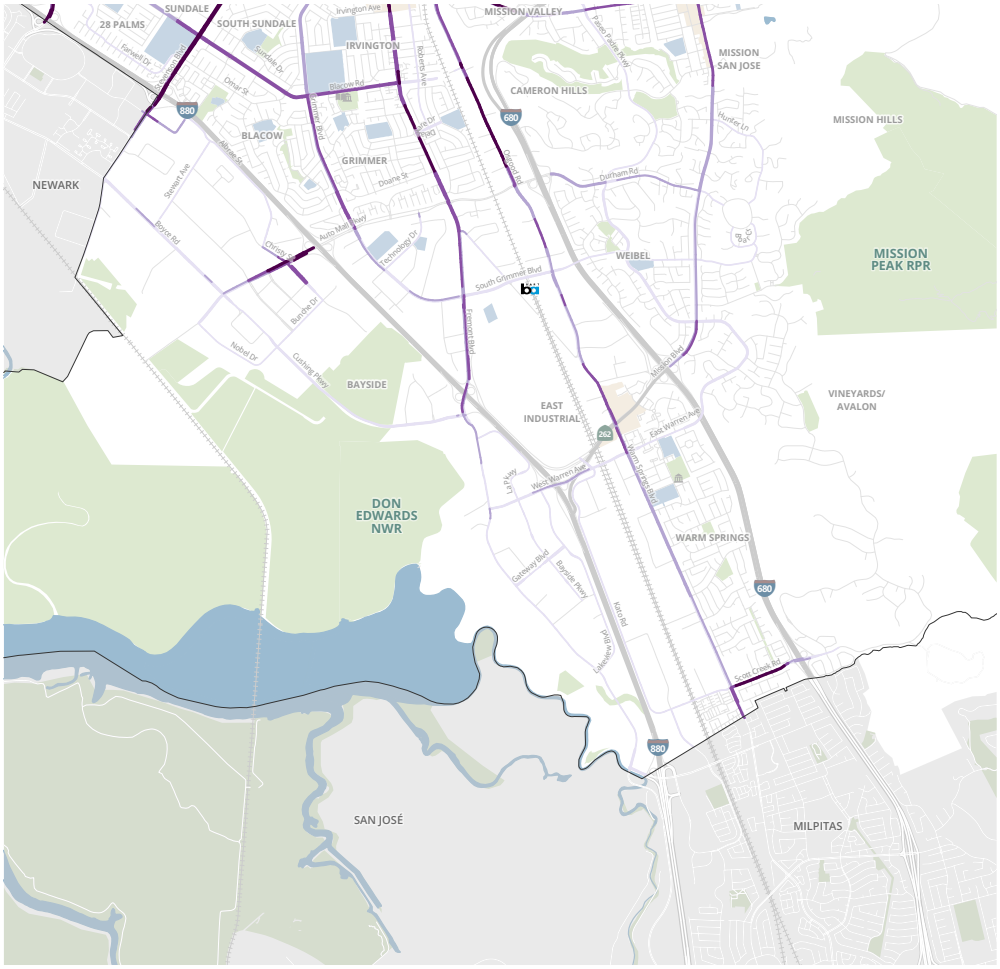
Figure 3

Low-Income Trip Network Volumes

South Fremont

Low-income trips are defined as those made by individuals living in a household with an income below 200% of the federal poverty level. Low-income trips may start or end outside of Fremont.

Modeled trip data is provided by Replica Places for a typical weekday in Fall 2022.



Low-Income Daily Trips

- More than 2,000 trips
- 1,001 to 2,000 trips
- 501 - 1,000 trips
- Fewer than 500 trips

Destinations + Boundaries

- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, Replica Places

N 0 1 Mile

Transit

Two BART stations serve the City of Fremont; one is in the central district, and the other is in the Warm Springs neighborhood. BART has plans for a third station, which will be in the Irvington neighborhood, located between the two existing stations. These three stations will provide Fremont residents with alternatives to motor vehicles for reaching local and regional destinations. The City of Fremont is also working to improve the active transportation infrastructure around the existing BART stations to make walking or cycling to and from transit stations easier.

Amtrak's Fremont station in the Centerville neighborhood at the corner of Fremont Boulevard and Bonde Way serves the Amtrak Capitol Corridor. Altamont Commuter Express (ACE) is the third rail transport provider, which connects San Jose to Stockton. The Fremont ACE station shares the platform with Amtrak. The adjacencies of these two rail transport services provide regional commuters with alternatives to private vehicles to various destinations throughout the region.

In addition, AC Transit complements the regional rail system in Fremont by providing bus routes throughout Fremont with higher frequency (every 30 minutes or less) that connect to the local destinations. These routes include Fremont Boulevard, Decoto Road, Mowry Avenue, Walnut Avenue, and Auto Mall Parkway. The Dumbarton Express line provides limited-stop service between Union City BART (with stops along Decoto Rd in Fremont) and connects to major job centers in the Peninsula with stops in Menlo Park and Palo Alto. Paratransit services are offered through both the City of Fremont and East Bay Paratransit.

Irvington BART Station

The Irvington BART station will be located at the intersection of Washington Boulevard and Osgood Road, approximately halfway between the existing Fremont BART Station and the Warm Springs/South Fremont BART Station. The station is anticipated to be open in late 2031. Consequently, affordable housing developments are underway in the surrounding area. Therefore, it is critical to implement safe and comfortable active transportation facilities in the area to support the increase of residents.

Ardenwood Transit Center

The Ardenwood Park and Ride lot is located at the Highway 84 Ardenwood Boulevard exit. The parking lot has 340 available spots, 300 are free first-come first-serve spaces and 49 are reserved spaces costing $50 per month. The lot is operated by AC Transit. There is a bus stop in the parking lot that is serviced by AC Transit lines U and DB. The AC Transit line DB (Dumbarton Express) provides express bus service over the Dumbarton Bridge between Stanford University and the Union City BART Station. The AC Transit line U

provides express service between Stanford and the Fremont BART Station with a stop at the Fremont ACE/Amtrak Station.

Centerville Train Depot

The Centerville Train Depot, also known as the Fremont Station, is in the Centreville neighborhood at the intersection of Fremont Boulevard and Peralta Boulevard. The station is serviced by Ace and Amtrak Capitol Corridor trains with connections to Stockton and San Jose. The station is also serviced by AC Transit, which provides local connections to Hayward BART, Fremont BART, Stanford University, and Ohlone College Newark. The Centerville Train Depot has 163 parking spaces available for $3 a day on weekdays. Additionally, the depot has bathrooms, seating, and a café.

Biking, Walking, and Rolling

The City of Fremont has an extensive bike network that reaches most of the city and connects to the regional San Francisco Bay Trail through the Coyote Hills in north Fremont and through the Innovation District in South Fremont (see Maps 2, 3, and 4). The network comprises a backbone of separated bikeways, which provide cross-city connections. Bike lanes provide connections between neighborhoods, and bike routes provide connections within neighborhoods. For example, along the segments of Fremont Boulevard and Paseo Padre Parkway that run across neighborhoods, through central Fremont, and between significant destination hubs, separated bikeways and protected intersections bridge connections across the city's large arterial streets. Additionally, bike lanes provide local connections between residential neighborhoods and destinations on shorter street segments such as Central Avenue, Thornton Avenue, and Mowry Avenue. Bike routes provide neighborhood connections along local streets between residential neighborhoods like Sutter Drive and Logan Drive. Fremont also boasts a robust system of regional recreational trails, with residents across the Bay Area traveling to Fremont to enjoy the outdoors.

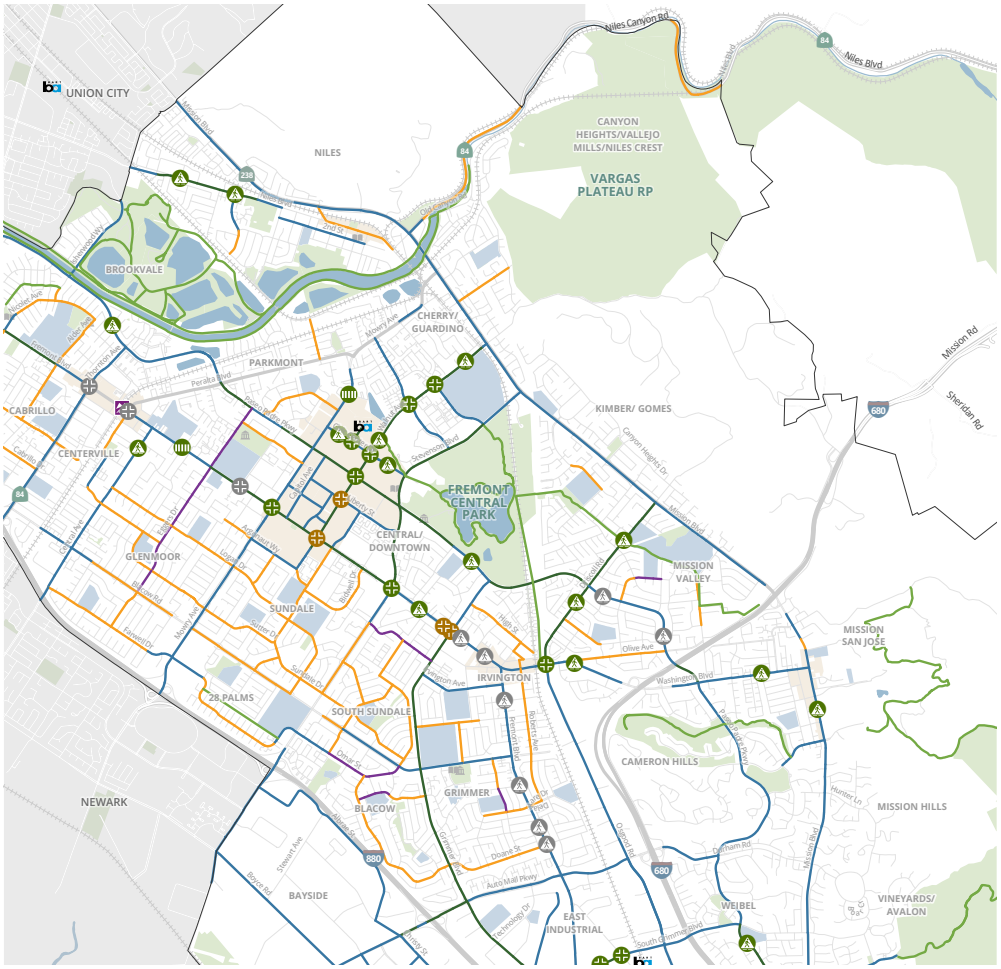
Within neighborhoods, local roads serve as the primary pedestrian network. However, the wide, fast arterials separating neighborhoods hinder the city's pedestrian connectivity. This is particularly true for regional centers like Niles, Irvington, and the downtown core, where major arterials restrict low-stress pedestrian access for the surrounding residential neighborhoods to shopping and other community amenities. For the Niles neighborhood in particular, the Alameda Creek, the BART train tracks, major roadways, and the eastern hills create barriers between the neighborhood and the rest of the city. The city has installed a series of Pedestrian Crosswalk Beacons (RRFBs) and Pedestrian Hybrid Beacons (PHBs) along major arterials like Fremont Boulevard and Walnut Avenue to improve pedestrian connections between residential neighborhoods and the Downtown District. The City is working to improve further connections to BART and other downtown destinations with additional separated bikeways on Walnut Avenue and intersection improvements along Fremont Boulevard.

Fremont is also a prime location for micromobility options such as electric bikes and motorized e-scooters because town centers are within a short trip of most homes in Fremont. From 2019 to 2021, the City partnered with a bike and scooter company on a pilot program to bring shared active transportation to Fremont.

Map 2

Bicycle & Pedestrian Infrastructure

Northeast and Central Fremont



Existing Bike Facilities
- Separated Bikeway
- Bike Lane
- Bike Boulevard
- Bike Route
- Shared Use Path

Planned / In Design
- RRFB
- Protected Intersection

In Construction
- Protected Intersection

Installed
- RRFB
- PHB
- Protected Intersection

Destinations + Boundaries
- Community Centers
- County Libraries
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

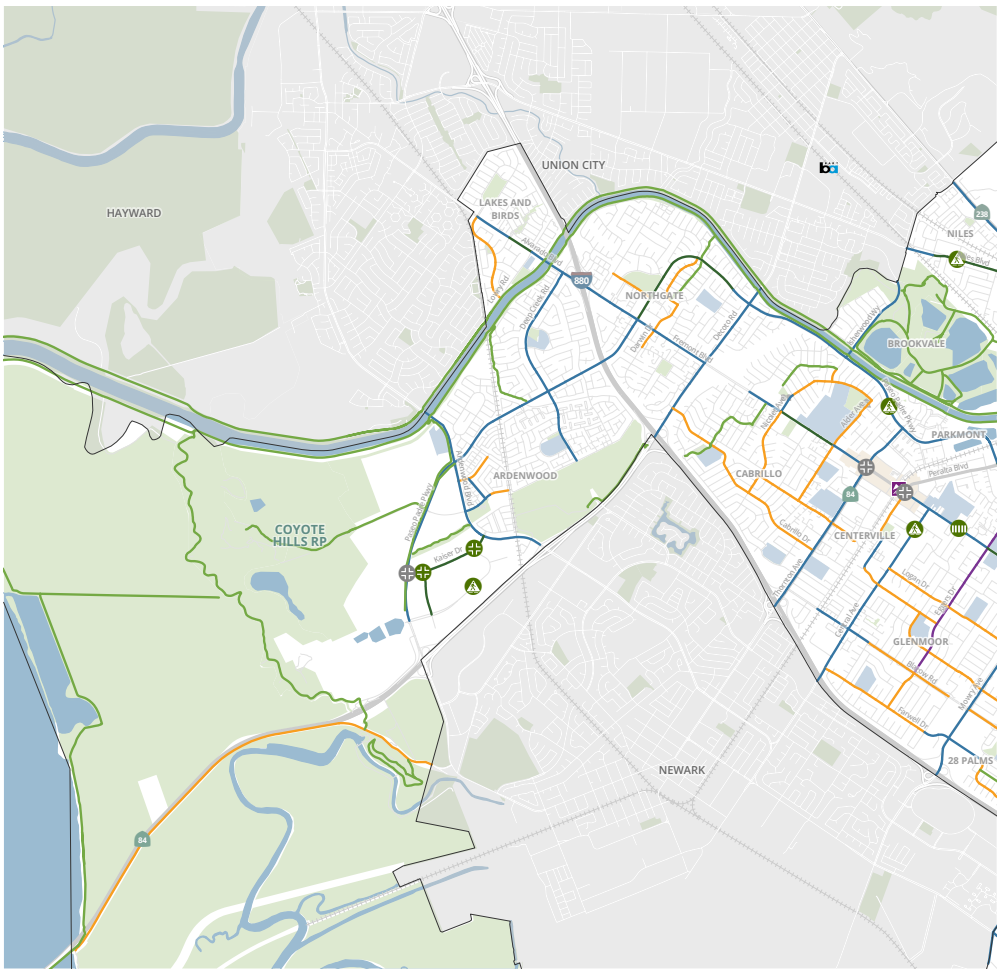
Source: Fehr & Peers, City of Fremont

N 0 1 Mile

Map 3

Bicycle & Pedestrian Infrastructure

Northwest Fremont



Existing Bike Facilities
- Separated Bikeway
- Bike Lane
- Bike Boulevard
- Bike Route
- Shared Use Path

Planned / In Design
- RRFB
- Protected Intersection

In Construction
- Protected Intersection

Installed
- RRFB
- PHB
- Protected Intersection

Destinations + Boundaries
- Community Centers
- County Libraries
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

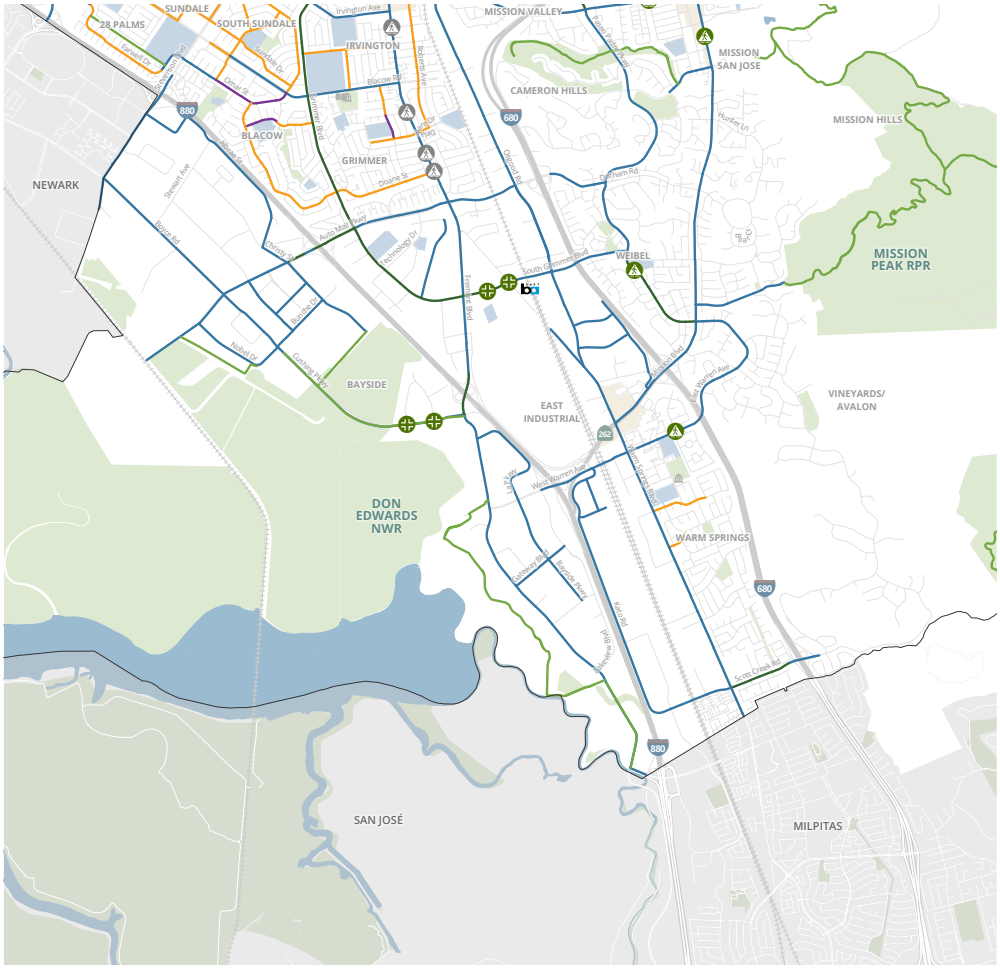
Source: Fehr & Peers, City of Fremont

N 0 1 Mile

Map 4

Bicycle & Pedestrian Infrastructure

South Fremont



Existing Bike Facilities
- Separated Bikeway
- Bike Lane
- Bike Boulevard
- Bike Route
- Shared Use Path

Planned / In Design
- RRFB
- Protected Intersection

In Construction
- Protected Intersection

Installed
- RRFB
- PHB
- Protected Intersection

Destinations + Boundaries
- Community Centers
- County Libraries
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, City of Fremont

N 0 1 Mile

Bike Infrastructure

For more detailed information on bike facility design standards, review Fremont's Active Transportation Design Guide. The Design Guide was developed in accordance with the following design standards: Caltrans Ch 1000—Bicycle, Caltrans DIB 89-01 Class IV Bikeway Guidance, FHWA Bikeway Selection Guide, and NACTO Urban Bikeway Design Guide.

Shared-Use Path (Class I)

Bike and shared-use paths are typically paved bi-directional pathways separate from the road right-of-way. Ideally, shared-use paths will follow a distinct course in an independent right-of-way, often along former railroad beds, waterways, utility corridors, or other rights-of-way that usually have few crossing roadways.

Bike Lane (Class II)

Bike lanes designate an exclusive space for bicyclists through pavement markings and signage. The bike lane is next to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic.

Buffered Bike Lane (Class IIB)

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane or parking lane.

Neighborhood Bikeway (Class IIIB)

Neighborhood bikeways are streets with low vehicle traffic volumes and speeds, designed to improve comfort for bicyclists and manage vehicle speeds. Signs, pavement markings, and speed and volume management measures are used to manage vehicle speeds and create safe, convenient bicycle crossings at busy arterial streets. On some corridors where frontage roads exist, neighborhood bikeways are implemented on the frontage roads with slower traffic rather than on the main arterials.

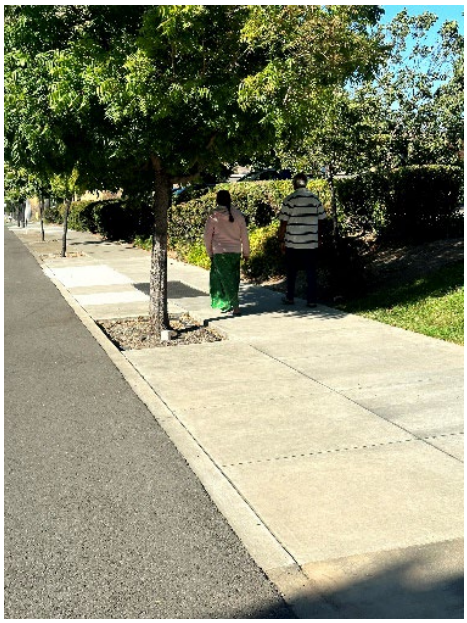
Separated Bikeway (Class IV)

Separated bikeways are on-street bike lanes that are physically separated from motor vehicle traffic by a vertical element, which can include bollards, posts, parked vehicles in a parking lane, or raising the cycle track to sidewalk level. They are also known as protected bikeways, on-street bike paths, and cycle tracks, and can be one-way or two-way bikeways. Separated bikeways are most common on high-speed arterials.

Bikeway Type	Mileage
Class I (Shared-Use Paths)	39.9
Class II (Bike Lanes)	72.6
Class III (Bike Routes)	31.6
Class IIIB (Neighborhood Bikeways)	3.2
Class IV (Separated Bikeways)	17.9
Total	**165.2**

Sidewalks

Sidewalks and walkways provide people with space to travel within the public right-of-way, separated from roadway vehicles.



Crosswalk

Marked crosswalks indicate optimal or preferred locations for pedestrians to cross and help motorists yield to pedestrians.

Pedestrian Crosswalk Beacon (RRFB)

User-activated pedestrian signals that use flashing yellow lights to alert motorists to the presence of people walking in the crosswalk. They can be installed in midblock locations or at intersections where a full traffic signal is not warranted. Alternative flashing signs that illuminate the sign's perimeter may be considered in residential areas.

Pedestrian Hybrid Beacon (PHB)

PHBs can warn and control traffic at unsignalized locations and assist pedestrians in crossing a street or highway at a marked crosswalk. The PHB rests dark until a pedestrian activates it via a pushbutton or other form of detection. PHBs are used on higher speed and higher volume roadways than RRFBs.

Curb Extensions

Curb extensions—also known as bulb-outs or neckdowns—extend the sidewalk or curb line out into the parking lane and reduce the effective street width and pedestrian crossing distances.

Leading Pedestrian Interval (LPI)

LPIs can be programmed into traffic signals to minimize conflicts between pedestrians crossing a roadway and left- or right-turning vehicles. LPIs give pedestrians the WALK signal 3-7 seconds before motorists can proceed through the intersection, making them more visible.

Median Refuge Island

A median refuge island, or crossing island, is a median with a refuge area intended to help protect pedestrians crossing a multilane road. Crossing islands should be considered as a supplement to the crosswalk. A pedestrian refuge island allows pedestrians to focus on one direction of traffic at a time as they cross and provides space to wait for an adequate gap in oncoming traffic before finishing the second phase of the crossing.

No Right on Red

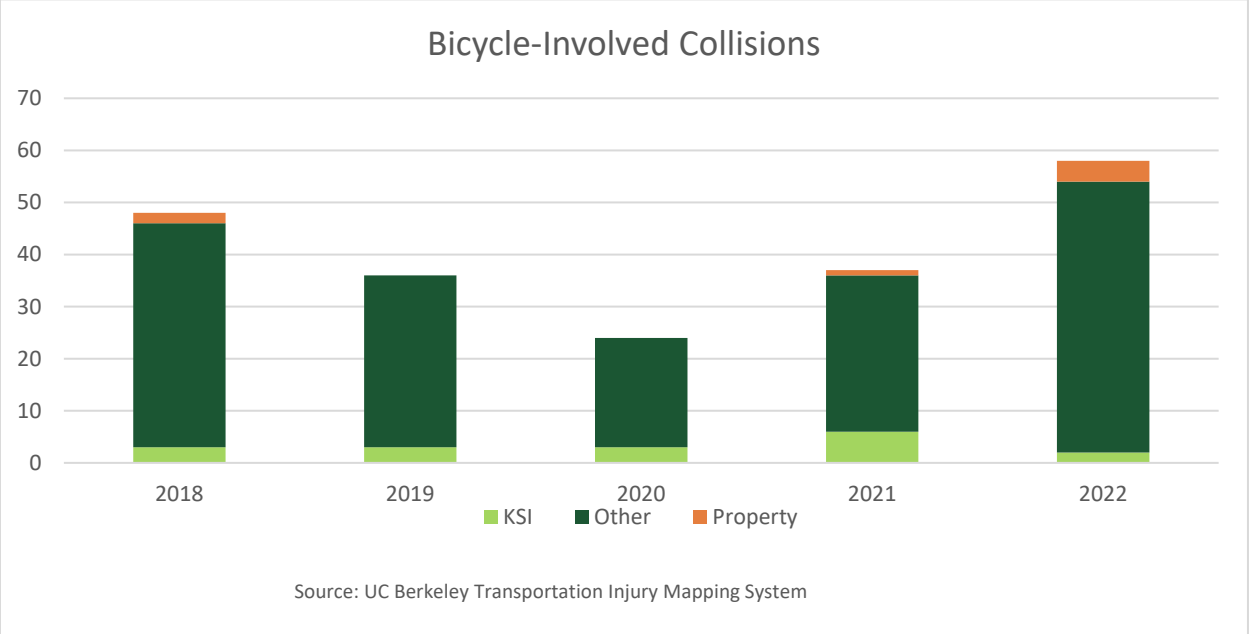
Prohibiting right turns on red should be considered where exclusive pedestrian phases or high pedestrian volumes are present.

Safety

Bicycle- and pedestrian-related collision data provides insight into specific locations and roadways that tend to have higher rates of collisions. This analysis uses collision data acquired from the Crossroads database (assembled from police crash reports) between January 2018 and December 2022. It is important to note that this analysis relied on reported collisions, and not all collisions involving people biking, walking, and rolling are reported. Further, near-miss crashes are not included as they are typically not reported.

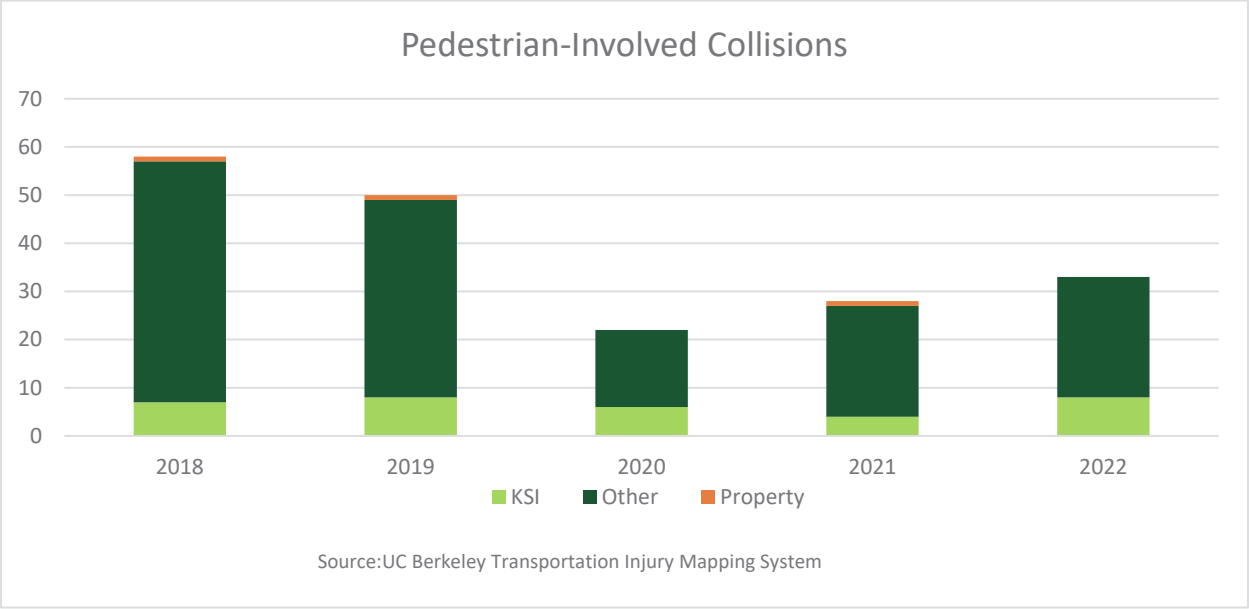
There were 203 bicycle-related collisions (Figure 9) and 191 pedestrian-related collisions (Figure 10) in Fremont during the study period. People walking were overrepresented in collisions that resulted in a fatality or serious injury (KSI). The most KSI bicycle collisions occurred in 2021, while the most KSI pedestrian collisions occurred in 2019 and 2022. Following national trends since the start of the pandemic, 2020 saw the fewest overall collisions followed by steady rises in both 2021 and 2022. While the overall number of collisions increased, the number of KSI collisions stayed relatively flat. The number of overall pedestrian collisions is approximately half of what it was during pre-pandemic conditions.

Figure 9: Bicycle Collisions (2018-2022)



Source: UC Berkeley Transportation Injury Mapping System

Figure 10: Pedestrian Collisions (2018-2022)



Bicycle and Pedestrian Collision Trends

Beyond simply analyzing the locations and factors of serious collisions, it is important to understand the risk factors that could contribute to future collisions. Weighted collision density identifies streets where collisions happen most frequently, with collisions for all active modes weighted based on severity. Maps 5, 6, and 7 display streets where severe collisions happen most frequently across Fremont. Most serious collisions happen on only a small subset of streets within Fremont; by improving safety for all road users on these streets, Fremont can significantly reduce serious collisions citywide.

Neighborhoods with the highest share of collisions are:

- Centerville
- 28 Palms
- Sundale
- Central/Downtown
- Irvington
- Warm Springs

Streets with the highest density of collisions are Fremont Boulevard, Mowry Avenue, Thornton Avenue, Mission Boulevard, and Auto Mall Parkway, as noted in the Weighted Collision Density Maps for Active Transportation (Maps 5, 6, and 7). Many intersections with high collision densities are present at the intersection of major arterial streets, such as Mowry Avenue and Fremont Boulevard, Mission Boulevard, and Warm Springs, and Auto Mall Parkway and Grimmer Boulevard. Projects to improve safety on several of these high-collision arterials are planned or under construction. Some of the high collision-density intersections are near schools such as Thornton Avenue and Coronado Drive, and Stevenson Boulevard

and Omar Street. There is also a concentration of high-collision street segments near the Fremont BART station and the surrounding downtown area, partially due to the higher density of walking and biking trips in these areas.

While most collisions occur on the arterial roadways in Fremont, a subset occurred on smaller residential streets. Further study should be done on these streets to determine what factors contribute to these collisions and whether traffic calming measures would help mitigate these risks.

Map 5

Weighted Collision Density - Active Modes

Northeast and Central Fremont

Collision data is from 2018 through 2022 and includes data for collisions between vehicles and people walking or biking. Collisions are weighted based on severity; severe or fatal collisions are weighted the highest.

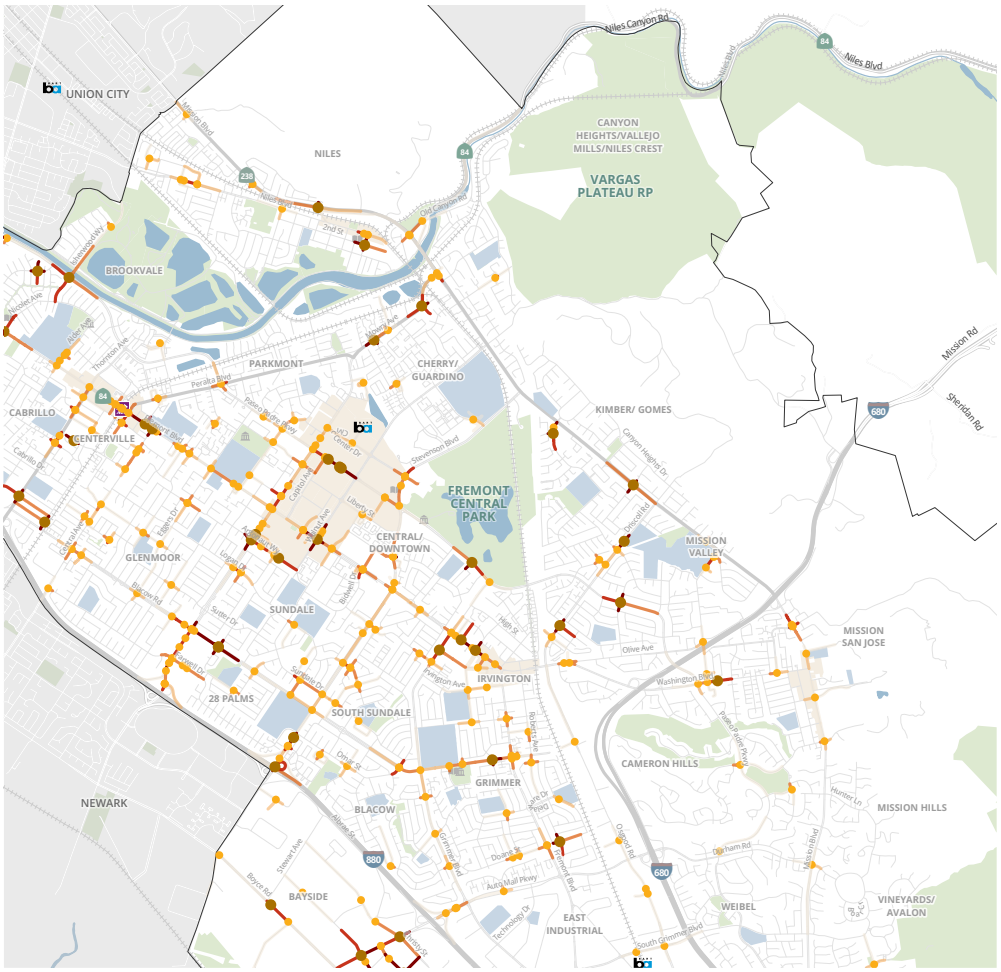
Weighted Collision Density
- Top 10th percentile
- 80th - 90th percentile
- 60th - 80th percentile
- 40th - 60th percentile
- Bottom 40th percentile

Bicycle & Pedestrian Collisions
- KSI Collision
- Non-KSI Collision

Destinations + Boundaries
- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, Crossroads

N 0 1 Mile



Map 6

Weighted Collision Density - Active Modes

Northwest Fremont

Collision data is from 2018 through 2022 and includes data for collisions between vehicles and people walking or biking. Collisions are weighted based on severity; severe or fatal collisions are weighted the highest.

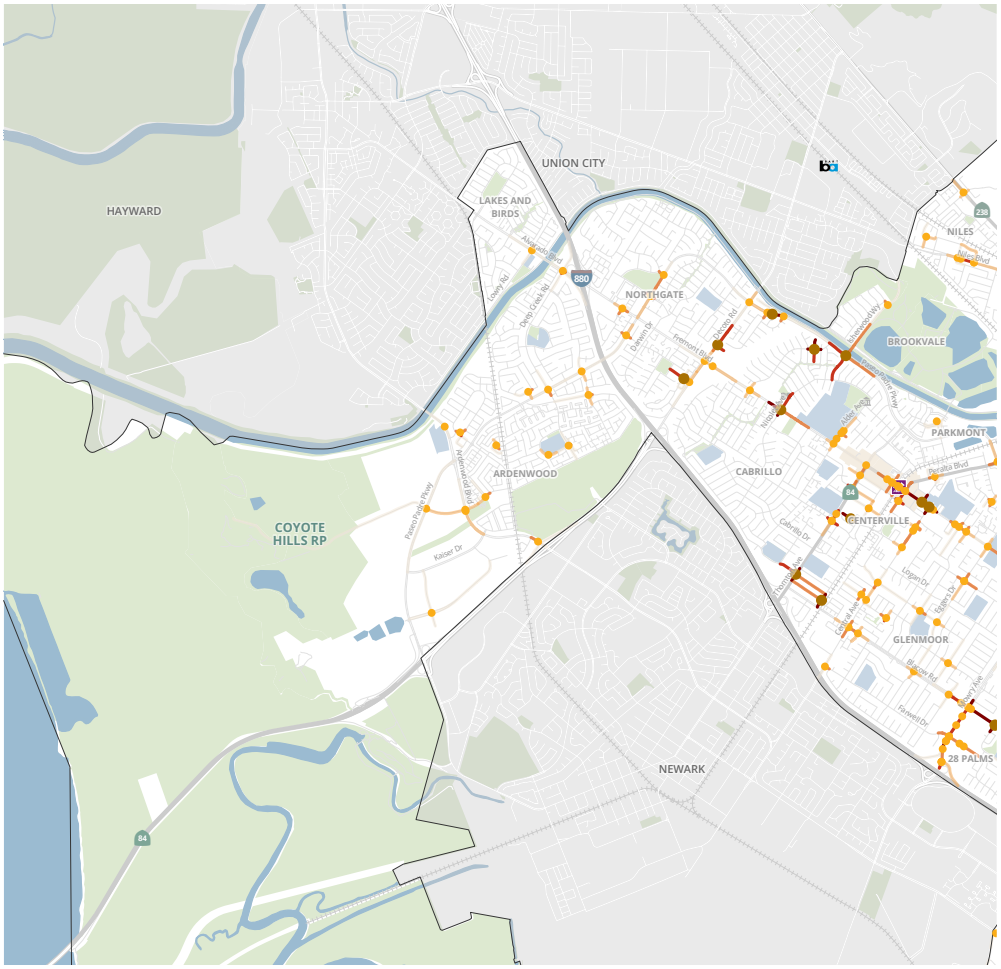
Weighted Collision Density
- Top 10th percentile
- 80th - 90th percentile
- 60th - 80th percentile
- 40th - 60th percentile
- Bottom 40th percentile

Bicycle & Pedestrian Collisions
- KSI Collision
- Non-KSI Collision

Destinations + Boundaries
- Community Centers
- County Libraries
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, Crossroads

N 0 1 Mile



Map 7

Weighted Collision Density - Active Modes

South Fremont

Collision data is from 2018 through 2022 and includes data for collisions between vehicles and people walking or biking. Collisions are weighted based on severity; severe or fatal collisions are weighted the highest.

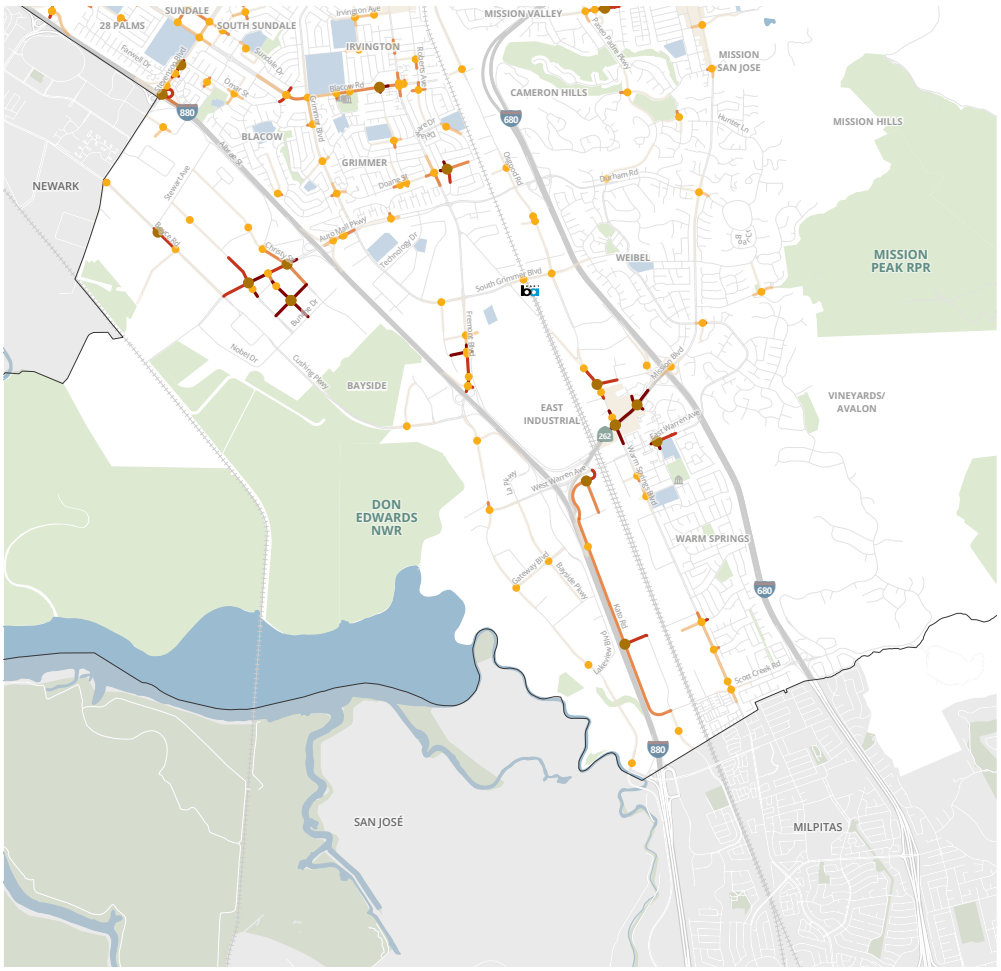
Weighted Collision Density
- Top 10th percentile
- 80th - 90th percentile
- 60th - 80th percentile
- 40th - 60th percentile
- Bottom 40th percentile

Bicycle & Pedestrian Collisions
- KSI Collision
- Non-KSI Collision

Destinations + Boundaries
- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, Crossroads

N 0 1 Mile



Bicycle Level of Traffic Stress (BLTS)

Methodology

BLTS analysis is completed through an assessment of street segments using spatial data from OpenStreetMap (OSM) data. Each segment of the roadway is evaluated based on its characteristics. Where OSM data includes values for lanes, posted speeds, bike lanes, sidewalks, parking lanes, and one-way tags, these tags are used to populate a database for LTS inputs. Once that database is populated, Alta uses the Mekura et al, 2012 Level of Traffic Stress methodology to score roadway segments. If multiple scores are present within a segment, the highest (most stressful) score is used as the overall segment score. The BLTS maps show partial street segments, including primary, secondary, tertiary, track, trunk, residential roadway, and motorway. The BTLS system in Fremont was modified to account for the City's quick-build projects. Therefore, quick-build bike facilities were given a lower score to reflect the lower comfort levels experienced due to the temporary materials used.

Findings

Fremont's Bicycle Level of Stress (BLTS) network shows areas of low-stress residential roads bisected by high-stress major roadways. For example, Mission Boulevard, Blacow Road, Fremont Boulevard, Peralta Boulevard, Osgood Road, Stevenson Boulevard, and Paseo Padre Parkway are all major roadways that cut through the City and create high-stress barriers for getting between neighborhoods (Figures 13, 14 and 15). However, separated bike facilities help overcome some of the stressors of major roadways and provide comfortable bike connections across the City. The quick-build Class IV Separated Bikeway on Grimmer Boulevard, a four-lane roadway with a posted speed limit of 40 MPH, provides a high-comfort bike connection along a roadway that would otherwise be unsafe. Similarly, the Class IV Separated Bikeway and other pedestrian crossing improvements on Fremont Boulevard from Eggers Drive to Stevenson Boulevard help reduce the stress level on this heavily used roadway. Moreover, Class I Shared-Use Paths can provide comfortable bike connections between neighborhoods and across major roadways. For example, the path from Mission San Jose High School to Central Park bridges the gap over Driscoll Road between Mission Valley and Downtown. This path provides users with an alternative to high-stress roadways such as Driscoll Road, Paseo Padre Parkway, and Mission Boulevard.

Figure 2

Bicycle Level of Traffic Stress (BLTS)

Northeast and Central Fremont

BLTS estimates the level of stress users feel while biking along a given roadway segment, based on characteristics like number of travel lanes, posted speed limit, and the presence of bike infrastructure. On-street bike facilities also provide additional buffer from vehicle traffic for pedestrians.

Bicycle Level of Traffic Stress
- High Comfort for All
- High Comfort for Most Adults
- Increasing Stress for Most
- High Stress Experience

Destinations + Boundaries
- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, City of Fremont, OpenStreetMap (Fall 2023)

N 0 1 Mile

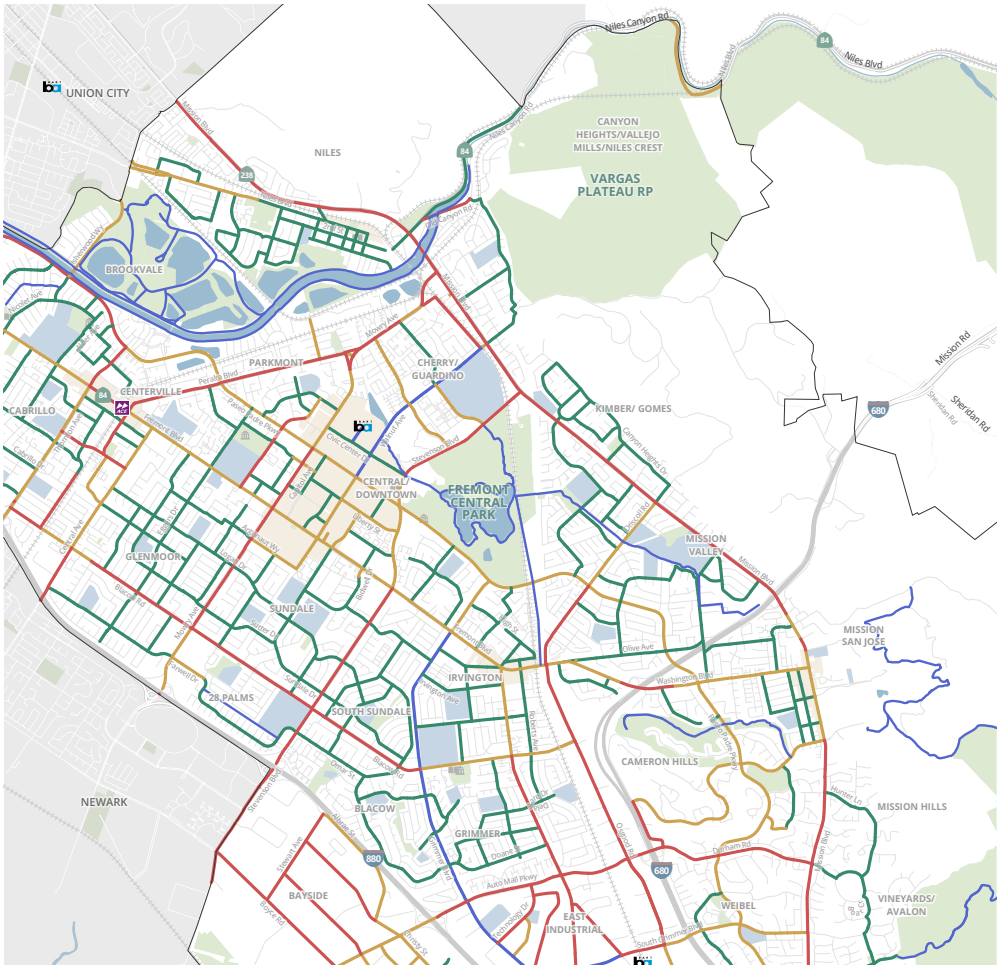


Figure 2

Bicycle Level of Traffic Stress (BLTS)

Northwest Fremont

BLTS estimates the level of stress users feel while biking along a given roadway segment, based on characteristics like number of travel lanes, posted speed limit, and the presence of bike infrastructure. On-street bike facilities also provide additional buffer from vehicle traffic for pedestrians.

Bicycle Level of Traffic Stress
- High Comfort for All
- High Comfort for Most Adults
- Increasing Stress for Most
- High Stress Experience

Destinations + Boundaries
- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, City of Fremont, OpenStreetMap (Fall 2023)

N 0 1 Mile

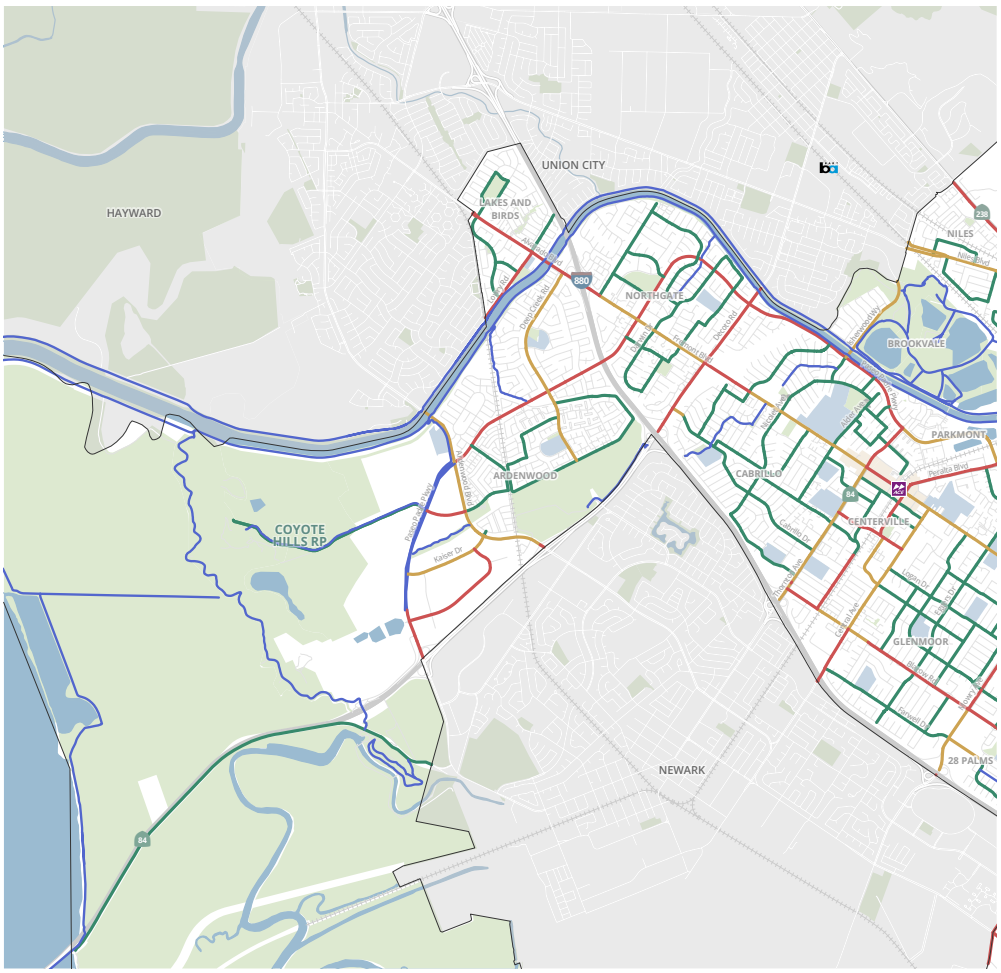


Figure 2

Bicycle Level of Traffic Stress (BLTS)

South Fremont

BLTS estimates the level of stress users feel while biking along a given roadway segment, based on characteristics like number of travel lanes, posted speed limit, and the presence of bike infrastructure. On-street bike facilities also provide additional buffer from vehicle traffic for pedestrians.

Bicycle Level of Traffic Stress

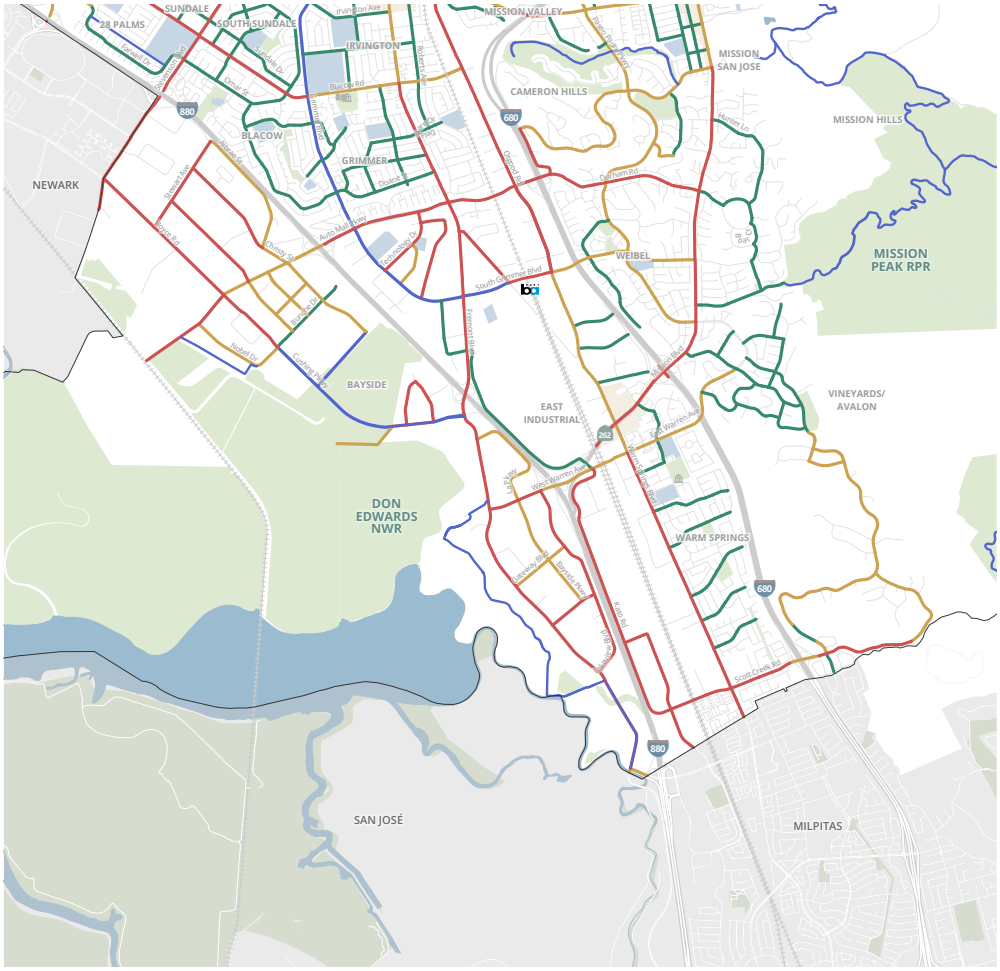
- High Comfort for All
- High Comfort for Most Adults
- Increasing Stress for Most
- High Stress Experience

Destinations + Boundaries

- County Libraries
- Community Centers
- BART Station
- Centerville ACE Station
- Schools
- Town/City Centers
- City Boundary

Source: Fehr & Peers, City of Fremont, OpenStreetMap (Fall 2023)

N 0 1 Mile



Conclusion

The City of Fremont is located at the northeastern edge of Silicon Valley between the Bay Area's bedroom communities in Alameda County and Central Valley and the major employers in Santa Clara and San Jose. Thus, Fremont experiences regional traffic congestion as employees commute between work and home. While a low percentage of Fremont residents commute by walking or biking, active transportation is a viable and growingly-attractive option for first and last mile trips to transit and other local trips like travel to school, shopping, recreational trails, or to local community centers.

Fremont has four regional rail stations: two BART stations, one Amtrak station, and one ACE station, which connects the city to the larger Bay Area region and beyond. To supplement these regional transit centers, the City of Fremont is working to enhance the active transportation infrastructure surrounding and connecting to the transit centers. Creating seamless and safe access to transit, including safe bike parking at stations, can help make regional transit more appealing than driving. Additionally, 35% of Fremont residents currently work from home; the evolving nature of hybrid work offers the potential for reducing the number of commute trips in the city and supporting the potential for local trips that can be made via active travel modes. With more than 25% of its residents under 18, there is also enormous potential to reduce congestion through promoting active transportation for school trips.

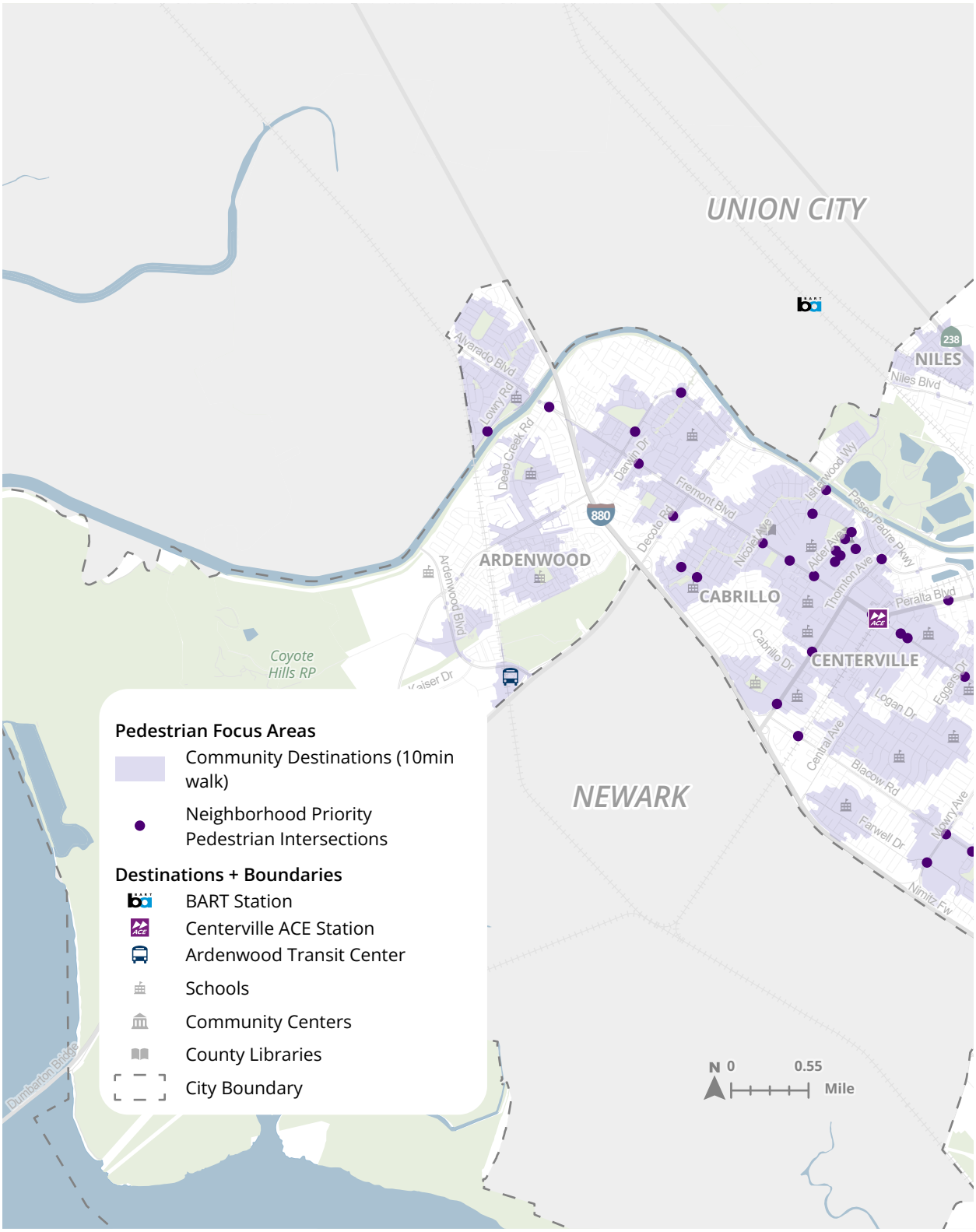
To encourage more people to take active travel modes for their daily trips, the City of Fremont will need to address the major High-Injury Corridors that serve as obstacles for pedestrians and cyclists. These corridors include Fremont Boulevard, Paseo Padre Parkway, Mowry Avenue, Washington Boulevard, Grimmer Boulevard, Blacow Road, and Thornton Avenue. These corridors isolate residential neighborhoods and create barriers to connectivity, making access to regional transit stations and local destinations difficult. The City is already undergoing efforts to improve the area surrounding the Fremont BART station for pedestrians and cyclists. Along with continue to support regional efforts, the City should study filling the local network such as along Paseo Padre Parkway, Stevenson Boulevard, Thornton Avenue, Grimmer Boulevard, Washington Boulevard, and Blacow Road to further improve the active transportation network. Studying potential improvements along these streets will enhance connections between residential neighborhoods and local destinations such as schools.

D

Appendix D: Pedestrian Focus Areas and Recommended Bikeways Neighborhood Maps

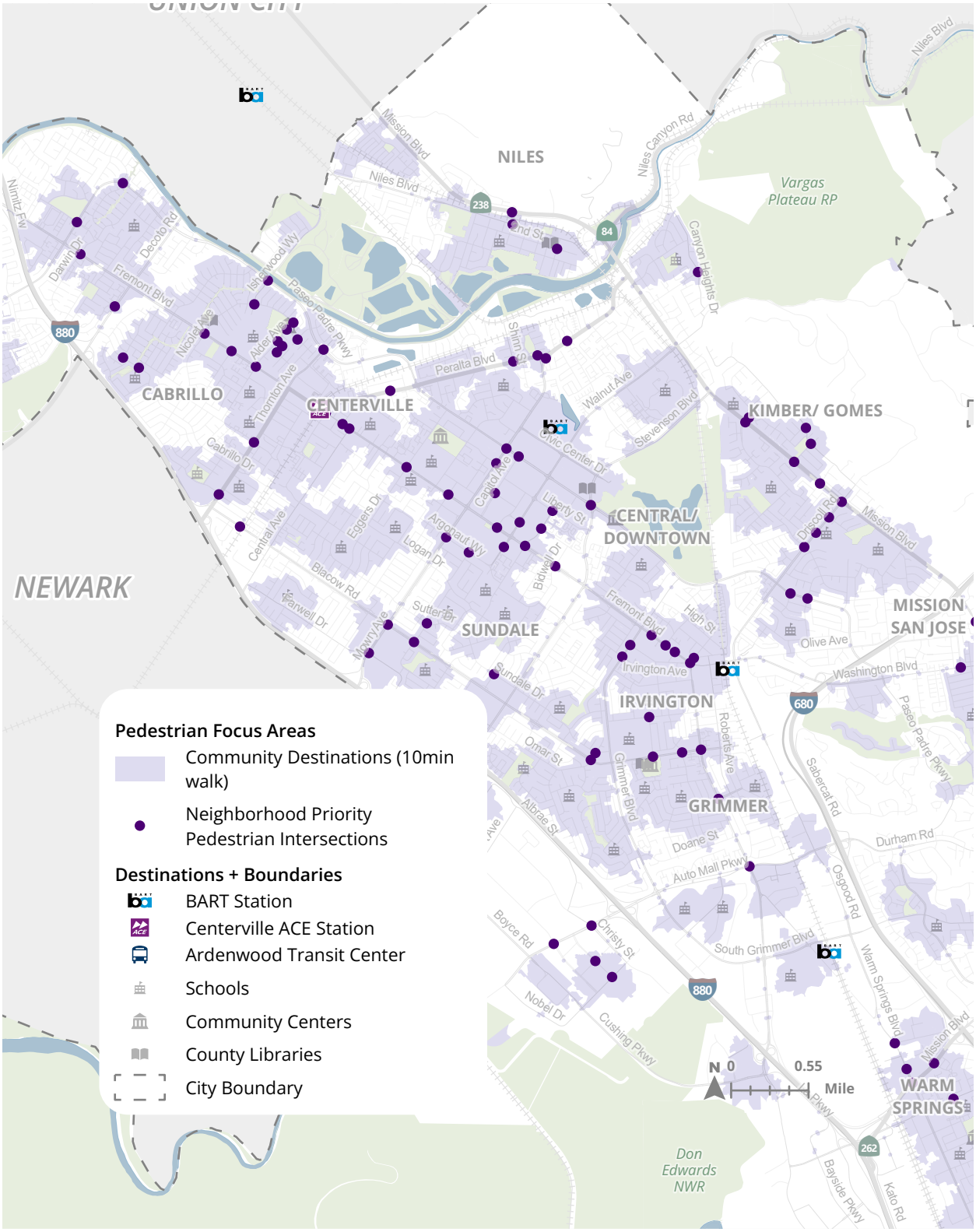
Pedestrian Focus Areas, Northwest Fremont

Figure D-1



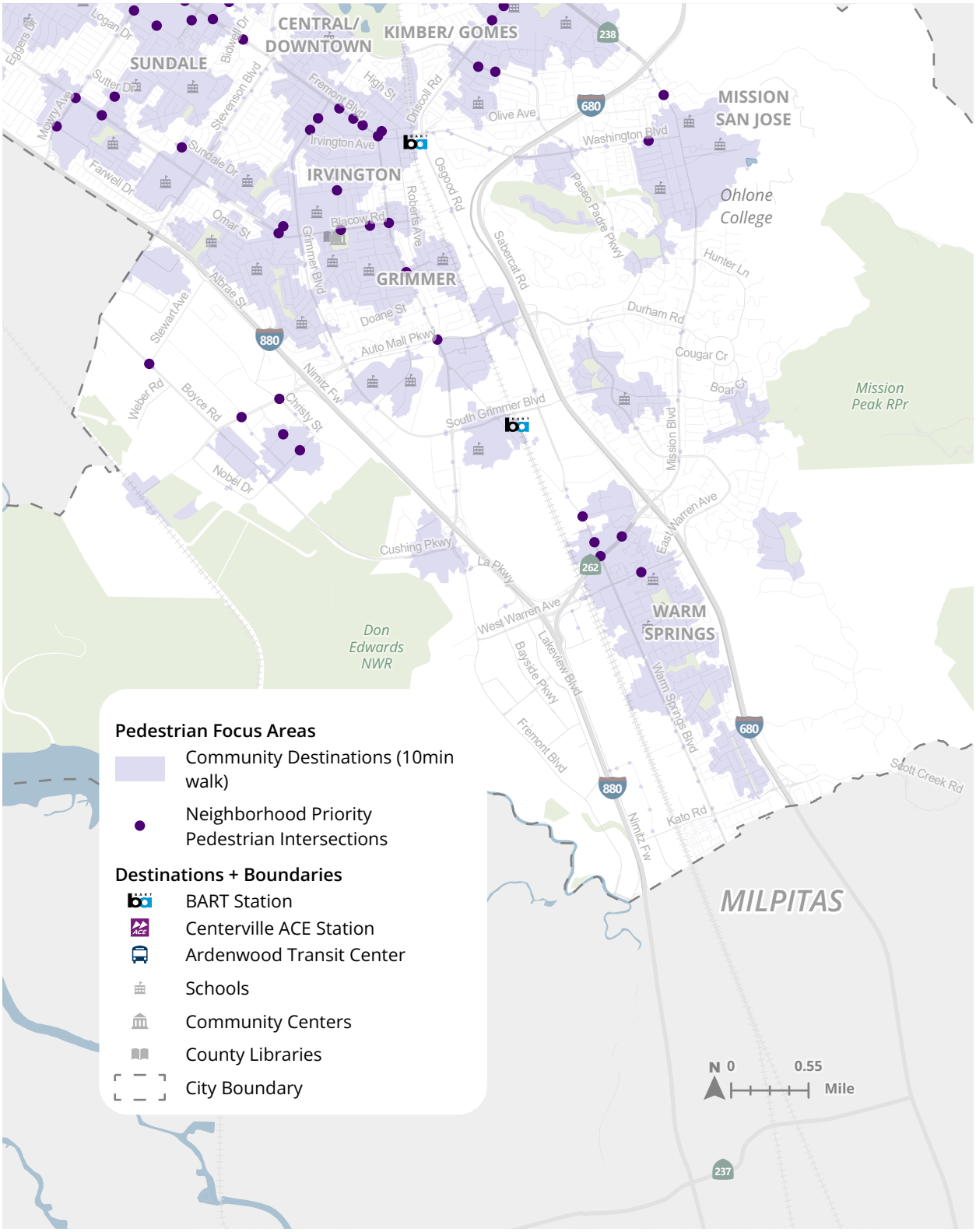
Pedestrian Focus Areas, Northeast and Central Fremont

Figure D-2



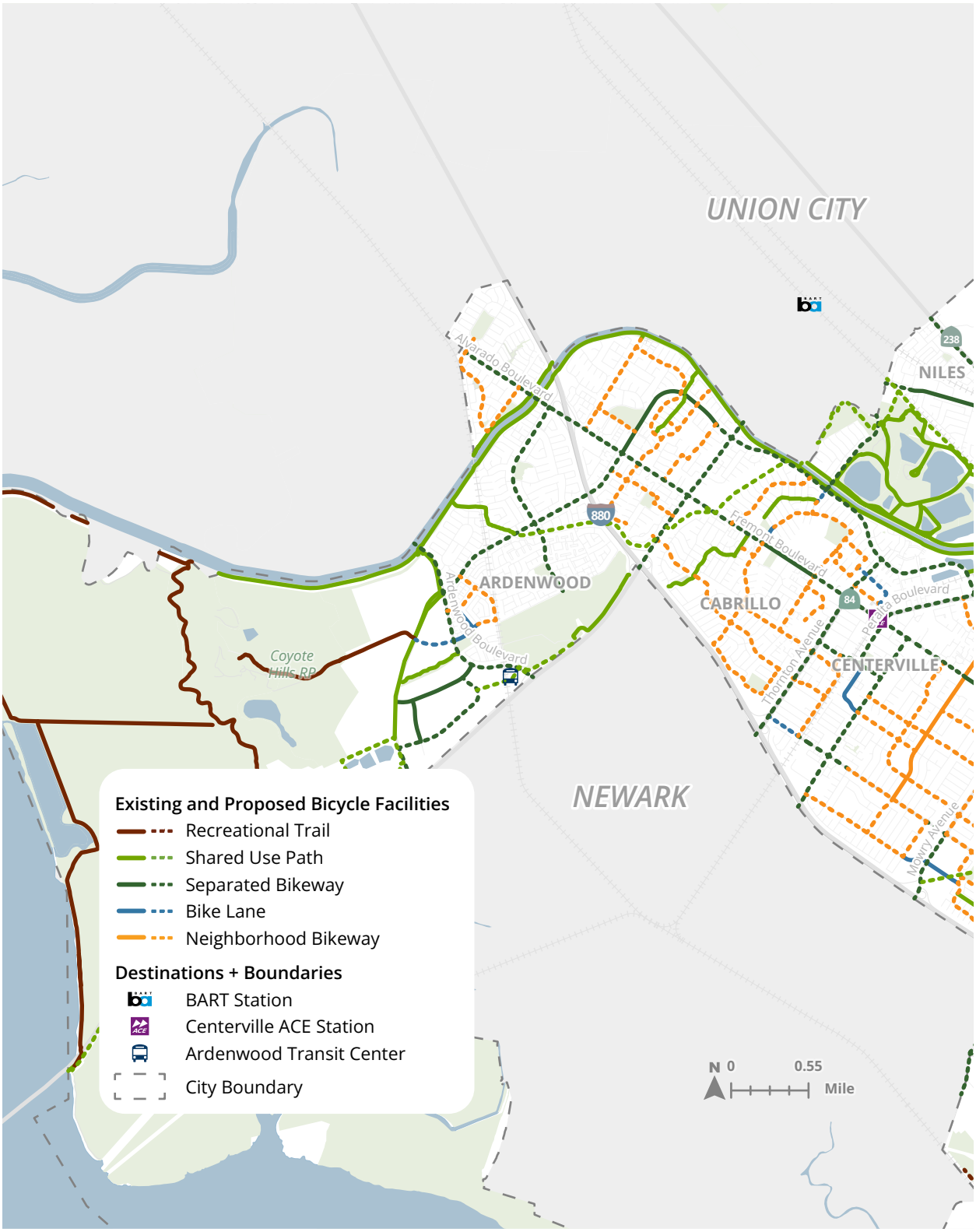
Pedestrian Focus Areas, South Fremont

Figure D-3



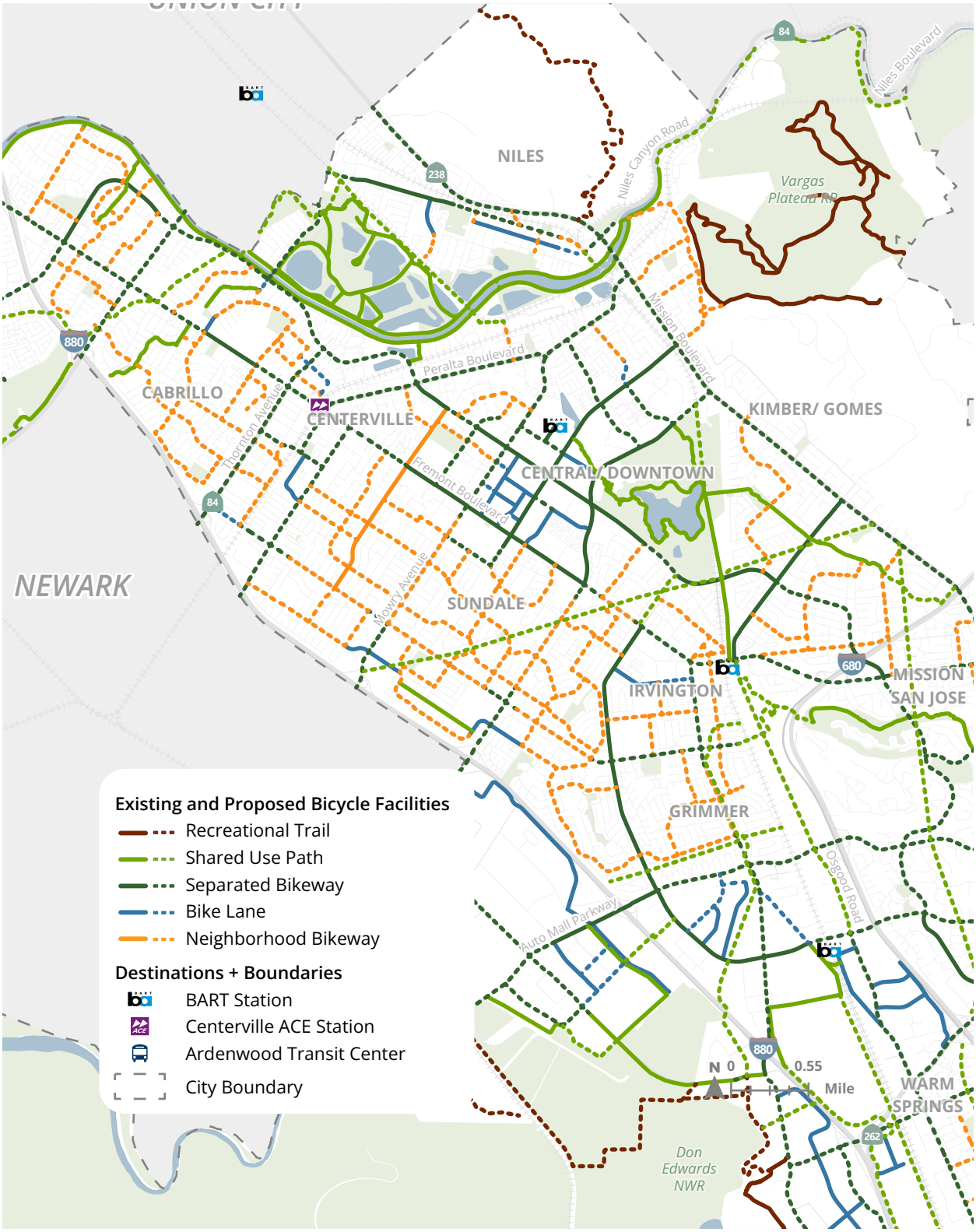
Recommended Bikeway Network, Northwest Fremont

Figure D-4



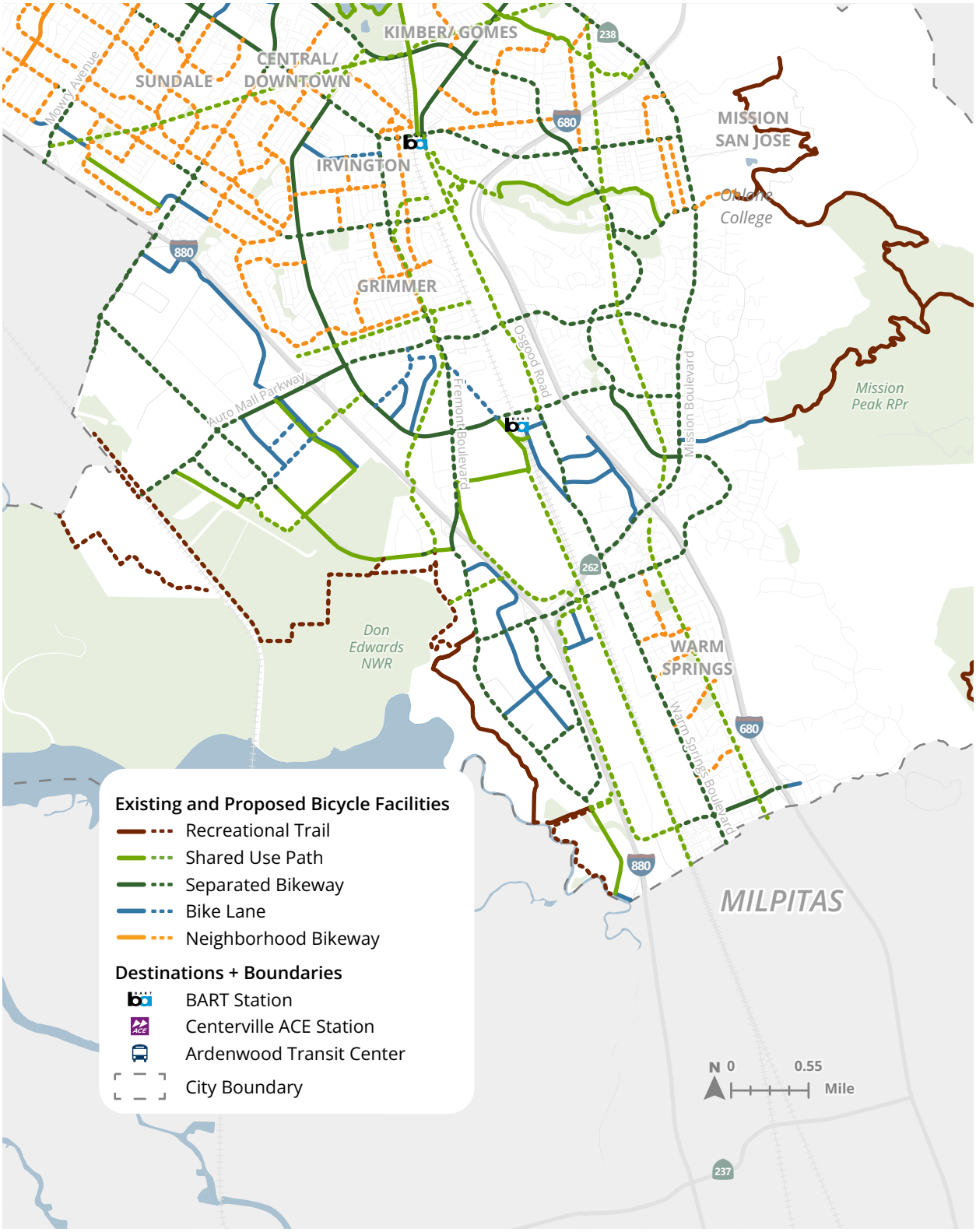
Recommended Bikeway Network, Northeast and Central Fremont

Figure D-5



Recommended Bikeway Network, South Fremont

Figure D-6



E

Appendix E: Prioritization Tables

Bicycle Corridor Prioritization

Table E-1

Corridor	Access to Destinations	In a Priority Development Area	Community Input	In an Equity Priority Area	80th Percentile Collision Density	Total Score	Priority Level
Dusterberry Way	1	2	2	2	2	9	Tier 1
Walnut Ave	2	2	2	1	2	9	Tier 1
Fremont Blvd	2	2	2	1	2	9	Tier 1
Peralta Blvd	2	1	2	1	2	8	Tier 1
Mowry Ave	2	1	2	1	2	8	Tier 1
Nicolet Ave	2	1	0	2	2	7	Tier 1
Bonde Way	1	2	1	2	1	7	Tier 1
Central Ave	1	1	1	2	2	7	Tier 1
Paseo Padre Pkwy	2	1	1	1	2	7	Tier 1
Thornton Ave	2	1	0	2	2	7	Tier 1
Argonaut Way	1	2	0	2	2	7	Tier 1
Grimmer Blvd	1	1	2	1	2	7	Tier 1
Alder Ave	1	1	0	2	2	6	Tier 1
Bidwell Dr	1	1	0	2	2	6	Tier 1
Hansen Ave	1	1	0	2	2	6	Tier 1
Sundale Dr	1	1	0	2	2	6	Tier 1
Liberty St	2	2	1	0	1	6	Tier 1
Warm Springs Blvd	2	2	0	0	2	6	Tier 1
Washington Blvd	2	1	1	0	2	6	Tier 1
Blacow Rd	2	1	0	1	2	6	Tier 1
Capitol Ave	2	2	1	0	1	6	Tier 1
Peralta Blvd	1	1	0	2	2	6	Tier 1
Moraine St	1	2	0	2	0	5	Tier 1
Irvington Ave	1	1	2	0	1	5	Tier 1
State St	1	2	2	0	0	5	Tier 1
Hastings St	2	2	0	0	1	5	Tier 1
Blue Ridge St	1	2	0	2	0	5	Tier 1
Boone Dr	1	0	0	2	2	5	Tier 1
Coronado Dr	1	0	0	2	2	5	Tier 1
Milton St	1	2	0	0	2	5	Tier 1
Oak St	1	2	0	2	0	5	Tier 1
Ozark River Way	1	2	0	0	2	5	Tier 1
Palm Ave	1	0	2	0	2	5	Tier 1
Parkside Dr	1	2	0	0	2	5	Tier 1
Post St	1	2	0	2	0	5	Tier 1
Union St	1	2	1	0	1	5	Tier 1
Auto Mall Pkwy	1	1	1	1	1	5	Tier 1
Civic Center Dr	1	2	1	0	1	5	Tier 1
Decoto Rd	1	1	1	0	2	5	Tier 1
Deep Creek Rd	2	1	0	0	2	5	Tier 1
Guardino Dr	1	2	0	0	2	5	Tier 1
Mission Blvd	2	1	0	0	2	5	Tier 1
Stevenson Blvd	1	1	0	1	2	5	Tier 1
Albany Path	1	2	2	0	0	5	Tier 1
Bart Way	1	2	2	0	0	5	Tier 1
Driscoll Rd	2	1	0	0	2	5	Tier 1
Besco Dr	1	0	1	1	1	4	Tier 2
Blackstone Way	1	2	0	0	1	4	Tier 2
Coco Palm Dr	1	0	0	2	1	4	Tier 2
Contra Costa Ave	1	0	0	2	1	4	Tier 2
Delaware Dr	1	0	0	2	1	4	Tier 2
Doane St	0	0	0	2	2	4	Tier 2
Fernald St	1	1	0	0	2	4	Tier 2
Gatewood St	0	0	0	2	2	4	Tier 2
Las Palmas Ave	1	0	1	0	2	4	Tier 2
Logan Dr	1	0	0	1	2	4	Tier 2
Margery Dr	0	2	0	0	2	4	Tier 2
Mohawk River St	2	2	0	0	0	4	Tier 2
Parkhurst Dr	1	1	0	2	0	4	Tier 2
Roberts Ave	1	2	0	0	1	4	Tier 2
Tamayo St	1	1	0	0	2	4	Tier 2

Tonopah Dr	1	2	0	0	1	4 Tier 2
Country Dr	1	2	0	0	1	4 Tier 2
E Warren Ave	1	1	0	0	2	4 Tier 2
Paseo Padre Pkwy	2	0	0	0	2	4 Tier 2
S Grimmer Blvd	1	1	1	0	1	4 Tier 2
Warren Ave	1	1	0	0	2	4 Tier 2
Isherwood Way	1	1	2	0	0	4 Tier 2
Niles Blvd	2	0	0	0	2	4 Tier 2
ACFD Channel	0	2	2	0	0	4 Tier 2
Alameda Creek Bridge	2	0	2	0	0	4 Tier 2
East Bay Greenway	2	2	0	0	0	4 Tier 2
Beacon Ave	1	2	0	0	1	4 Tier 2
Cabrillo Trail	1	2	1	0	0	4 Tier 2
Lake Elizabeth Trail	2	2	0	0	0	4 Tier 2
Second St	1	0	0	0	2	3 Tier 2
Old Warm Springs Blvd	1	2	0	0	0	3 Tier 2
Balboa Way	1	0	0	2	0	3 Tier 2
Bullard St	1	2	0	0	0	3 Tier 2
Cabrillo Dr	2	0	0	1	0	3 Tier 2
Cabrillo Ter	1	0	0	2	0	3 Tier 2
Cadiz Dr	1	2	0	0	0	3 Tier 2
Carol Ave	1	1	1	0	0	3 Tier 2
Chapel Way	1	0	2	0	0	3 Tier 2
Clarke Dr	1	0	2	0	0	3 Tier 2
Denise St	1	2	0	0	0	3 Tier 2
Eggers Dr	1	1	0	0	1	3 Tier 2
Falcon Dr	1	2	0	0	0	3 Tier 2
Gable Dr	1	2	0	0	0	3 Tier 2
Glenmoor Dr	1	0	0	1	1	3 Tier 2
H St	1	0	2	0	0	3 Tier 2
Hereford St	1	2	0	0	0	3 Tier 2
High St	1	2	0	0	0	3 Tier 2
Lake Arrowhead Ave	1	2	0	0	0	3 Tier 2
Lincoln St	1	2	0	0	0	3 Tier 2
Lippert Ave	1	2	0	0	0	3 Tier 2
Lowry Rd	1	2	0	0	0	3 Tier 2
Main St	1	2	0	0	0	3 Tier 2
Marlowe St	1	2	0	0	0	3 Tier 2
Old Canyon Rd	1	0	2	0	0	3 Tier 2
Omar St	1	0	0	0	2	3 Tier 2
Pickering Ave	1	0	0	0	2	3 Tier 2
Robin St	1	0	0	0	2	3 Tier 2
Royal Palm Dr	1	0	0	0	2	3 Tier 2
Ruskin Ave	1	2	0	0	0	3 Tier 2
Sacramento Ave	0	1	0	2	0	3 Tier 2
San Pedro Dr	1	0	0	2	0	3 Tier 2
Sullivan Underpass	1	0	0	0	2	3 Tier 2
Sutter Dr	0	0	1	2	0	3 Tier 2
Turner Ct	1	2	0	0	0	3 Tier 2
Alvarado Blvd	1	2	0	0	0	3 Tier 2
Ardenwood Blvd	2	0	0	0	1	3 Tier 2
Cushing Pkwy	1	0	2	0	0	3 Tier 2
Durham Rd	0	1	0	0	2	3 Tier 2
Kato Rd	0	2	0	0	1	3 Tier 2
Niles Canyon Rd	1	0	2	0	0	3 Tier 2
Scott Creek Rd	0	1	0	0	2	3 Tier 2
I-680 Bridge Museum Trail	0	2	1	0	0	3 Tier 2
East West Connector Trail	1	0	2	0	0	3 Tier 2
Kato Rd Trail	0	1	0	0	2	3 Tier 2
Sabercat Creek Trail	1	1	1	0	0	3 Tier 2
Albrae St	2	0	0	0	1	3 Tier 2
Ardenwood Path	1	0	2	0	0	3 Tier 2
Boscell Rd	1	0	0	0	2	3 Tier 2
Brookvale Trail	1	1	1	0	0	3 Tier 2
Cabrillo Trail	2	1	0	0	0	3 Tier 2
California St	1	2	0	0	0	3 Tier 2

WS BART Private Road	1	2	0	0	0	3 Tier 2
Technology Dr	0	0	2	0	0	2 Tier 3
Beard Rd	1	1	0	0	0	2 Tier 3
Blanchard St	0	2	0	0	0	2 Tier 3
Butano Park Dr	0	0	0	0	2	2 Tier 3
Cabrillo Ct	0	0	2	0	0	2 Tier 3
Cabrillo Dr	0	0	0	2	0	2 Tier 3
Canyon Heights Dr	1	0	1	0	0	2 Tier 3
Cedarwood Dr	0	0	0	2	0	2 Tier 3
Chadbourne Dr	0	0	0	0	2	2 Tier 3
Darwin Dr	1	1	0	0	0	2 Tier 3
Davis St	0	0	0	0	2	2 Tier 3
Dawson St	1	1	0	0	0	2 Tier 3
Ellsworth St	2	0	0	0	0	2 Tier 3
Farwell Dr	1	0	0	0	1	2 Tier 3
Ferry Ln	0	2	0	0	0	2 Tier 3
Kimbro St	1	0	0	0	1	2 Tier 3
Mattos Dr	1	1	0	0	0	2 Tier 3
Mission View Dr	1	1	0	0	0	2 Tier 3
Morrison Canyon Rd	0	0	2	0	0	2 Tier 3
Plymouth Ave	1	0	1	0	0	2 Tier 3
Sherwood St	1	0	0	0	1	2 Tier 3
Starlite Way	1	1	0	0	0	2 Tier 3
Starr St	0	0	0	0	2	2 Tier 3
Valpey Park Ave	1	0	0	0	1	2 Tier 3
Yellowstone Park Dr	1	0	0	0	1	2 Tier 3
Commerce Dr	1	0	0	0	1	2 Tier 3
Boyce Rd	0	0	0	0	2	2 Tier 3
Gallaudet Dr	2	0	0	0	0	2 Tier 3
Paseo Padre Pkwy	0	0	0	0	2	2 Tier 3
Pine St	1	0	0	0	1	2 Tier 3
Dumbarton - Quarry Lakes	2	0	0	0	0	2 Tier 3
Dumbarton - Quarry Lakes	1	0	1	0	0	2 Tier 3
East Bay Greenway	0	2	0	0	0	2 Tier 3
East Bay Greenway	2	0	0	0	0	2 Tier 3
East Bay Greenway	2	0	0	0	0	2 Tier 3
East West Connector Trail	2	0	0	0	0	2 Tier 3
Hetch Hetchy North-South	2	0	0	0	0	2 Tier 3
I-680 Bridge Museum Trail	0	2	0	0	0	2 Tier 3
I-680 Bridge Museum Trail	0	2	0	0	0	2 Tier 3
Sabercat Trail	0	2	0	0	0	2 Tier 3
Sabercat Trail	0	2	0	0	0	2 Tier 3
Sabercat Trail	0	2	0	0	0	2 Tier 3
Alameda Creek Trail	2	0	0	0	0	2 Tier 3
Alameda Creek Trail	1	1	0	0	0	2 Tier 3
Corporate Way	0	2	0	0	0	2 Tier 3
East Bay Greenway	2	0	0	0	0	2 Tier 3
Lake Elizabeth Trail	2	0	0	0	0	2 Tier 3
Lake Elizabeth Trail	2	0	0	0	0	2 Tier 3
Lake Elizabeth Trail	2	0	0	0	0	2 Tier 3
Lake Elizabeth Trail	2	0	0	0	0	2 Tier 3
Lake Elizabeth Trail	2	0	0	0	0	2 Tier 3
Morrison Canyon Trail	1	0	1	0	0	2 Tier 3
Reliance Way	0	2	0	0	0	2 Tier 3
Reliance Way Connection	0	2	0	0	0	2 Tier 3
Research Ave	0	2	0	0	0	2 Tier 3
Stanford Ave	2	0	0	0	0	2 Tier 3
Station Way	0	2	0	0	0	2 Tier 3
Transit Rd	0	2	0	0	0	2 Tier 3
Warm Springs Ct	0	2	0	0	0	2 Tier 3
West Access Bridge Connection	0	2	0	0	0	2 Tier 3
Marshlands Rd	1	0	0	0	0	1 Tier 3
Cherry Ln	1	0	0	0	0	1 Tier 3
Bates Dr	1	0	0	0	0	1 Tier 3
Bridgewater Pl	1	0	0	0	0	1 Tier 3

Brophy Dr	1	0	0	0	0	1 Tier 3
Bryant St	1	0	0	0	0	1 Tier 3
Camden St	1	0	0	0	0	1 Tier 3
Canal Ter	1	0	0	0	0	1 Tier 3
Canyon Heights Dr	1	0	0	0	0	1 Tier 3
Chaucer Dr	1	0	0	0	0	1 Tier 3
Flamingo Ln	1	0	0	0	0	1 Tier 3
Garland Dr	1	0	0	0	0	1 Tier 3
Glenview Dr	1	0	0	0	0	1 Tier 3
Hillview Dr	1	0	0	0	0	1 Tier 3
Hilo St	1	0	0	0	0	1 Tier 3
Lemos Ln	1	0	0	0	0	1 Tier 3
Lockwood Ave	0	1	0	0	0	1 Tier 3
Maar Ave	1	0	0	0	0	1 Tier 3
Marigold Dr	1	0	0	0	0	1 Tier 3
Old Canyon Rd	1	0	0	0	0	1 Tier 3
Olive Ave	0	1	0	0	0	1 Tier 3
Orangewood Dr	1	0	0	0	0	1 Tier 3
Orchard Dr	1	0	0	0	0	1 Tier 3
Pine Ln	0	0	0	0	1	1 Tier 3
Rancho Arroyo Pkwy	1	0	0	0	0	1 Tier 3
Shinn St	1	0	0	0	0	1 Tier 3
Warwick Rd	1	0	0	0	0	1 Tier 3
Cushing Pkwy	1	0	0	0	0	1 Tier 3
Fremont Blvd	1	0	0	0	0	1 Tier 3
Inland Bay Trail Alignment	0	0	0	0	1	1 Tier 3
W Warren Ave	0	0	1	0	0	1 Tier 3
Bunche Dr	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Dumbarton-Union City	1	0	0	0	0	1 Tier 3
Dumbarton - Quarry Lakes	1	0	0	0	0	1 Tier 3
Dumbarton - Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
East West Connector Trail	1	0	0	0	0	1 Tier 3
East West Connector Trail	1	0	0	0	0	1 Tier 3
East West Connector Trail	1	0	0	0	0	1 Tier 3
FUSD Property Trail	0	1	0	0	0	1 Tier 3
Grimmer Greenway	0	1	0	0	0	1 Tier 3
I-880 Pacific Commons Bridge Trail	0	0	1	0	0	1 Tier 3
Mission Creek Trail	1	0	0	0	0	1 Tier 3
Multi-use Trail	1	0	0	0	0	1 Tier 3
Niles Canyon Trail	1	0	0	0	0	1 Tier 3
Niles Canyon Trail	1	0	0	0	0	1 Tier 3
Niles Canyon Trail	1	0	0	0	0	1 Tier 3
Niles Canyon Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
ACFD Channel	1	0	0	0	0	1 Tier 3
Alameda Creek Trail	1	0	0	0	0	1 Tier 3
Alameda Creek Trail	1	0	0	0	0	1 Tier 3
Alameda Creek Trail	1	0	0	0	0	1 Tier 3
Alameda Creek Trail	0	1	0	0	0	1 Tier 3
Alameda Creek Trail Connector	1	0	0	0	0	1 Tier 3
Bay Area Ridge Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3

Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bay Trail	1	0	0	0	0	1 Tier 3
Bayview Trail	1	0	0	0	0	1 Tier 3
Benicia St	0	0	0	0	1	1 Tier 3
Brown Rd	1	0	0	0	0	1 Tier 3
Coastal/Scenic Bay Trail	1	0	0	0	0	1 Tier 3
Dumbarton Bridge Trail	1	0	0	0	0	1 Tier 3
Farwell Pathway	1	0	0	0	0	1 Tier 3
Kaiser Dr	1	0	0	0	0	1 Tier 3
Lake Elizabeth Trail	1	0	0	0	0	1 Tier 3
Lake Elizabeth Trail	1	0	0	0	0	1 Tier 3
Lake Elizabeth Trail	1	0	0	0	0	1 Tier 3
Lake Elizabeth Trail	1	0	0	0	0	1 Tier 3
Mountain Peak	1	0	0	0	0	1 Tier 3
Nobel Drive Trail	1	0	0	0	0	1 Tier 3
Northgate Trail	1	0	0	0	0	1 Tier 3
Northgate Trail	1	0	0	0	0	1 Tier 3
Ohlone Widerness Trail	1	0	0	0	0	1 Tier 3
Paseo Padre Pkwy	1	0	0	0	0	1 Tier 3
Patterson Ranch Rd Trail	1	0	0	0	0	1 Tier 3
Patterson Ranch Rd Trail	1	0	0	0	0	1 Tier 3
Patterson Ranch Rd Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Quarry Lakes Trail	1	0	0	0	0	1 Tier 3
Regional Park Trail	1	0	0	0	0	1 Tier 3
Sabercat Creek Trail	1	0	0	0	0	1 Tier 3
Ysc Trail	0	0	1	0	0	1 Tier 3
Technology Pl	0	0	0	0	0	0 Tier 3
Curie St	0	0	0	0	0	0 Tier 3
Gomes Rd	0	0	0	0	0	0 Tier 3
Porter St	0	0	0	0	0	0 Tier 3
Tan Oak Dr	0	0	0	0	0	0 Tier 3
Tupelo St	0	0	0	0	0	0 Tier 3
Whitehead Ln	0	0	0	0	0	0 Tier 3
Bayview Dr	0	0	0	0	0	0 Tier 3
Dumbarton Cir	0	0	0	0	0	0 Tier 3
Lakeview Blvd	0	0	0	0	0	0 Tier 3
Nobel Dr	0	0	0	0	0	0 Tier 3
Bay Trail	0	0	0	0	0	0 Tier 3
Bay Trail	0	0	0	0	0	0 Tier 3
Coastal/Scenic Bay Trail	0	0	0	0	0	0 Tier 3
ACFD Channel	0	0	0	0	0	0 Tier 3
ACFD Channel	0	0	0	0	0	0 Tier 3
Cinematic Common	0	0	0	0	0	0 Tier 3
Dumbarton-Union City	0	0	0	0	0	0 Tier 3
Dumbarton - Quarry Lakes	0	0	0	0	0	0 Tier 3
Niles Canyon Trail	0	0	0	0	0	0 Tier 3
Niles Canyon Trail	0	0	0	0	0	0 Tier 3
Niles Canyon Trail	0	0	0	0	0	0 Tier 3

ACFC Channel	0	0	0	0	0	0 Tier 3
Alameda Creek Trail	0	0	0	0	0	0 Tier 3
Alameda Creek Trail	0	0	0	0	0	0 Tier 3
Alameda Creek Trail Connection	0	0	0	0	0	0 Tier 3
Auburn Ct	0	0	0	0	0	0 Tier 3
Auburn St	0	0	0	0	0	0 Tier 3
Bay Trail	0	0	0	0	0	0 Tier 3
Bay Trail	0	0	0	0	0	0 Tier 3
Bay Trail	0	0	0	0	0	0 Tier 3
Bay Trail	0	0	0	0	0	0 Tier 3
Bayside Pkwy	0	0	0	0	0	0 Tier 3
Business Center Dr	0	0	0	0	0	0 Tier 3
Campus Dr	0	0	0	0	0	0 Tier 3
Christy St	0	0	0	0	0	0 Tier 3
Christy St	0	0	0	0	0	0 Tier 3
Christy St	0	0	0	0	0	0 Tier 3
Coastal/Scenic Bay Trail	0	0	0	0	0	0 Tier 3
Crandall Creek Trail	0	0	0	0	0	0 Tier 3
Dixon Landing Rd	0	0	0	0	0	0 Tier 3
Dry Creek Trail	0	0	0	0	0	0 Tier 3
Gateway Blvd	0	0	0	0	0	0 Tier 3
Landing Pkwy	0	0	0	0	0	0 Tier 3
Pacific Commons South Trail	0	0	0	0	0	0 Tier 3
Quarry Lakes Trail	0	0	0	0	0	0 Tier 3
Solar Way	0	0	0	0	0	0 Tier 3
Tan Bark Dr	0	0	0	0	0	0 Tier 3
YSC Trail	0	0	0	0	0	0 Tier 3

Bicycle Corridor Prioritization Methodology

Table E-2

Criteria		Score
Access to Destinations	2 community destinations on corridor	2
	1 community destination on or 2+ within 1/4 mile	1
	No community destinations on/accessed via corridor	0
In a Priority Development Area	≥50% of corridor in PDA	2
	0 - 50% (exclusive) of corridor in PDA	1
	0% of corridor in PDA; does not intersect	0
Community Input	Top 20th percentile of comments/mile on corridor	2
	60th-79th percentile of comments/mile on corridor	1
	0-59th percentile of comments/mile on corridor	0
80th Percentile Collision Density	Corridor includes 80th+ percentile segments	2
	Corridor includes 60th-80th percentile segments	1
	No 60th-100th percentile segments on corridor	0
In an Equity Priority Area	≥50% of corridor in equity area	2
	0 - 50% (exclusive) of corridor in equity area	1
	0% of corridor in equity area; does not intersect	0

Pedestrian Intersection Prioritization

Table E-3

Intersection	Access to Destinations	In a Priority Development Area	Community Input	In an Equity Priority Area	80th Percentile Collision Density	Total Score	Priority Level
Fremont Blvd & Bonde Way	1	1	1	1	1	5	Tier 1
Fremont Blvd & Peralta Blvd	1	1	1	1	1	5	Tier 1
Blacow Rd & Calaveras Ave	1	0	1	1	1	4	Tier 2
Fremont Blvd & Clough Ave	1	1	1	0	1	4	Tier 2
Fremont Blvd & Nicolet Ave	1	1	1	0	1	4	Tier 2
Fremont Blvd & Sundale Dr	1	1	1	0	1	4	Tier 2
Mission Blvd & Warm Springs Blvd	1	1	1	0	1	4	Tier 2
Walnut Ave & California St	1	1	1	0	1	4	Tier 2
Walnut Ave & Midblock (Fremont to Argonaut)	1	1	0	1	1	4	Tier 2
Blacow Rd & Fremont Blvd	1	0	1	0	1	3	Tier 2
Blacow Rd & Mowry Ave	1	0	0	1	1	3	Tier 2
Boone Dr & Sundale Dr	1	0	0	1	1	3	Tier 2
Calaveras Ave & Sutter Dr	1	0	1	1	0	3	Tier 2
Capitol Ave & State St	1	1	1	0	0	3	Tier 2
Central Ave & Fremont Blvd	1	1	0	0	1	3	Tier 2
Dawson St & Ruskin Ave	1	1	1	0	0	3	Tier 2
Decoto Rd & Ozark River Dr	1	1	0	0	1	3	Tier 2
Driscoll Rd & Amapola Dr	1	0	1	0	1	3	Tier 2
E Warren Ave & Fernald St	1	0	1	0	1	3	Tier 2
Falcon Dr & Lowry Rd	1	0	1	0	1	3	Tier 2
Fremont Blvd & Alder Ave	1	1	0	0	1	3	Tier 2
Fremont Blvd & Beacon Ave	1	1	0	0	1	3	Tier 2
Fremont Blvd & Bidwell Dr	0	1	1	0	1	3	Tier 2
Fremont Blvd & Chapel Wy	1	1	0	0	1	3	Tier 2
Fremont Blvd & Darwin Dr	1	1	1	0	0	3	Tier 2
Fremont Blvd & Delaware Dr	1	0	1	1	0	3	Tier 2
Fremont Blvd & Eggers Dr	1	1	1	0	0	3	Tier 2
Fremont Blvd & Gibraltar Dr	1	1	1	0	0	3	Tier 2
Fremont Blvd & Monroe Ave	1	1	1	0	0	3	Tier 2
Fremont Blvd & Papazian Way	1	1	0	0	1	3	Tier 2
Fremont Blvd & Parish Ave	1	1	0	0	1	3	Tier 2
Fremont Blvd & Washington Blvd	1	1	1	0	0	3	Tier 2
Grimmer Blvd & Bay St	1	1	0	0	1	3	Tier 2
Hereford St & Surry Pl	1	1	1	0	0	3	Tier 2
Leslie St & Sundale Dr	1	1	1	0	0	3	Tier 2
Liberty St & Sundale Dr	1	1	1	0	0	3	Tier 2
Main St & Union St	1	1	1	0	0	3	Tier 2
Marlowe St & Ruskin Ave	1	1	1	0	0	3	Tier 2
Mission Blvd & Las Palmas Ave	1	0	1	0	1	3	Tier 2
Mowry Ave & Farwell Dr	1	0	1	0	1	3	Tier 2
Mowry Ave & Guardino Dr	1	0	1	0	1	3	Tier 2
Mowry Ave & Hastings St	1	1	1	0	0	3	Tier 2
Mowry Ave & Paseo Padre Pkwy	1	1	0	0	1	3	Tier 2
Mowry Ave & Peralta Blvd	1	1	1	0	0	3	Tier 2
Paseo Padre Pkwy & Capitol Ave	1	1	0	0	1	3	Tier 2
Paseo Padre Pkwy & Milton St	1	1	0	0	1	3	Tier 2
Paseo Padre Pkwy & Stevenson Blvd	1	1	1	0	0	3	Tier 2
Paseo Padre Pkwy & Thornton Ave	1	1	1	0	0	3	Tier 2
Thornton Ave & Contra Costa Ave	1	0	0	1	1	3	Tier 2
Thornton Ave & San Pedro Dr	1	0	0	1	1	3	Tier 2
Warm Springs Blvd & Brown Rd	1	1	0	0	1	3	Tier 2
Alder Ave & Dawson St	1	0	1	0	0	2	Tier 3
Alder Ave & Hereford St	1	0	1	0	0	2	Tier 3
Alder Ave & Nicolet Ave	1	0	1	0	0	2	Tier 3
Almeria Ave & E Las Palmas Ave	1	0	1	0	0	2	Tier 3
Alvarado Blvd & Deep Creek Rd	0	1	1	0	0	2	Tier 3
Ardo St & Cabrillo Dr	1	0	1	0	0	2	Tier 3
Argonaut Way & Mowry Ave	1	0	0	0	1	2	Tier 3
Argonaut Way & Sacramento Ave	1	0	0	0	1	2	Tier 3
Auto Mall Pkwy & Boscell Rd	1	0	0	0	1	2	Tier 3
Auto Mall Pkwy & Christy St	1	0	1	0	0	2	Tier 3
Auto Mall Pkwy & Fremont Blvd	1	0	1	0	0	2	Tier 3

Blacow Rd & Gatewood St	1	0	0	0	1	2 Tier 3
Blacow Rd & Hansen Ave	0	0	0	1	1	2 Tier 3
Blacow Rd & Omar St	1	0	0	0	1	2 Tier 3
Blacow Rd & Sherwood St	1	0	1	0	0	2 Tier 3
Boyce Rd & Stewart Ave	0	0	1	0	1	2 Tier 3
Bunche Dr & Pacific Commons Blvd	1	0	1	0	0	2 Tier 3
Cabrillo Dr & Gibraltar Dr	1	0	1	0	0	2 Tier 3
Canyon Heights Dr & Imperio Ave	1	0	1	0	0	2 Tier 3
Canyon Heights Dr & Mackintosh St	1	0	1	0	0	2 Tier 3
Canyon Heights Dr & Pickering Ave	1	0	1	0	0	2 Tier 3
Carol Ave & Sherwood St	1	0	1	0	0	2 Tier 3
Curie St & Pacific Commons Blvd	1	0	1	0	0	2 Tier 3
Driscoll Rd & Chiltern Dr	1	0	0	0	1	2 Tier 3
Driscoll Rd & Mission Blvd	1	0	1	0	0	2 Tier 3
Driscoll Rd & Saint Anthony Dr	1	0	1	0	0	2 Tier 3
Grimmer Blvd & Davis St	1	0	0	0	1	2 Tier 3
Isherwood Way & Nicolet Ave	1	0	1	0	0	2 Tier 3
J St & Second St	1	0	0	0	1	2 Tier 3
Mission Blvd & Mackintosh St	1	0	1	0	0	2 Tier 3
Mission Blvd & Mohave Dr	1	0	0	0	1	2 Tier 3
Mission Blvd & Ondina Dr	1	0	0	0	1	2 Tier 3
Mission Blvd & Starr St	1	0	0	0	1	2 Tier 3
Mission Blvd & Sullivan Underpass	1	0	0	0	1	2 Tier 3
Mowry Ave & Peralta Blvd	1	0	1	0	0	2 Tier 3
Niles Blvd & F St	1	0	1	0	0	2 Tier 3
Paseo Padre Pkwy & Chadbourne Dr	1	0	0	0	1	2 Tier 3
Paseo Padre Pkwy & Chaucer Dr	1	0	1	0	0	2 Tier 3
Paseo Padre Pkwy & Dorne Pl	1	0	0	0	1	2 Tier 3
Paseo Padre Pkwy & Isherwood Way	1	0	1	0	0	2 Tier 3
Peralta Blvd & Canterbury St	0	1	1	0	0	2 Tier 3
Peralta Blvd & Shinn St	1	0	1	0	0	2 Tier 3
Robin St & Sundale Dr	1	0	0	0	1	2 Tier 3
Warm Springs Blvd & Mission Ct	1	0	0	0	1	2 Tier 3
Washington Blvd & Starr St	1	0	1	0	0	2 Tier 3

Pedestrian Intersection Prioritization Methodology

Table E-4

Criteria		Score
Access to Destinations	Within 10-minute walkshed of a community destination	1
	Not within 10-minute walkshed of a community destination	0
In a Priority Development Area	Intersection in a PDA	1
	Intersection not in a PDA	0
Community Input	At least one web map walking-related comment	1
	No web map walking-related comments	0
80th Percentile Collision Density	Intersection of 80th+ percentile segments	1
	No 80th+ percentile segments	0
In an Equity Priority Area	Intersection in an equity area	1
	Intersection not in an equity area	0