Berkeley Bicycle Plan 2017
MTC Planning Innovations

October 26, 2017

PURPOSE AND NEED

Total Commuters: 54,583

Pedestrian Commuters: 8,842

Walking Mode Share 16.2%

Bicycle Commuters: 4,640

Bicycling Mode Share 8.5%

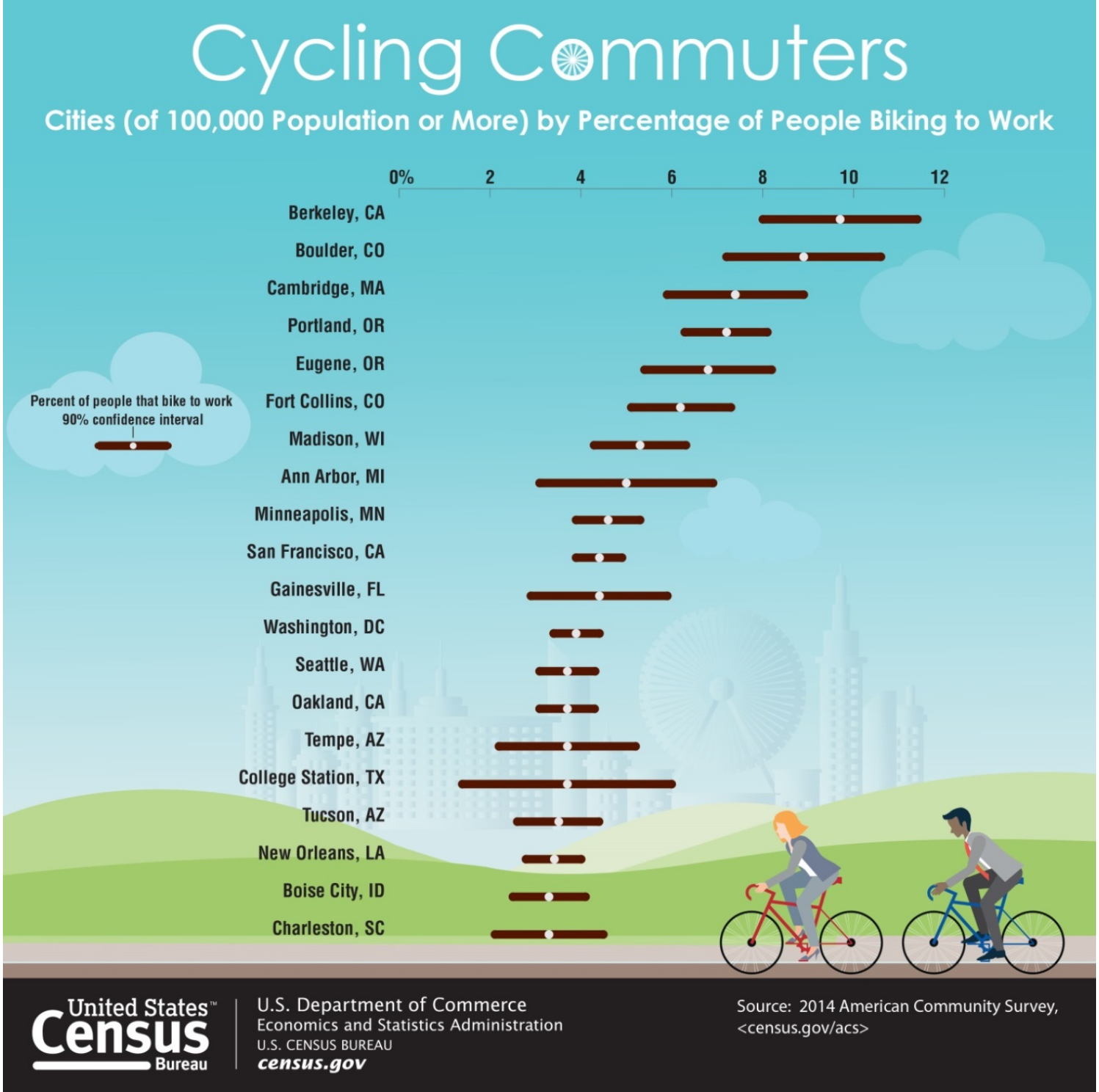
Drive Commuters: 23,307

Driving Mode Share 42.7%

Public Transit Commuters: 11,353

Public Transit Mode Share 20.8%

Source: U.S. Census Bureau, 2014 American Community Survey


Cycling Commuters
Cities (of 100,000 Population or More) by Percentage of People Biking to Work
0%
2
4
6
8
10
12
Berkeley, CA
Boulder, CO
Cambridge, MA
Portland, OR
Eugene, OR
Fort Collins, CO
Madison, WI
Ann Arbor, MI
Minneapolis, MN
San Francisco, CA
Gainesville, FL
Washington, DC
Seattle, WA
Oakland, CA
Tempe, AZ
College Station, TX
Tucson, AZ
New Orleans, LA
Boise City, ID
Charleston, SC
Percent of people that bike to work
90% confidence interval
United States Census Bureau
U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU
census.gov
Source: 2014 American Community Survey, <census.gov/acs>

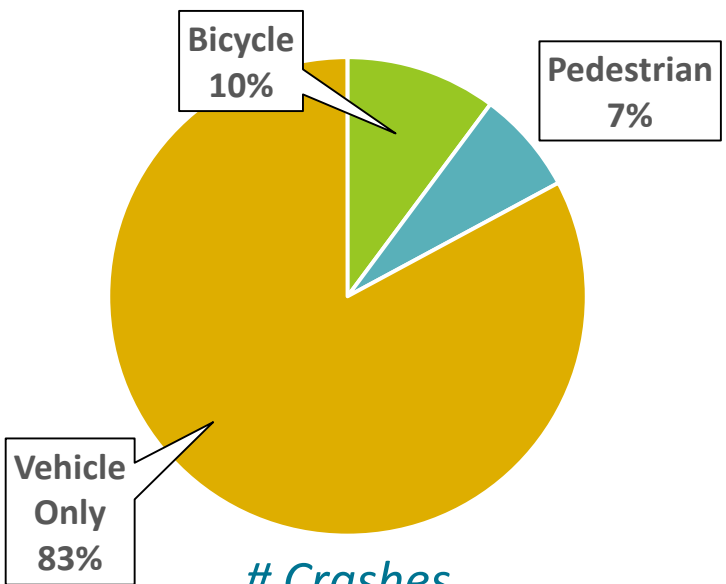
PURPOSE AND NEED

8.5% Bicycle Commute to Work Mode Share (2nd highest in US)

58% Increase In Bicycle Counts (2005-2015)

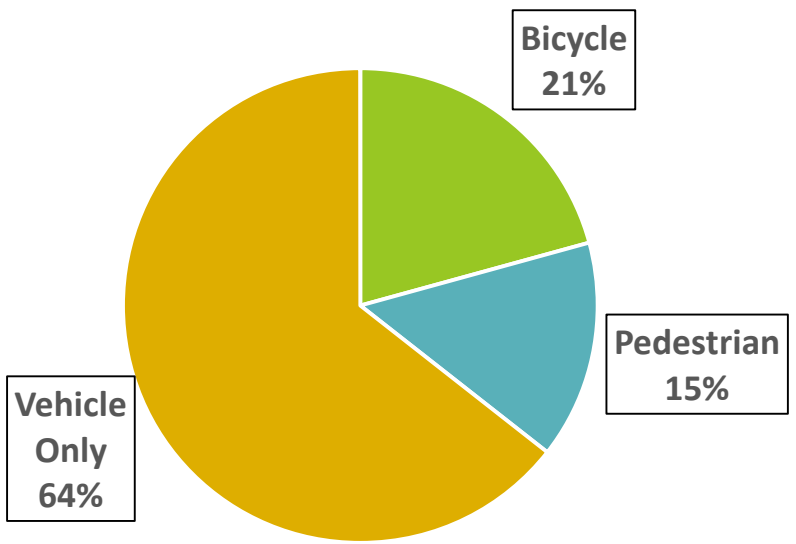
163 Bicycle Injury & Fatality Collisions Per Year (2011-2016)

Sources: US Census Bureau American Community Survey; City of Berkeley Bicycle Counts; UC Berkeley Transportation Survey; SWITRS Traffic Collision Data



 # Crashes

(2011-2016)



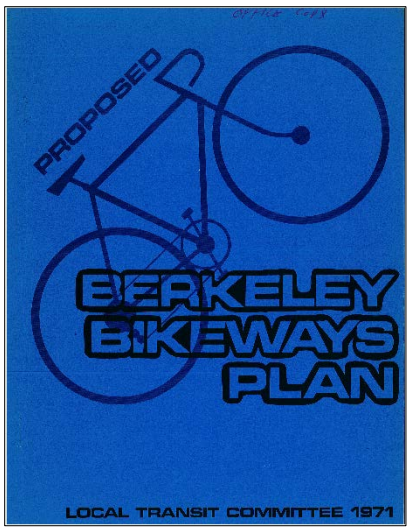
 # Injuries & Fatalities

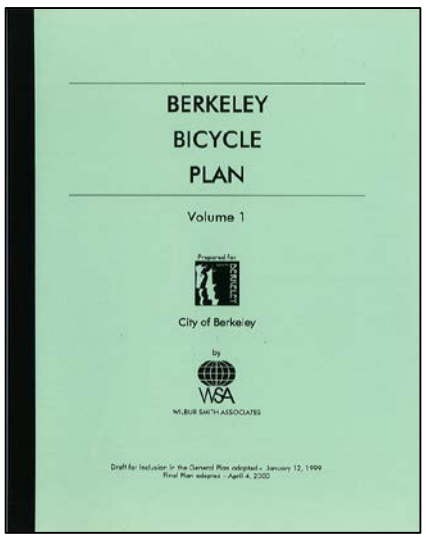
(2011-2016)

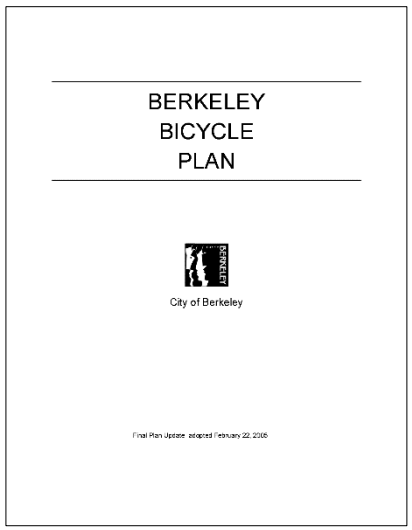
Update Required for Funding (Caltrans, MTC, Alameda CTC)

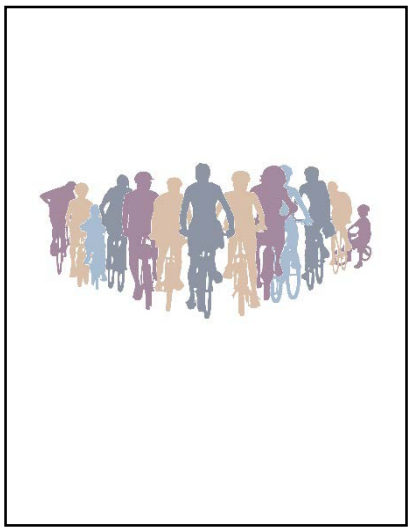
PURPOSE AND NEED

1971 → 2000 → 2005 → 2017









PLAN DEVELOPMENT PROCESS

1. **Existing Conditions and Needs Analysis** — *Jan 2015-Nov 2015*
2. **Project and Program Recommendations** — *Nov 2015-July 2016*
3. **Administrative Draft Plan** — *May 2016-Aug 2016*
4. **Public Review Draft Plan** — *Aug 2016-Oct 2016*
5. **Final Draft Plan** — *Oct 2016-Dec 2016*
6. **Final Draft Plan Revisions** — *Dec 2016-May 2017*
7. **City Council Adoption** — May *2017*

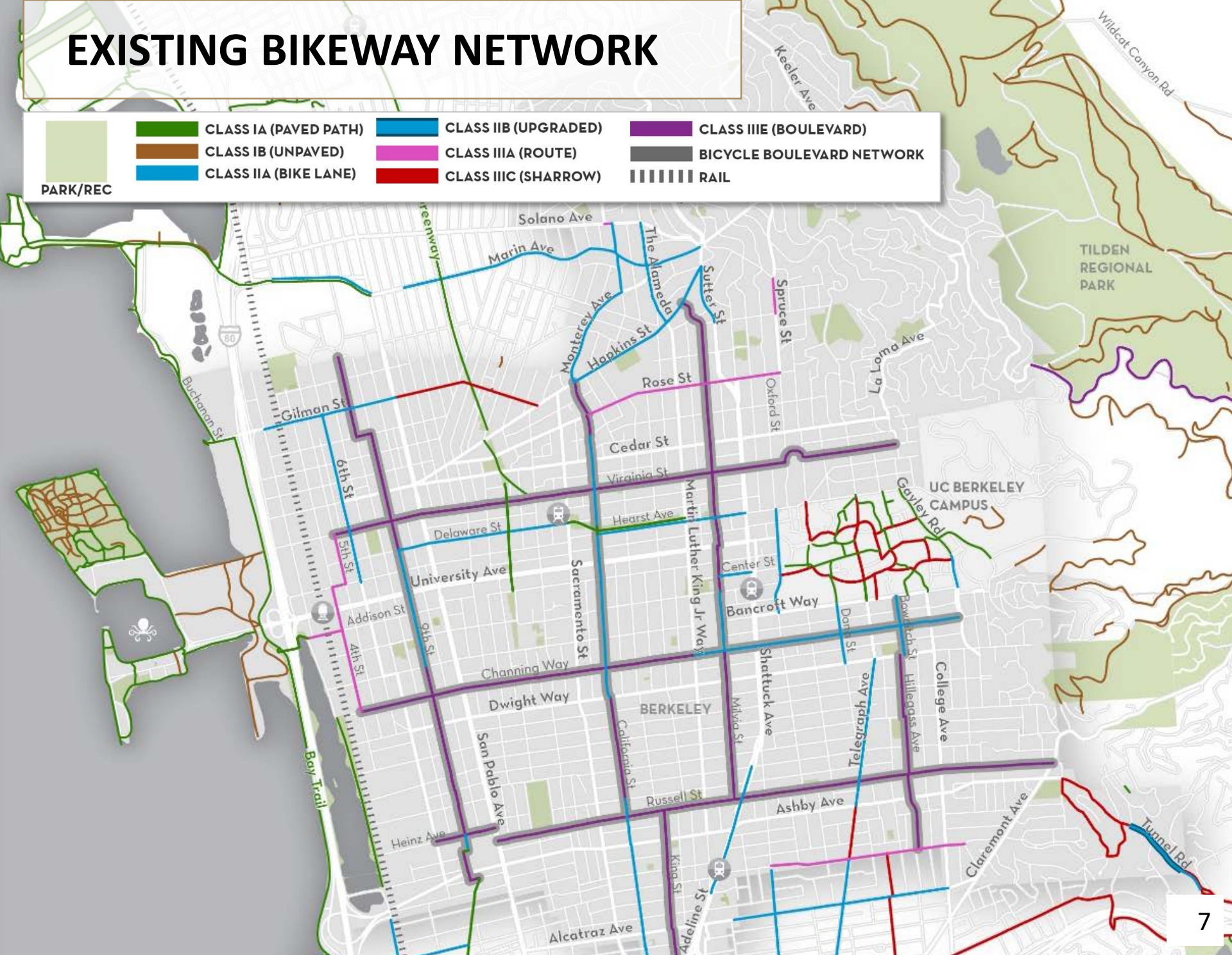
Public Input

600 Survey Responses

1,000+ Comments

22 Meetings & Events

EXISTING BIKEWAY NETWORK



ELEMENTS OF BICYCLE BOULEVARDS

Elements of Bicycle Boulevards

DISTINCT VISUAL IDENTITY

Unique pavement markings and wayfinding signs increase visibility of Bicycle Boulevard routes, assist with navigation, and alert drivers that the roadway is a priority route for people bicycling.

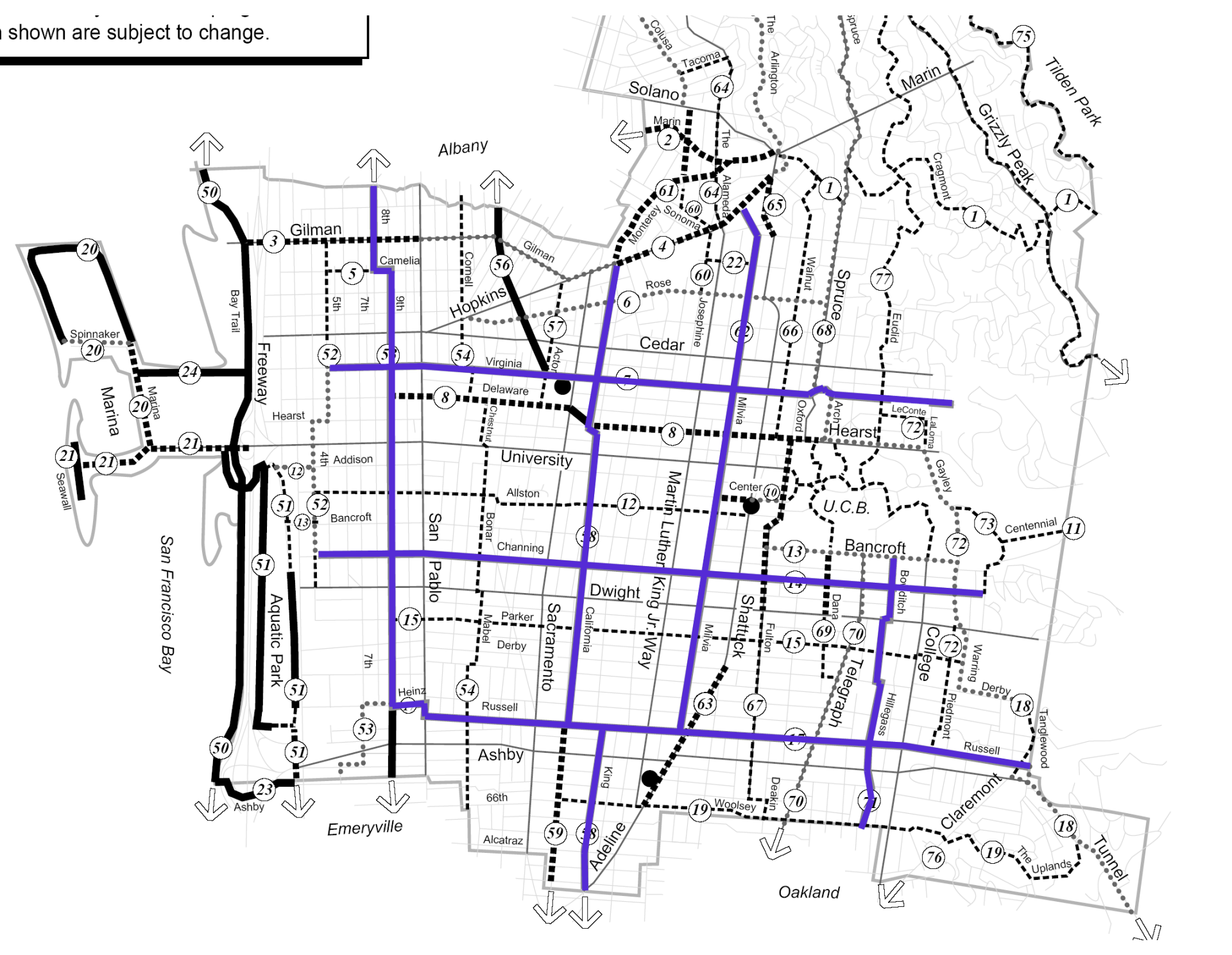
SAFE, CONVENIENT CROSSINGS

Traffic controls, warning devices, and/or separated facilities at intersections help facilitate safe and convenient crossings of major streets along the Bike Boulevard network.

BICYCLE PRIORITY

Traffic calming treatments that prioritize bicycle through-travel and discourage cut-through motor vehicle traffic, such as traffic circles, diverters, chicanes, sometimes in place of existing stop signs.

n shown are subject to change.



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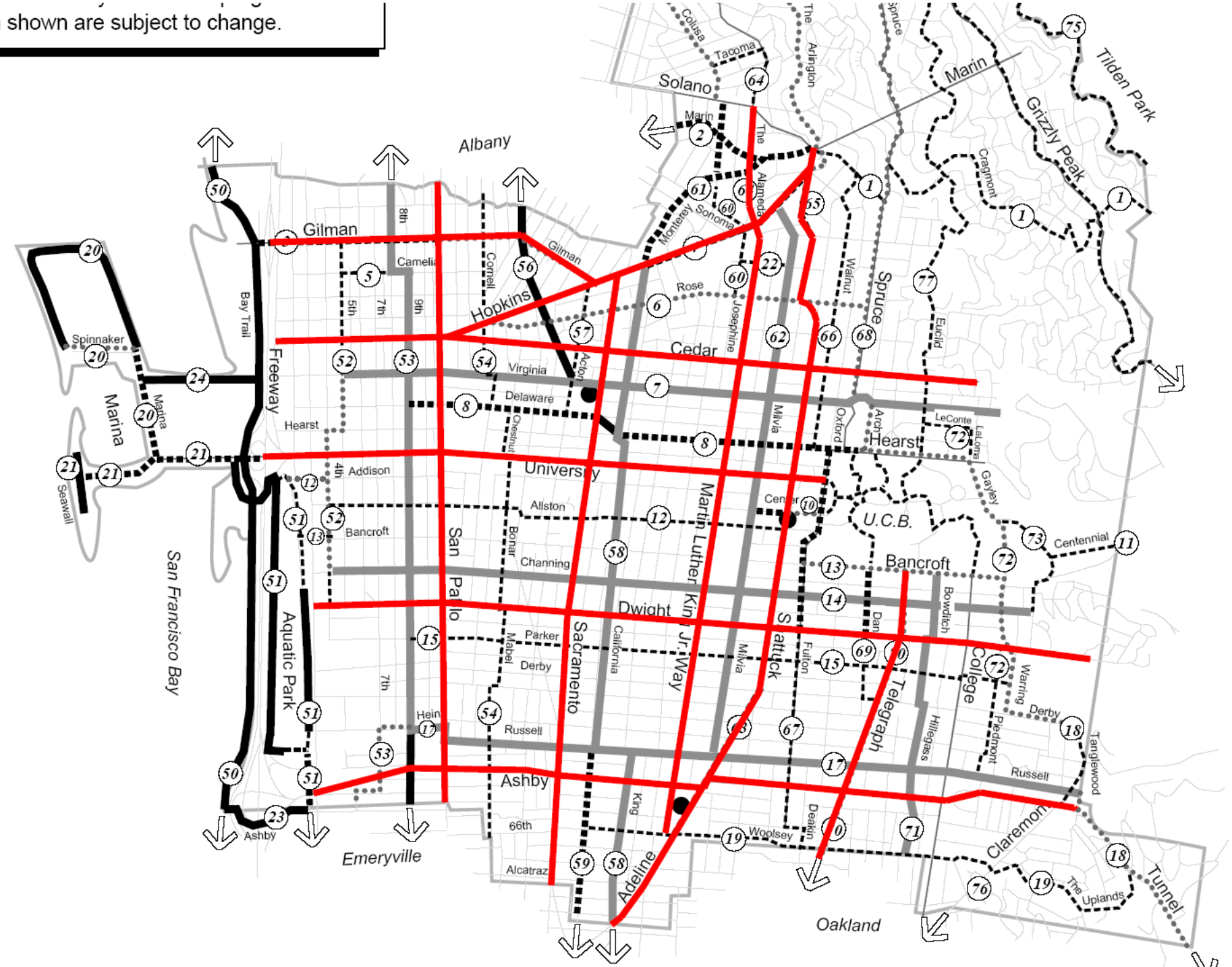

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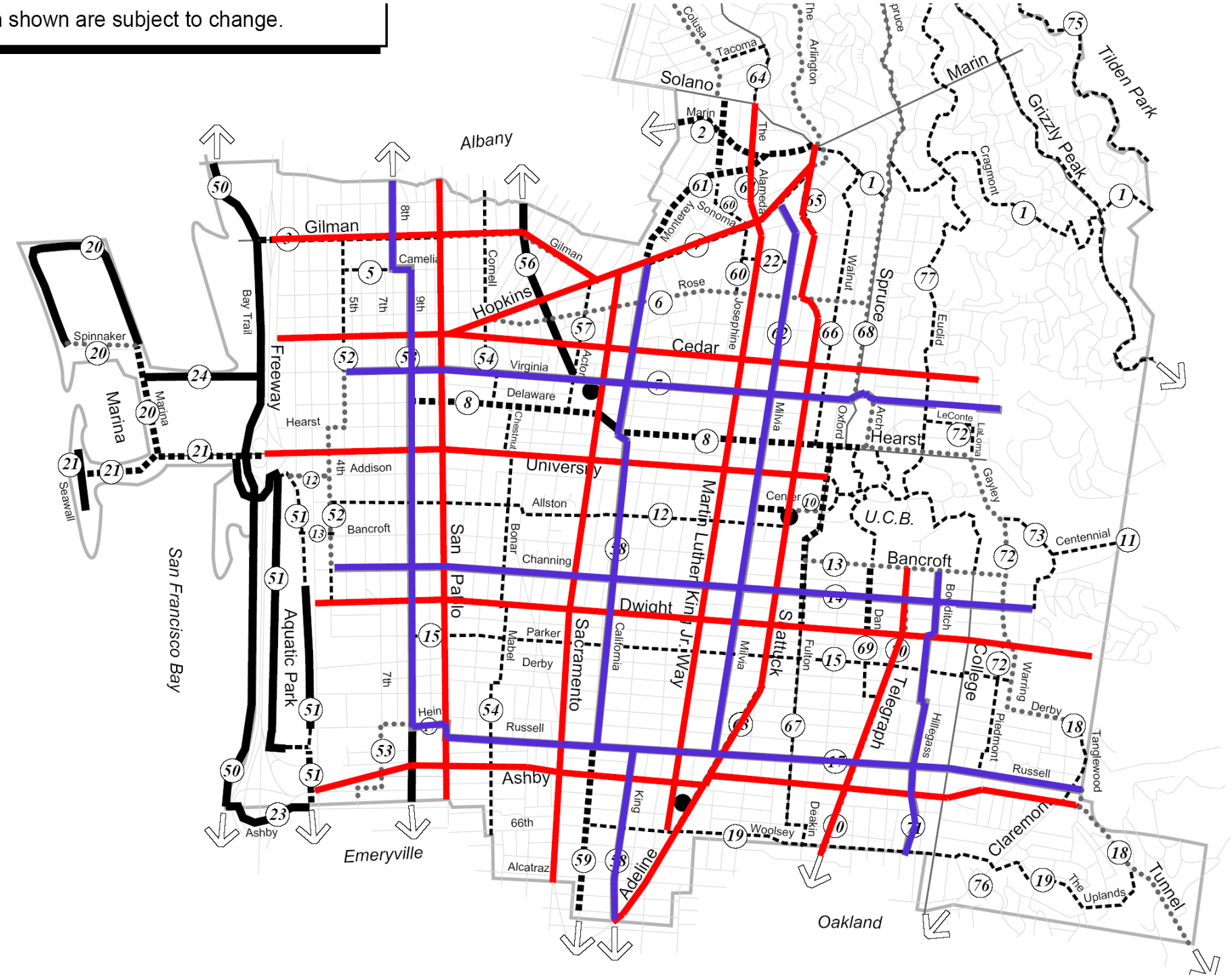
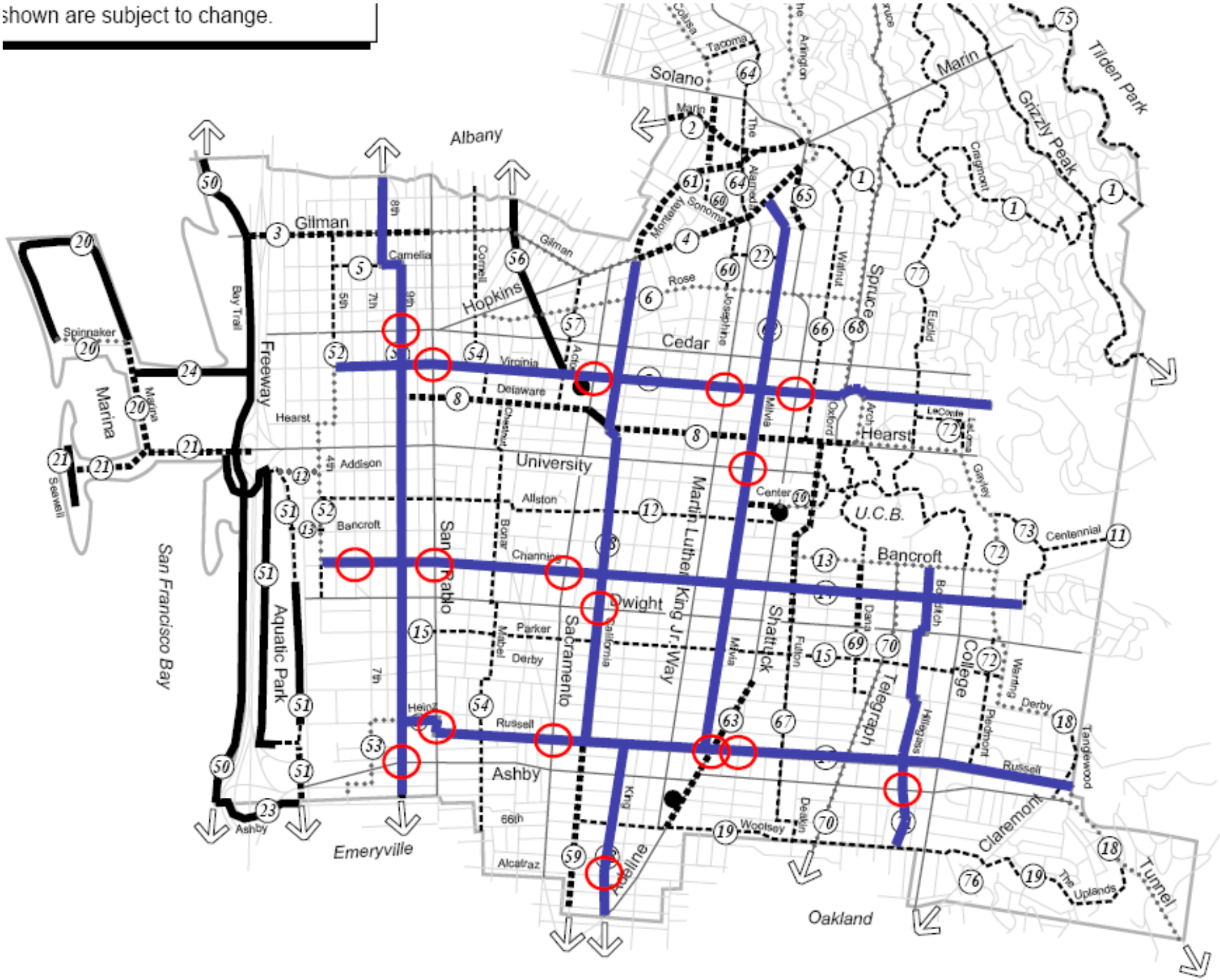


DO NOT
ENTER
EMERGENCY VEHICLES
AND BICYCLES EXCEPTED
$ 75 FINE

BLVD

shown are subject to change.



RIGHT
TURN
ONLY
EXCEPT BICYCLES
Channing Way
LANE

STOP
STOP

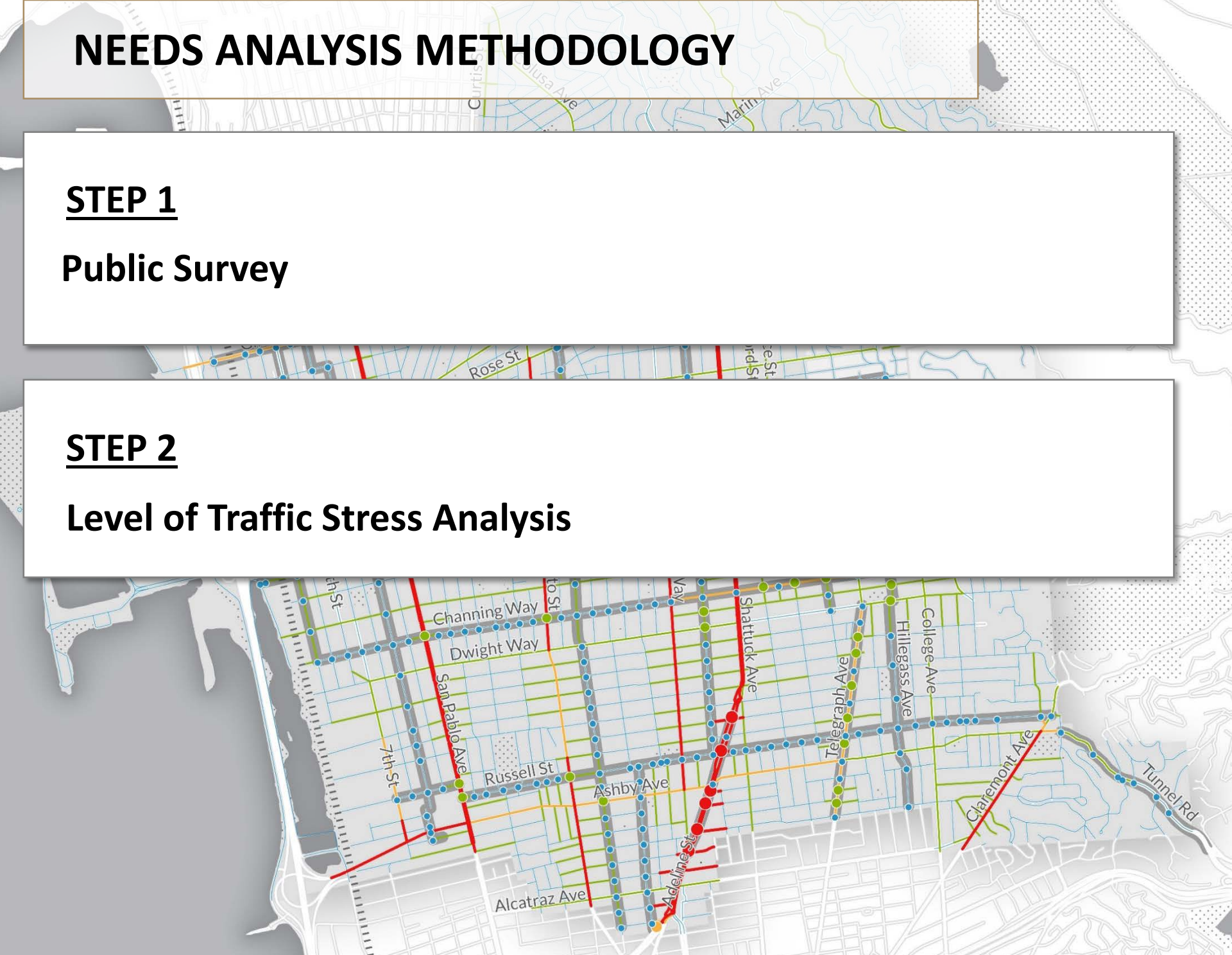
NEEDS ANALYSIS METHODOLOGY

STEP 1

Public Survey

STEP 2

Level of Traffic Stress Analysis



PUBLIC SURVEY

What types of facilities will encourage more residents to bicycle in Berkeley?

FOUR TYPES OF BICYCLISTS

Strong and Fearless	**Enthusiastic and Confident**
Interested but Concerned	**No Way No How**

Tablet-based survey administered by survey firm Civinomics

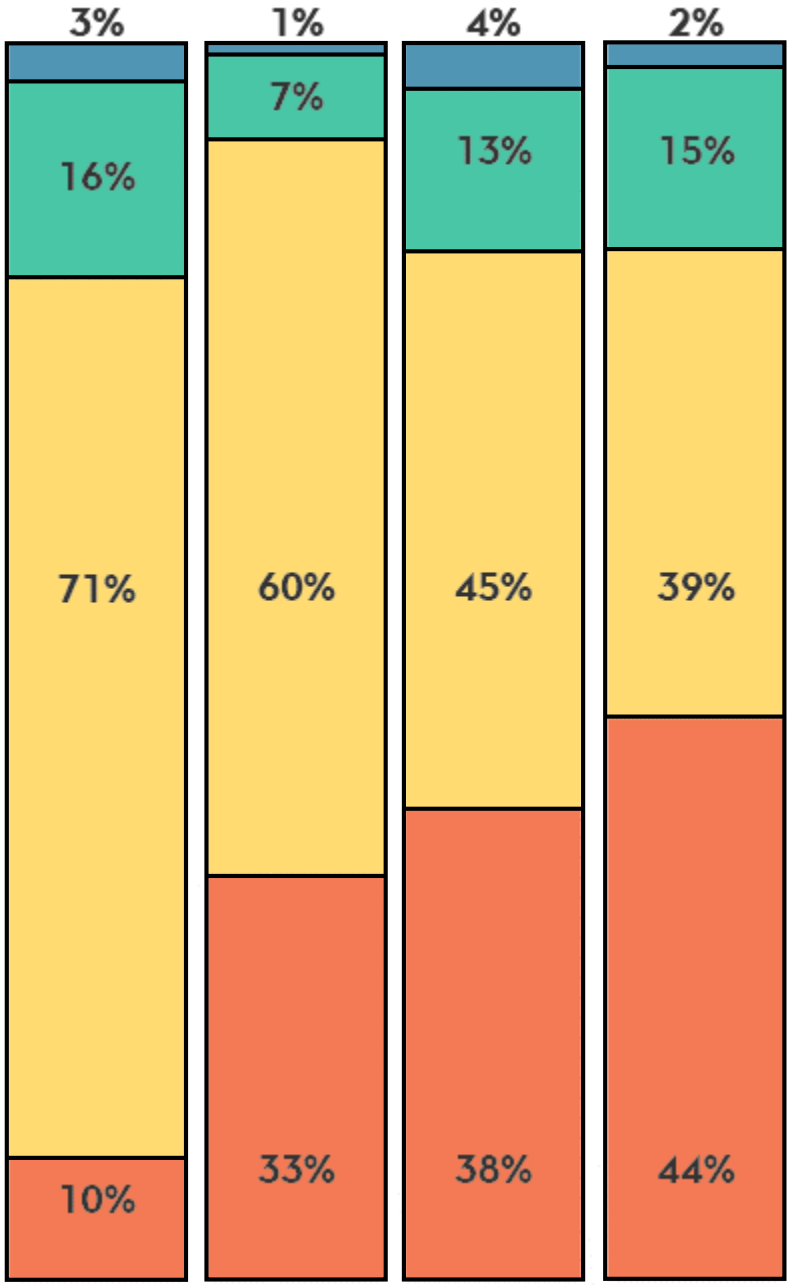
PUBLIC SURVEY: FOUR TYPES OF BICYCLISTS

Strong and Fearless – 3%

Enthusiastic and Confident – 16%

Interested but Concerned – 71%

No Way No How – 10%



PUBLIC SURVEY

A two-lane neighborhood commercial shopping street with faster, busier traffic , on- street car parking, and no bike lane. *

- Very comfortable
- Somewhat comfortable
- Somewhat uncomfortable
- Very uncomfortable

PUBLIC SURVEY

What if bike markings ("Sharrows") were added? *

- 1 - Very uncomfortable
- 2 - Somewhat uncomfortable
- 3 - Somewhat comfortable
- 4 - Very comfortable

PUBLIC SURVEY

What if a bike lane was added? *

- 1 - Very uncomfortable
- 2 - Somewhat uncomfortable
- 3 - Somewhat comfortable
- 4 - Very comfortable

Level of Comfort

Residents feel the most comfortable biking on this facility

A two-lane commercial street with a separated bike lane

1 VERY COMFORTABLE

1.1

1.2

1.3

1.4

1.5

A four-lane street with a separated bike lane

A paved path separate from the street

A street with two lanes in each direction and a center divider with a separated bike lane

A two-lane commercial street with a buffered bike lane

A residential street with Bicycle Boulevard markings

A quiet, residential street with light traffic

1.8

1.9

A four-lane street with a buffered bike lane

2 SOMEWHAT COMFORTABLE

A two-lane commercial street with a bike lane

A street with two lanes in each direction and a center divider with a buffered bike lane

A two-lane commercial street with "sharrows"

A four-lane street with a bike lane

2.7

2.8

A street with two lanes in each direction and a center divider with a striped bike lane

3 SOMEWHAT UNCOMFORTABLE

A two-lane commercial shopping street

A street with two lanes in each direction and a center divider

3.3

Residents feel the least comfortable biking in this environment

3.6

A four-lane street with faster, heavier traffic

4 VERY UNCOMFORTABLE

*Level of comfort on bicycle facilities as reported by survey respondents who were identified as Interested but Concerned

'2013_Cycling_DesignPersonBicycleFacilities.pdf

PUBLIC SURVEY

Level of Comfort: How comfortable do you feel riding in different environments, from a 1 (very comfortable) to a 4 (very uncomfortable)?

1.1 **Most Comfortable**

Class IVA A two-lane commercial street with a separated bike lane

3.6 **Least Comfortable**

No Facility A four-lane street with faster, heavier traffic

LEVEL OF TRAFFIC STRESS INPUTS

Mineta Transportation Institute *Report II-19: Low-Stress Bicycling and Network Connectivity* (2012).

STEP 1

SEGMENT INPUTS

- **Posted speed limit**
- **Bike lane presence/width**
- **Number of travel lanes**
- **Parking aisle presence/width**

INTERSECTION INPUTS

- **Posted speed limit**
- **Presence of median**
- **Number of travel lanes to cross**
- **Presence of signal**

STEP 2

CALIBRATION

LEVEL OF TRAFFIC STRESS ANALYSIS

Traffic stress is the perceived sense of danger associated with riding in or adjacent to vehicle traffic.

LTS 1
- Low Stress
- Suitable for all ages and abilities

Interested but Concerned

LTS 2
- Low Stress, with attention required
- Suitable for most adults and some children

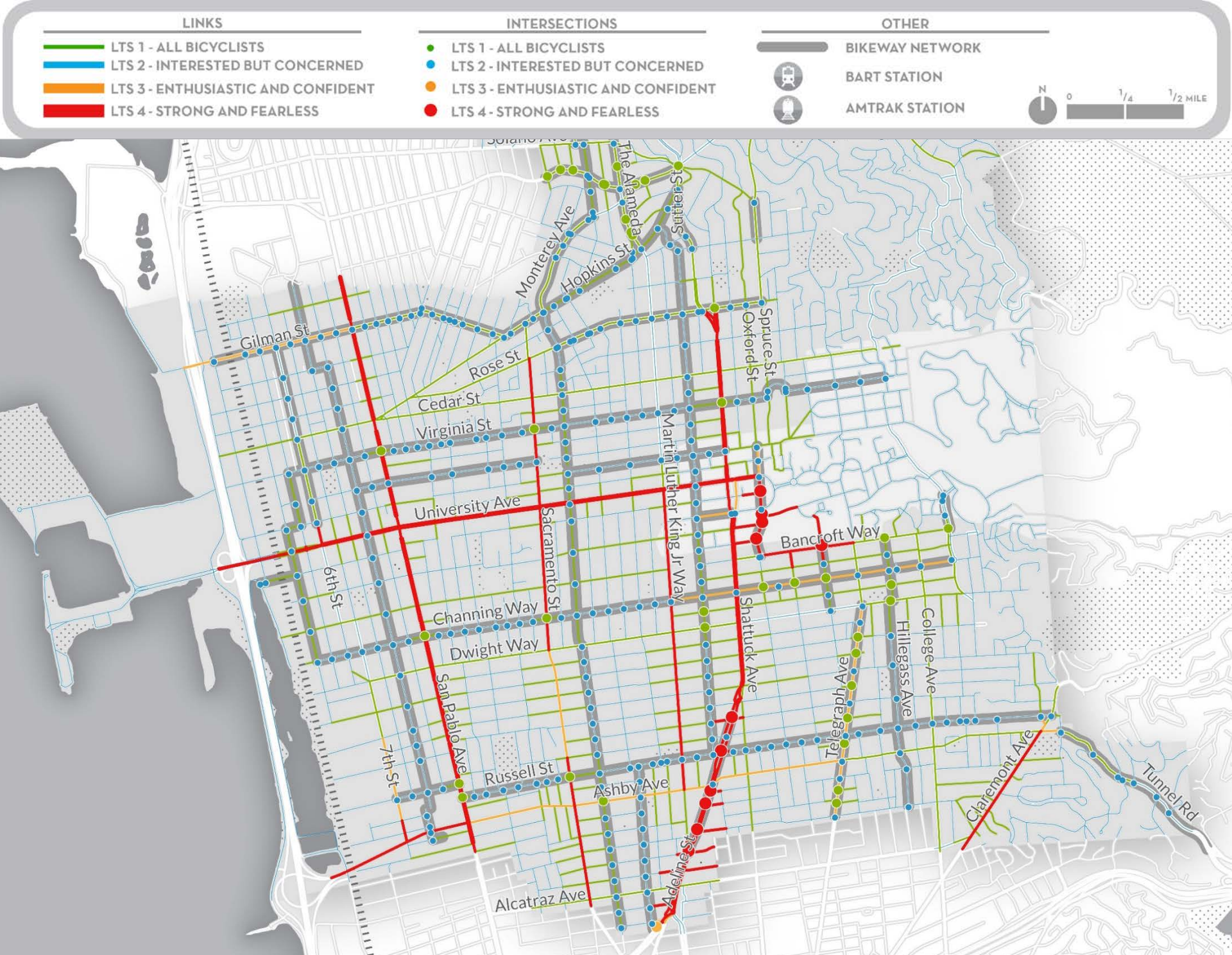
Enthusiastic and Confident

LTS 3
- More stressful than LTS 2
- Requires attention and suitable for adults with confidence to bicycle

Strong and fearless

LTS 4
- Most stressful
- Suitable only for most experienced

No Way, No How


LINKS
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LTS 2 - INTERESTED BUT CONCERNED
LTS 3 - ENTHUSIASTIC AND CONFIDENT
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OTHER
BIKEWAY NETWORK
BART STATION
AMTRAK STATION
N
0
1/4
1/2 MILE
The Alameda
Solano Ave
Monterey Ave
Hopkins St
Sutter St
Gilman St
Rose St
Cedar St
Virginia St
Spruce St
Oxford St
Martin Luther King Jr Way
University Ave
Sacramento St
Bancroft Way
6th St
Channing Way
Dwight Way
Shattuck Ave
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OTHER
- BIKEWAY NETWORK
- BART STATION
- AMTRAK STATION

N 0 1/4 1/2 MILE

LTS 1

- Low Stress
- Suitable for all ages and abilities

Interested but Concerned

Enthusiastic and Confident

Channing Way & San Pablo Ave

LESSONS LEARNED

1. LTS inputs do not necessarily capture the full range of cyclist experience
2. Additional data and calibration may be required; i.e. traffic volumes, etc.
3. Utilize survey results

STEP 2 - LTS CALIBRATION

STREET CLASSIFICATION[1]	TYPICAL POSTED MPH	BERKELEY POSTED MPH	AVERAGE DAILY TRAFFIC (ADT) RANGE[2]	LOCAL EXAMPLE
Local	25	25	0-1,500	Channing Way
Collector	30	25	1,501-5,000	Euclid Avenue
Minor Arterial	35	25	5,001 – 12,500	Cedar Street
Major Arterial	>40	25	>12,500	Sacramento Street

1. Street classifications are based on current Berkeley GIS data typology (local, connector, minor and major) and may differ from classifications in the Berkeley General Plan.
2. Traffic volume range is based on average daily traffic data for Berkeley. The street class and the traffic volume range are generally consistent, but there may be exceptions in each category.

STEP 2 - LTS CALIBRATION

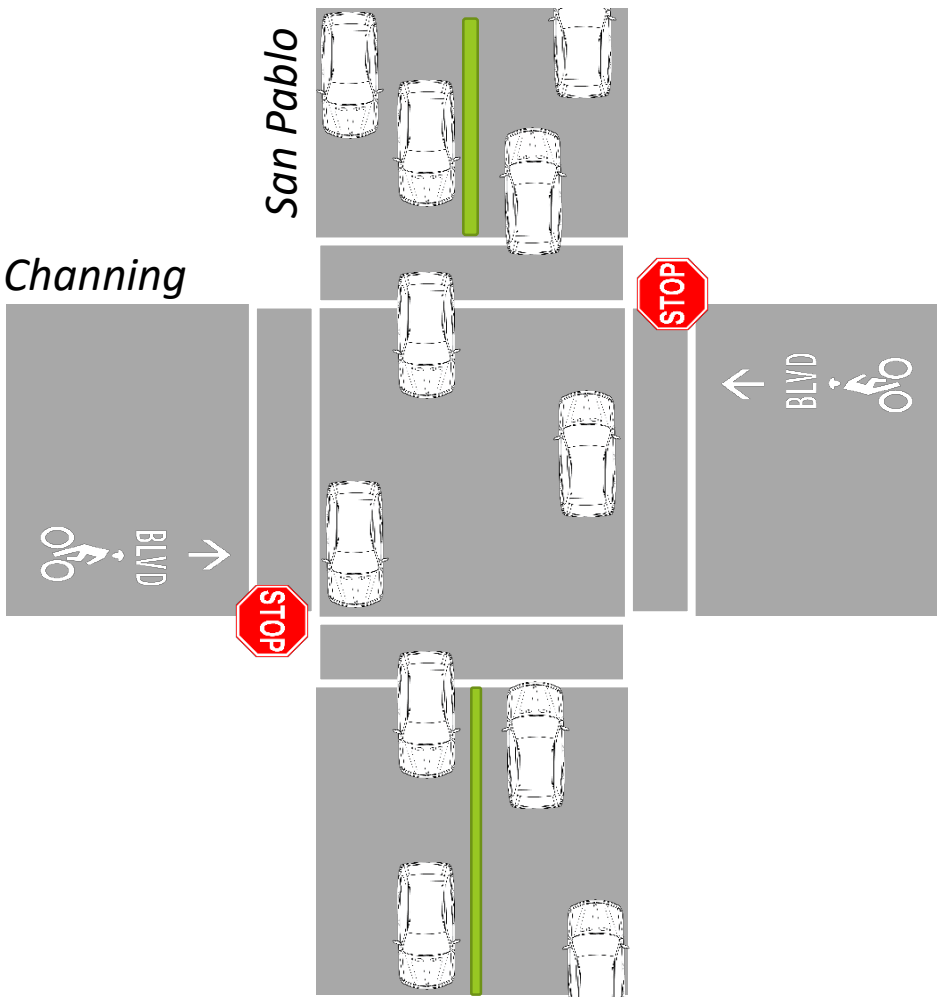
LTS (MTI)	LTS (Berkeley)
SEGMENTS	
• **Posted speed limit**	• **Average daily traffic (ADT)**
• Number of travel lanes	• Number of travel lanes
• Presence and character of bicycle lanes	• Presence and character of bicycle lanes
INTERSECTIONS	
Unsignalized	
• **Posted speed limit**	• **Average daily traffic (ADT) of cross-traffic**
• Number of travel lanes	• Number of travel lanes
• Bicycle/pedestrian refuge islands	• Bicycle/pedestrian refuge islands
• Presence of a traffic signal	• Presence of a traffic signal
• Right turn lanes	• Right turn lanes
Signalized	

• **Pocket bike lane**	• **Segment LTS criteria for bikeway approach**
	  • **ADT**
	  • **Number of travel lanes**
	  • **Presence and character of bicycle lanes**

• **Right turn lane**	**-**

STEP 2 – CALIBRATION - INTERSECTIONS

1. Unsignalized Intersections:
Average Daily Traffic volumes
of major street being crossing



2. Signalized *intersections:*
Link LTS score of bikeway approach to signal.

Level of Comfort

Residents feel the most comfortable biking on this facility

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1.1

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A four-lane street with faster, heavier traffic

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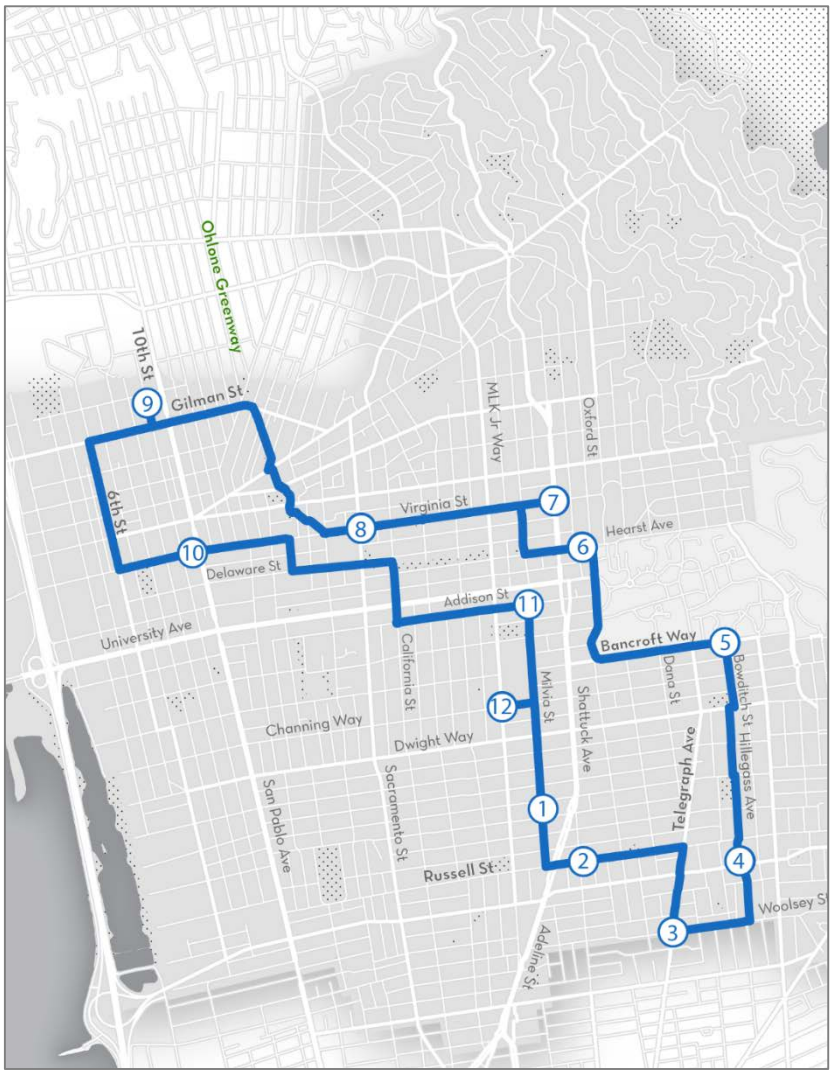
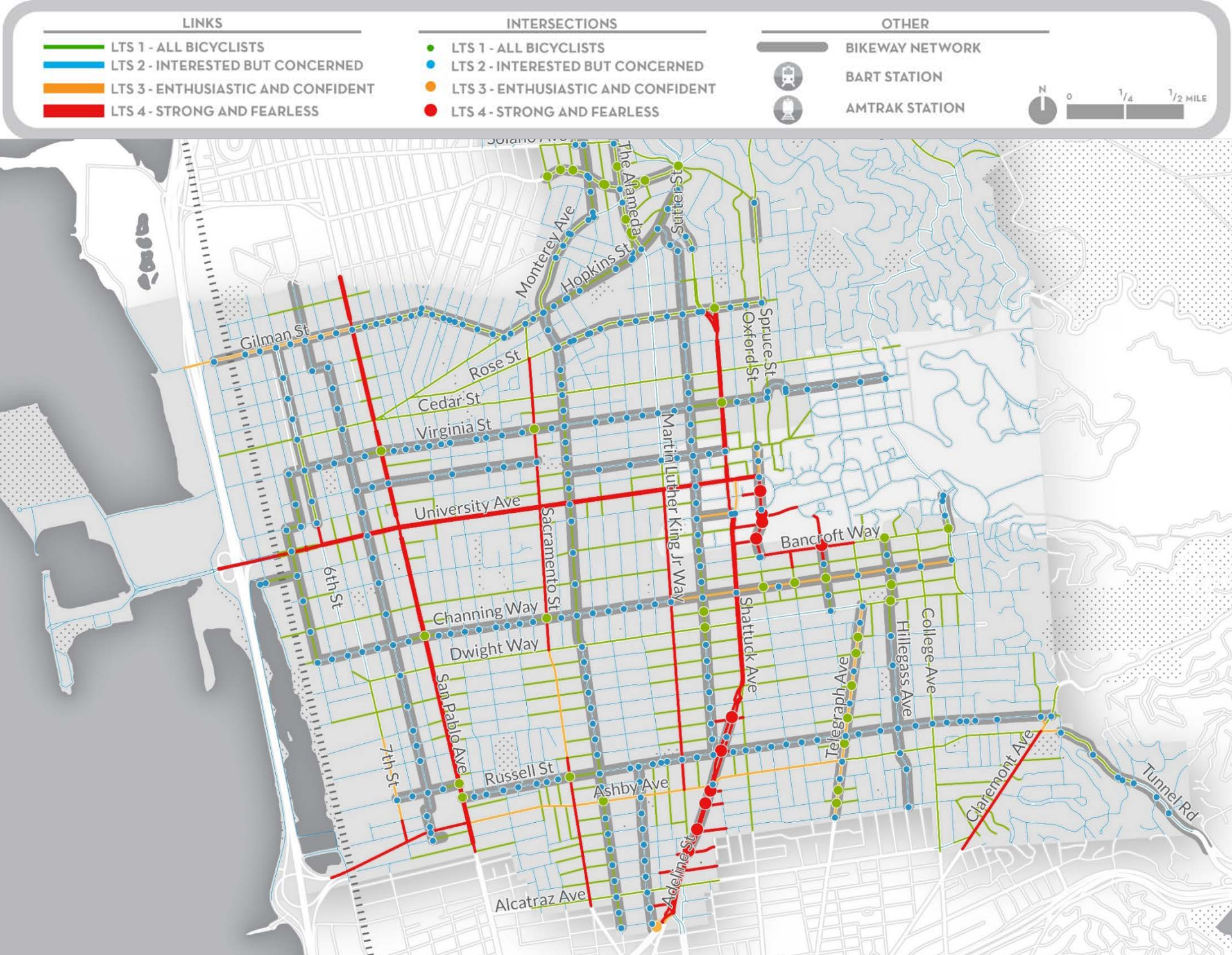
'2013_Cycling_DesignPersonBicycleFacilities.pdf

STEP 2 – CALIBRATION - BIKE TOUR

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Cedar St
Virginia St
Delaware St
University Ave
Bancroft Way
Channing Way
Dwight Way
Russell St
Ashby Ave
Woolsey St
Alcatraz Ave
Claremont Ave
Piedmont Ave
College Ave
Telegraph Ave
Shattuck Ave
Milvia Ave
Sacramento St
California St
Martin Luther King Jr Way
Oxford St
Spruce St
Hillegass Ave
Dana St
Bowditch St
Center St
Hearst St
5th St
4th St
6th St
7th St
9th St
San Pablo Ave
Adeline St

ALL AGES AND ABILITIES

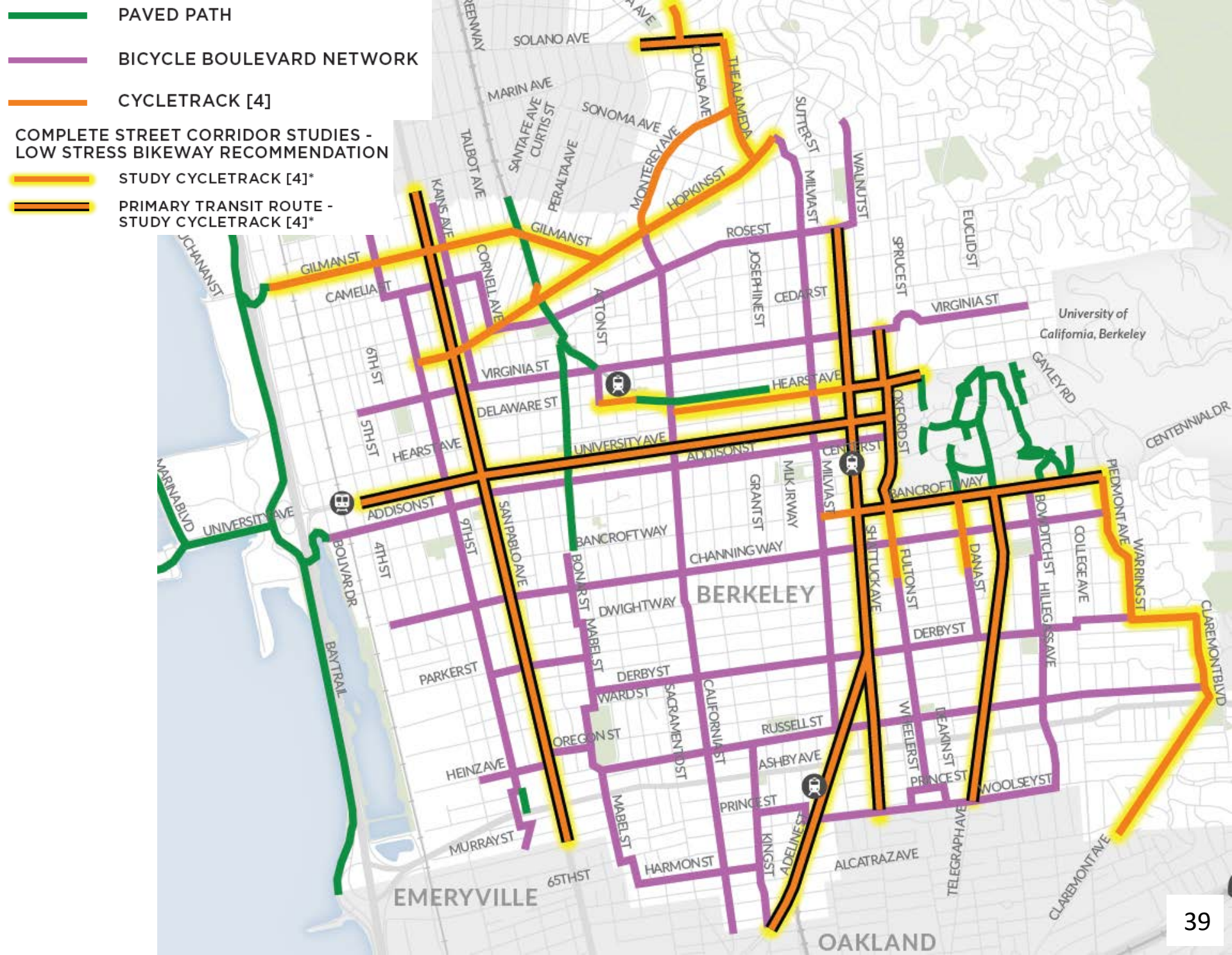
Level of Traffic Stress	Comfortable up to % of Berkeley Residents*	Types of Cyclists
LTS 1 • LOW STRESS • SUITABLE FOR ALL AGES & ABILITIES, INCLUDING CHILDREN	90%	Interested, But Concerned
LTS 2 • LOW STRESS, WITH ATTENTION REQUIRED • INDICATES TRAFFIC STRESS THAT MOST ADULTS WILL TOLERATE	79%	Enthusiastic & Confident
LTS 3 • MORE STRESSFUL THAN LEVEL 2 • REQUIRES ATTENTION, SUITABLE FOR ADULTS WITH CONFIDENCE TO BICYCLE	16%	Strong & Fearless
LTS 4 • MOST STRESSFUL • SUITABLE ONLY FOR MOST TRAFFIC-TOLERANT	3%	

*According to the Berkeley Bicycle Plan Public Survey

FOCUS ON LOW STRESS FACILITIES

VISION STATEMENT:

"Berkeley will be a model bicycle-friendly city where bicycling is a safe, comfortable, and convenient form of transportation and recreation for people of all ages and abilities."


PAVED PATH
BICYCLE BOULEVARD NETWORK
CYCLETRACK [4]
COMPLETE STREET CORRIDOR STUDIES - LOW STRESS BIKEWAY RECOMMENDATION
STUDY CYCLETRACK [4]*
PRIMARY TRANSIT ROUTE - STUDY CYCLETRACK [4]*
SOLANO AVE
MARIN AVE
SONOMA AVE
COLUSA AVE
THE ALAMEDA
SUTTER ST
MILVIA ST
WALNUT ST
EUCLID ST
SPRUCE ST
ROSE ST
JOSEPHINE ST
CEDAR ST
VIRGINIA ST
University of California, Berkeley
GAYLEY RD
CENTENNIAL DR
HEARST AVE
OXFORD ST
CENTER ST
UNIVERSITY AVE
ADDISON ST
BANCROFT WAY
PIEDMONT AVE
WARRING ST
CLAREMONT BLVD
CHANNING WAY
DWIGHT WAY
BERKELEY
DERBY ST
RUSSELL ST
ASHBY AVE
PRINCE ST
WOOLSEY ST
ALCATRAZ AVE
CLAREMONT AVE
TELEGRAPH AVE
COLLEGE AVE
DANA ST
FULTON ST
SHATTUCK AVE
BOWDITCH ST
HILLEGASS AVE
MLK JR WAY
GRANT ST
SAN PABLO AVE
BONAR ST
MABEL ST
CALIFORNIA ST
SACRAMENTO ST
WARD ST
OREGON ST
PARKER ST
HEINZ AVE
MURRAY ST
65TH ST
HARMON ST
EMERYVILLE
OAKLAND
BAY TRAIL
BOLIVAR DR
MARINA BLVD
UNIVERSITY AVE
GILMAN ST
CAMELIA ST
CORNELL AVE
ACTON ST
6TH ST
5TH ST
4TH ST
9TH ST
KAINS AVE
TALBOT AVE
SANTA FE AVE
CURTIS ST
PERALTA AVE
MONTEREY AVE
HOPKINS ST
DELAWARE ST
JCHANAN ST
GREENWAY

BIKE BOULEVARD CROSSINGS MATRIX

	Crossing local streets	Crossing Collector streets		Crossing Minor Arterial streets		Crossing Major Arterial streets	
UNSIGNALIZED	0-1,500 ADT	1,501-5,000 ADT		5,001-12,500 ADT		12,500+ ADT	
Crossing Treatment	1-3 lanes	1-3 lanes	4 lanes	1-3 lanes	4-5 lanes	1-3 lanes	4-5 lanes
1 Marked Crossing	LTS 1	LTS 1 or 2	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4
2 Median Refuge Island	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4
3 RRFB	X	LTS 1	LTS 1	LTS 2	LTS 3	LTS 3	LTS 3
4 RRFB with median	X	LTS 1	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3
5 Ped. Hybrid Beacon	X	X	LTS 1	LTS 1	LTS 1	LTS 1	LTS 1
6 Traffic Signal	X	X	X	LTS 1	LTS 1	LTS 1	LTS 1

INTERSECTION CROSSING IMPROVEMENTS
P
PROTECTED INTERSECTION
2w
2-WAY CYCLETRACK CONNECTOR
R
RRFB
RM
RRFB + MEDIAN
H
PEDESTRIAN HYBRID BEACON
S
TRAFFIC SIGNAL
SEE FIGURE 5-14 DOWNTOWN INSET
University of California, Berkeley
BERKELEY
EMERYVILLE
OAKLAND
VIRGINIA ST
HEARST AVE
DELAWARE ST
UNIVERSITY AVE
BANCROFT WAY
CHANNING WAY
DWIGHT WAY
DERBY ST
RUSSELL ST
ASHBY AVE
PRINCE ST
WOOLSEY ST
ALCATRAZ AVE
CEDAR ST
ROSE ST
PARKER ST
HEINZ AVE
MURRAY ST
65TH ST
SAN PABLO AVE
SHATTUCK AVE
TELEGRAPH AVE
COLLEGE AVE
PIEDMONT AVE
CLAREMONT BLVD
GAYLEY RD
CENTENNIAL DR
See tables (E- 8, E-9, E-10) in Appendix E for more information on recommended improvements.
N
0

PROJECT PRIORITIZATION CRITERIA

1. Safety

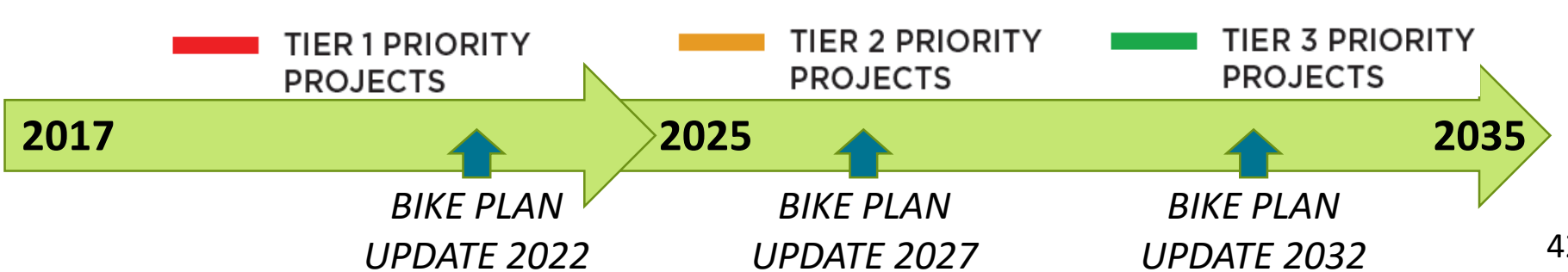
2. Community Support

3. Equity

PROPOSED TIMELINE:

Complete Tier 1: 2025

Complete Tier 2: 2035



THANK YOU!

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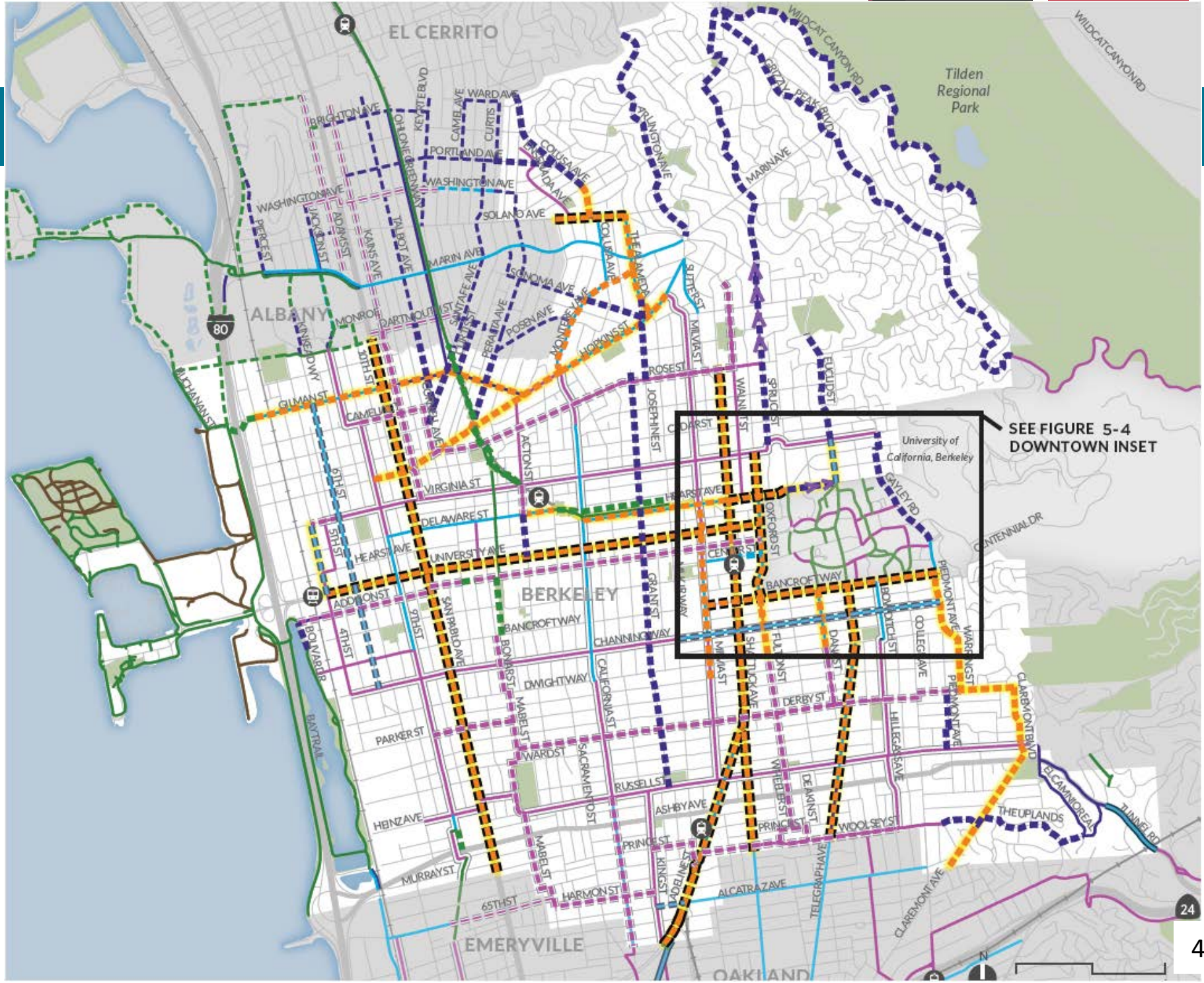
City of Berkeley Department of Public Works
eanderson@cityofberkeley.info


EL CERRITO
ALBANY
BERKELEY
EMERYVILLE
OAKLAND
Tilden Regional Park
University of California, Berkeley
SEE FIGURE 5-4 DOWNTOWN INSET
WILDCAT CANYON RD
GRIZZLY PEAK BLVD
MARIN AVE
SOLANO AVE
CUSHING PKWY
GILMAN ST
DELAWARE ST
VIRGINIA ST
HEARST AVE
UNIVERSITY AVE
ADDISON ST
BANCROFT WAY
DWIGHT WAY
CHANNING WAY
PARKER ST
ASHBY AVE
ALCATRAZ AVE
TELEGRAPH AVE
COLLEGE AVE
PIEDMONT AVE
CLAREMONT BLVD
THE UPLANDS
EL CAMINO REAL
TUNNEL RD
GAYLEY RD
CENTENNIAL DR
BAY TRAIL
80
24

Level of Traffic Stress

TRAFFIC VOLUME	WIDTH*	MTI SCORE	LTS+ SCORE	BIKE TOUR INTERSECTION AND BIKE TOUR SURVEYED SCORE
Without a Crossing Island				
5,001 – 12,500	Up to 3 lanes	2	3	Bowditch Street and Bancroft Way (4) Average LTS = 3.275
>12,500	Up to 3 lanes	3	4	Ashby Avenue and Hillegass Avenue (3.8) Virginia Street and MLK Jr. Way (3.2) Hillegass Avenue and Dwight Way (2.8) Shattuck Avenue and Russell Street (3.1)
5,001 – 12,500	4-5 lanes	3	N/A	(No calibration data from Bike Tour)
>12,500	4-5 lanes	4	4	Telegraph and Woolsey (X.X) MLK and Channing (X.X)
With a Crossing Island				
5,001 – 12,500	Up to 3 lanes		N/A	(No calibration data from Bike Tour)
>12,500	Up to 3 lanes		N/A	(No calibration data from Bike Tour)
5,001 – 12,500	4-5 lanes			Oxford and Hearst (X.X)**
>12,500	4-5 lanes			Sacramento and Virginia (X.X) Shattuck and Virginia (X.X)***

* Streets below 5,000 ADT were not considered as part of this Collector/Arterial street crossing analysis.
** Crossing island and four lanes on south leg of intersection only.
*** Influence of RRFB at this location is not yet fully understood; more study is required. This analysis assumes that because of the increased gaps in traffic it provides, it is equivalent to a crossing island.

Level of Traffic Stress

Table C-4: *Level of Traffic Stress Criteria for Unsignalized Crossings without a Crossing Island*

WIDTH OF STREET BEING CROSSED			
Traffic Volume (ADT)	**Up to 3 lanes**	**4-5 lanes**	**6+ lanes[1]**
<1,500[2]	LTS 1	LTS 2	LTS 4
1,501-5,000[2]	LTS 1 or 2[3]	LTS 2	LTS 4
5,001 – 12,500	LTS 3	LTS 3	LTS 4
>12,500	LTS 4[3]	LTS 4	LTS 4

1 This table is based on Table 7 in the MTI report, and some of these street configurations (i.e. 6 lane streets with less than 1,500 ADT) do not exist in Berkeley.

2 The Bike Tour did not survey LTS scores for intersections with less than 5,000 ADT. As such there is no data to calibrate these <5,000 ADT intersections. However, calibration increased the scores for those streets with up to three lanes and ADT higher than 5,000. As such, calibration is assumed to be needed for similar streets below 5,000 ADT.

3 LTS score is context sensitive. In these cases LTS 1 or LTS 2 should be determined on a case-by-case basis based on the specific traffic volume of the street being crossed, including if there are breaks in the flow of traffic. A suggested break-point between LTS 1 and LTS 2 is 3,250 vehicles, median of 1the 1,501-5,000 range.

Level of Traffic Stress

Table C-5: *Level of Traffic Stress Criteria for Unsignalized Crossings with a Crossing Island at Least Six Feet Wide*

WIDTH OF STREET BEING CROSSED			
Traffic Volume (ADT)	**Up to 3 lanes**	**4-5 lanes**	**6+ lanes***
<1,500	LTS 1	LTS 1	LTS 2
1,501-5,000	LTS 1	LTS 2	LTS 3
5,001 – 12,500	LTS 2	LTS 3	LTS 4
>12,500	LTS 3	LTS 4	LTS 4

* This table is based on Table 8 in the MTI report, and some of these street configurations (i.e. 6 lane streets with less than 1,500 ADT) do not exist in Berkeley.

Level of Traffic Stress

Table C-6: *Sample Scoring of Unsignalized Intersection Bikeway (Channing Way) and Other Street (San Pablo Avenue)*

CHANNING WAY AND SAN PABLO STREET	LTS (MTI)		CALIBRATED LTS	
	VARIABLE	SCORE	VARIABLE	SCORE
Cross-street posted speed limit / ADT	25 MPH	2	26,500 ADT	4
Number of travel lanes	4	2	4	4
Bicycle/pedestrian refuge islands	No	n/a	No	n/a
Presence of a traffic signal	n/a	n/a	n/a	n/a
Right turn lane	None	n/a	None	n/a
Intersection Score		LTS 2		LTS 4

Level of Traffic Stress

Table C-7: *Criteria for Class II Bikeways alongside a Parking Lane*

	LTS > 1	LTS > 2	LTS > 3	LTS > 4
Street width (through lanes per direction)	1	(no effect)	2 or more	(no effect)
Sum of bike lane parking lane width (includes marked buffer and paved gutter)	15 ft. or more	14 or 14.5 ft.	13.5 ft. or less	(no effect)
Average daily traffic (ADT) volume*	<1,500 ADT	1,501-5,000 ADT	5,001-12,500 ADT	>12,500 ADT
Bike lane blockage (typically applies in commercial areas)	rare	(no effect)	frequent	(no effect)

(no effect) = factor does not trigger an increase to this level of traffic stress.
* ADT replaces speed limit or prevailing speed from the MTI Report.

Level of Traffic Stress

Table C-8: *Criteria for Class II Bikeways Not Alongside a Parking Lane*

	LTS > 1	LTS > 2	LTS > 3	LTS > 4
Street width (through lanes per direction)	1	2, if directions are separated by a raised median	More than 2, or 2 without a separating median	(no effect)
Bike lane width (includes marked buffer and paved gutter)	6 ft. or more	5.5 ft. or less	(no effect)	(no effect)
Average daily traffic (ADT) volume*	1,501-5,000 ADT or less	(no effect)	5,001-12,500 ADT	>12,500 ADT
Bike lane blockage (typically applies in commercial areas)	rare	(no effect)	frequent	(no effect)

(no effect) = factor does not trigger an increase to this level of traffic stress.
*ADT replaces speed limit or prevailing speed from the MTI Report.

Table C-9: *Criteria for Class III Bikeways*

TRAFFIC VOLUME (ADT)	2-3 LANES		4-5 LANES	6+ LANES
<1,500	1 or*	2	3	4
1,501-5,000	2 or*	3	4	4
5,001 – 12,500	4		4	4
>12,500	4		4	4

*Use lower value for streets without marked centerlines or classified as residential and with fewer than 3 lanes; use higher value otherwise.