Appendix 2.3.1
Needs Assessment Memo

FEHR PEERS

MEMORANDUM

Date: February 22, 2016

To: Saravana Suthanthira, Alameda CTC

From: Francisco Martin and Matthew Ridgway, Fehr & Peers

Subject: Alameda Countywide Multimodal Arterial Plan – Final Needs Assessment

OK14-0023

1. INTRODUCTION

The purpose of this memo is to present the existing and future (Year 2040) transportation conditions of the Countywide Study Network, in addition to identifying Study Network segments with a need for multimodal improvements. The memo describes the existing and planned future transportation infrastructure, including the arterial system, intelligent transportation systems (ITS) equipment, and bicycle, pedestrian, transit and goods movement facilities. The performance measure methods and evaluation of Study Network conditions to determine multimodal improvement needs are also described. The results contained in this memo serve as the basis for identifying proposed improvements, which are summarized in a separate memo.

2. NEEDS ASSESSMENT FRAMEWORK AND APPROACH

2.1 BACKGROUND

The Needs Assessment Evaluation builds on two preceding tasks that were submitted to all jurisdictions within Alameda County for review and comment during November 2015:

- Existing Conditions memo[1] – summarizes existing conditions performance measure evaluations along Study Network segments.
- Arterial Network memo[2] – presents the Arterial Network, which is a subset of the broad Study Network for focused identification and prioritization of improvements.

More information regarding tasks listed above is provided in the respective memos developed for each task.

2.2 APPROACH

The purpose of the Needs Assessment evaluation is to identify Study Network segments with a need for multimodal improvements. The Needs Assessment evaluation was conducted using the following process (outlined in **Exhibit 1**).

Step 1 – Existing Conditions

Existing Conditions data were collected and multimodal performance measures were evaluated along the Arterial Network[3].

Step 2 – Volume and Speed Forecast Development

Future year traffic volume and speed forecasts were developed using the Alameda Countywide Travel Demand Model (Alameda CTC Model) and existing traffic volumes.

Step 3 – Future Year (2020 and 2040) Conditions

Year 2020 and Year 2040 conditions multimodal performance measures were evaluated using data collected for existing conditions, future year traffic volume and forecasts, and assuming planned and funded roadway improvements.

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[1] More information provided in the memo titled *Alameda Countywide Multimodal Arterial Plan – Final Existing Conditions* (Fehr & Peers, December 4, 2015).

[2] More information provided in the memo titled *Alameda Countywide Multimodal Arterial Plan – Final Arterials of Countywide Significance (Arterial Network) Criteria and Map* (Fehr & Peers and CD+A, December 4, 2015).

[3] Readily-available data collected for use on the MAP was gathered from various sources, including data provided by public agency staff, the INRIX database (speed data), the Alameda CTC Travel Demand Model, aerial imagery, and SWITRS database (collision data). The data generally represents 2014 conditions. Detailed information on the data collection process is summarized in the Existing Conditions memo.

Step 4 – Performance Measure Objectives Evaluation

Multimodal performance measure objectives were applied to the existing and future year conditions evaluation to identify Arterial Network segments that do not meet the objectives.

Step 5 – Needs Assessment Evaluation

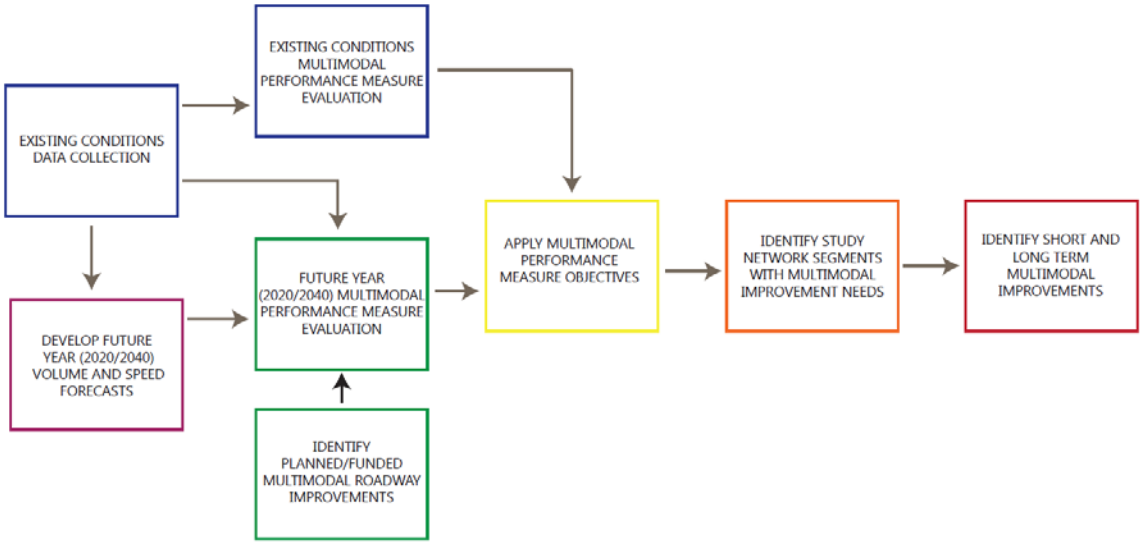
An Arterial Network segment is identified as having a need for improvement if performance of either of the top two modal priorities (developed earlier in the MAP development based on Typology framework) does not meet the performance objective.

Step 6 – Draft Proposed Improvements

Where a need is identified and improvement implementation is feasible, proposed improvements by mode are recommended.

Additional information regarding key components of the Needs Assessment evaluation methodology is provided below.

Exhibit 1 – Needs Assessment Framework



2.2.1 Approved Performance Measure, Objectives and Modal Priority

Approved performance measures and objectives were evaluated along all Study Network segments with available data. A particular objective identified for a performance measure related to a mode is the minimum threshold that needs to be met if that particular mode has a high priority along that Study Network segment. The Needs Assessment evaluation focused on the top two modal priorities along each segment to identify if the performance measure objectives were met[4]. A segment was identified as having a need for improvement if performance objectives were not met for either of the top two modal priorities.

The approved modal priorities inform which performance objectives are utilized to identify if there is a need for improvement along a segment; different modal priorities result in different objectives to determine if an arterial study segment is performing adequately to suit the multimodal needs. For example, the Bicycle Comfort Index identifies four different ratings, ranging from "Low" (Level of Traffic Stress 4) to "Excellent" (Level of Traffic Stress 1). If a Study Network segment was identified as having high bicycle modal priority (or top two in modal priority), the performance measure objective would be to achieve a High or Excellent rating. If the segment is not identified as having high bicycle modal priority, a Bicycle Comfort Index performance objective does not apply and therefore it is assumed that any Bicycle Comfort Index rating is adequate for that segment.

2.2.2 Future Year Volume and Network Assumptions

Year 2020 and 2040 Study Network performance was evaluated using future year traffic volume forecasts developed by Fehr & Peers. Detailed information regarding the forecast development process is summarized in the memo titled *Alameda Countywide Multimodal Arterial Plan Travel Demand Forecasting Results – Draft* (Fehr & Peers, August 21, 2015).

Performance measures were evaluated for future year conditions assuming planned and funded roadway network improvements. The list of funded improvements was primarily obtained from the 2012 *Alameda Countywide Transportation Plan* (Alameda CTC, June 2012).

[4] Although the Needs Assessment is primarily evaluating improvement needs for the top two modal priorities, proposed improvements were also considered for lower priority modes only if there is enough right-of-way remaining to implement improvements. Presentation of information in the Needs Assessment for the highest two modes is intended to make the evaluation more digestible.

2.3 STUDY SCENARIOS

2.3.1 Study and Arterial Network

The MAP evaluates a 1,200 mile Study Network to understand existing and future roadway conditions and the function of the roads in supporting all modes and assess multimodal needs in a broader context. To identify and prioritize improvements, the MAP focuses on a core and subset, of approximately 510 miles, of the Study Network called the Arterial Network. This core network represents arterials of Countywide Significance and serves as the backbone of multimodal mobility throughout the County.

2.3.2 Analysis Scenarios

The MAP evaluates multimodal performance for Existing, Year 2020 and Year 2040 Conditions. The Year 2020 analysis was based on a single set of standard forecasts. The Year 2040 analysis considered three separate analysis scenarios:

- The **Standard Forecasting Scenario**,
- The **Social and Behavioral Trends Scenario**, which represents a supplemental forecasting scenario accounting for lower vehicle miles of travel (VMT) per capita associated with social and behavioral trends, and
- The **Next Generation Vehicle Scenario**, which represents a supplemental analysis scenario that will account for roadway capacity impacts associated with the expected increase of next generation vehicles within the vehicle fleet in Alameda County.

In addition to the standard forecasts analysis, the MAP evaluates two 2040 scenarios that capture travel behavior trends and impact of next generation vehicles that are not yet reflected in travel demand forecasting models, including the Alameda CTC Model. Current planning tools are mostly based on existing or near-term trends that do not fully capture changes in trends beyond the standard forecasting approach. The Social and Behavioral Trends Scenario analysis examines how volume forecasts generated by the Alameda CTC Model could reasonably change given changes in factors that influence travel behavior, and result in lower VMT. These factors include social and behavioral trends such as an increase in urban living, reduced auto ownership, and shifting lifestyle and generational travel preferences. Social and Behavioral Trends Scenario forecasts assumed the following traffic volume reductions by Planning Area compared to the Standard Forecasting Scenario:

- North County – five percent reduction.
- Central County – five percent reduction.
- South County – 10 percent reduction.
- East County – seven percent reduction.

The Next Generation Vehicle Scenario analysis captures the impact of next-generation vehicles (connected or autonomous in nature) to arterial per lane capacity; Next Generation Vehicle Scenario assumes a 20% increase in arterial capacity. It's important to note that these analysis scenarios are intended as a planning exercise – research on these trends is still in its infancy. For future year scenarios, approximate adjustments to the Standard Forecasting Scenario were used as much as possible in order not to give a false sense of precision. The supplemental analysis is intended to inform jurisdictions on the potential effects that either the Social and Behavioral Trends or Next Generation Vehicles Scenarios may have on future year transportation conditions.

For purposes of the MAP development, the two supplemental forecasting analysis scenarios with variants for demographic, economic, and technologic trends focus only on Year 2040 Conditions. Based on available research, Year 2020 Conditions will likely not have large changes due to these trends as it's too soon for these trends to result in significant changes. Furthermore, this Needs Assessment memo summarizes evaluation results for Existing and Year 2040 Conditions only. Year 2020 results will be used to prioritize short and long-term improvements.

2.3.3 Methodology Limitations

As with any planning-level analysis, assumptions are made to effectively evaluate a roadway network at this scale. The following presents a list of potential methodology limitations to be considered when reviewing Needs Assessment results:

- Cross-sectional measurements were made by utilizing readily-available online aerial imagery.
- Study segment lengths are an average of about 2,200 lineal feet and the representative sample segment (the segment for which analysis is conducted) is generally the most constrained portion of the study segment.
- Automobile and Transit Travel Speed forecasts were estimated by applying the Bureau of Public Roads (BPR) equation. The equation, shown below, estimates future year speed as a function of the Existing Conditions speed and future year volume-to-capacity ratio. Although use of traffic operations models are recommended to estimate future year

speed, the MAP's planning level approach to estimate future year speeds is adequate for an analysis of this scale. Generally, accuracy of speed estimates is lower for a planning level approach compared to estimating speeds using a traffic operations modeling approach.

BPR Equation: $$Future\ Year\ Speed = \frac{\text{Existing Speed}}{[1+0.15(\text{Future Year Volume}-\text{to}-\text{Capacity Ratio})^4]}$$

Readily-available online aerial imagery was the primary source for collecting cross-sectional measurements; images generally range between a few months to three years old. The majority of cross-sectional data was collected in February 2015. Therefore, if a jurisdiction implemented substantial roadway improvements within the last three years, it is possible that those improvements are not yet shown on readily-available aerial imagery. During the improvement identification phase, Fehr & Peers determined that several roadways were recently improved and the aerial imagery was updated after Existing Conditions cross-sectional measurements were collected in February 2015. Fehr & Peers updated the Year 2020 and 2040 cross-sectional database to reflect recent improvements; however, those updates were not made to the Existing Conditions database. As a result, the Needs Assessment evaluation between Existing and Future Year Conditions may not be consistent along the various segments that were recently improved. Note that the Year 2040 Needs Assessment results, which assume recently improved facilities, are the basis for identifying proposed improvements.

3. PERFORMANCE EVALUATION AND NEEDS ASSESSMENT

This section provides an overview of the performance measure and objectives evaluation for Existing and Year 2040 Conditions. Performance measures were evaluated along the Study Network with readily-available data; the segments were then assessed on whether the objectives are met for the top two modal priorities. A Study Network segment was identified as having a need for improvement if either of the top two prioritized modes did not meet the performance objective.

This memo summarizes the performance and Needs Assessment evaluation at the facility-specific level. After proposed improvements are finalized, the consultant team and Alameda CTC will package proposed improvements into individual projects along Arterial Network corridors later in the Plan development process.

3.1 EXAMPLE NEEDS ASSESSMENT DETERMINATIONS

Table 1 presents an overview of the Needs Assessment approach from development of Typology through determination of multimodal needs along four Study Network segments. Detailed information regarding the Typology and modal priority methodology was previously presented to all jurisdictions for review and comment; the methodology was approved by Alameda CTC and committees in October 2015. As shown in **Table 1**, the land use and Typology overlays provided the basis for identifying modal priorities. If a jurisdiction did not agree with the modal priority identified by applying the approved methodology, they had the option to override the suggested modal priority. The Needs Assessment evaluation focused on the top two modal priorities along each segment to identify if the performance measure objectives were met. A segment was identified as having a need for improvement if performance objectives were not met for either of the top two modal priorities.

TABLE 1
EXAMPLE NEEDS ASSESSEMNT DETERMINATION

Street Segment	Land Use Context Overlay	Street Type	Transit Overlay	Bicycle Overlay	Pedestrian Overlay	Truck Overlay	Modal Priority	Year 2040 Performance Objective Met for High Priority Modes?	Need for Improvement?
San Pablo Avenue between 20th Street and 27th Street (Oakland)	Downtown Mixed Use	Community Connector	Major Corridor	Class 3	Tier 1	None	1. Transit 2. Pedestrian 3. Bicycle 4. Automobile 5. Goods Movement	Transit: • Speed – Objective Not Met • Reliability – Objective Met • Transit Infrastructure Index – Objective Not Met Pedestrian: • Pedestrian Comfort Index – Objective Met	**Yes** – Transit Mode Improvements Needed
W. Tennyson Road between Tampa Avenue and Leidig Court (Hayward)	Residential and Commercial	County Connector	Local Route	Class 2	Tier 3	Tier 3	1. Pedestrian[1] 2. Bicycle 3. Automobile 4. Transit 5. Goods Movement	Pedestrian: • Pedestrian Comfort Index – Objective Not Met Bicycle: • Bicycle Comfort Index – Objective Not Met	**Yes** – Pedestrian and Bicycle Mode Improvements Needed
Paseo Padre Parkway between Peralta Boulevard and Grimmer Boulevard (Fremont)	Downtown Mixed Use	Community Connector	Local Route	Class 2	Tier 2	None	1. Pedestrian 2. Bicycle 3. Transit 4. Automobile 5. Goods Movement	Pedestrian: • Pedestrian Comfort Index – Objective Not Met Bicycle: • Bicycle Comfort Index – Objective Not Met	**Yes** – Pedestrian and Bicycle Mode Improvements Needed
Tesla Road between S. Livermore Avenue and S. Vasco Road (Alameda County)	Rural/Open Space	Community Connector	None	Class 2	None	Tier 3	1. Automobile[3] 2. Goods Movement 3. Bicycle 4. Pedestrian	Automobile: • Speed – Objective Met • Reliability – Objective Not Met Goods Movement: • Truck Infrastructure Index – Objective Met	**Yes** – Automobile Improvements Needed

Notes:
1. Applying the modal priority methodology along W. Tennyson Road in Hayward results in the following priority: Automobile, Goods Movement, Bicycle, Pedestrian and Transit. However, Hayward staff requested that the modal priority for W. Tennyson Road be changed to that listed in the table above.
2. Applying the modal priority methodology along Tesla Road in Alameda County results in the following priority: Goods Movement, Bicycle, Automobile and Pedestrian. However, Alameda County staff requested that the modal priority for Tesla Road be changed to that listed in the table above.

3.2 OVERVIEW OF FINDINGS

Key Needs Assessment findings by mode are presented below.

Transit Mode

The majority of high priority transit segments operate with PM peak hour transit speeds less than 75 percent of the Automobile Congested Speed under Existing Conditions, which do not meet the performance objective. Similarly, the majority segments do not meet the Transit Infrastructure Index objective, which is a measure of bus stop design and provided amenities.

The Transit Reliability objective, which compares the PM peak hour transit speed to non-peak hour transit speed, was met along all high priority transit segments within the South and East County Planning Areas. In contrast, about 30 percent of high priority transit segments in the North and Central County Planning areas did not meet the objective. Overall, the North and Central County Planning Areas have the greatest need for transit improvements compared to the South and East County Planning Areas.

Pedestrian Mode

The majority of high priority pedestrian segments within Alameda County meet the Pedestrian Comfort Index objective under Existing Conditions; about 25 percent of segments do not meet the objective at a countywide level. The Needs Assessment evaluation indicates that the South and East County Planning Areas have the greatest need for pedestrian improvements.

Bicycle Mode

The majority of high priority bicycle segments within Alameda County do not meet the Bicycle Comfort Index objective under Existing Conditions. Although all Planning Areas have a significant need for bicycle improvements, the Central, South and East County Planning Areas have the greatest need for improvements along high priority bicycle segments.

Automobile Mode

In regards to Automobile Congested Speed, the majority of high priority automobile segments operate with automobile speeds greater than 40 percent of the posted speed limit during the PM peak period (4:00 – 6:00 PM) under Existing Conditions, which meets the performance objective. About a third of high priority automobile segments in Alameda County operate at V/C ratios

greater than 0.8 during the PM peak hour, which do not meet the Automobile Reliability objective. The Needs Assessment evaluation indicates that the Central County Planning Area has the greatest need for automobile improvements compared to the North, South and East County Planning Areas.

Goods Movement Mode

The majority of high priority goods movement segments within Alameda County provide a curb lane width of 12 feet or greater and thus meet the Truck Route Accommodation Index objective under Existing Conditions. The Needs Assessment evaluation indicates that the North County Planning Area has the greatest need for widening the curb lane width along high priority goods movement segments.

3.3 TRANSIT NEEDS ASSESSMENT EVALUATION

The Existing and Year 2040 transit performance evaluation was primarily based on the following performance measures:

- Transit Travel Speed, the performance objective is to achieve a PM peak hour transit speed greater than 75 percent of the automobile congested speed. The transit network for which PM peak hour transit speed data was collected represents 50% of transit network in Alameda County although it is only about 20 percent, or 240 miles, of the Study Network. **Table 2** presents a countywide summary of transit travel speed for each analysis scenario.
- Transit Reliability, which is a measure of the PM peak hour to non-peak hour transit speed ratio; the performance objective is to achieve a ratio greater than 0.7. Transit reliability was evaluated for about 20 percent, or 240 miles, of the Study Network. **Table 3** presents a countywide summary for this measure.
- Transit Infrastructure Index, which is a measure of typical bus stop design and provided amenities along a Study Network segment; the performance objective is to achieve High rating for Study Network segments along major transit corridors or a minimum Medium rating for segments along crosstown routes. Transit infrastructure index was evaluated for about 30 percent, or 360 miles, of the Study Network. **Table 4** presents a countywide summary for this measure.
- Pedestrian Comfort Index Rating, the performance objective is to achieve a Medium, High or Excellent rating along Study Network segments with high priority transit to

ensure adequate pedestrian access to and from bus stops. More information regarding the pedestrian performance evaluation is presented later in this memo.

The transit performance and Needs Assessment evaluation for Existing and Year 2040 Conditions is summarized below.

TABLE 2
ALAMEDA COUNTYWIDE TRANSIT TRAVEL SPEED SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments Operating Between 20 – 30 MPH	13%	9%
% of Segments Operating Between 10 – 20 MPH	54%	44%
% of Segments Operating Between 5 – 10 MPH	32%	44%
% of Segments Operating Less Than 5 MPH	1%	3%

Notes:
1. Countywide data coverage for Transit Travel Speed is 240 miles.

TABLE 3
ALAMEDA COUNTYWIDE TRANSIT RELIABILITY SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments Operating at Ratio Greater Than 0.8	51%	33%
% of Segments Operating at Ratio Between 0.6 – 0.8	47%	52%
% of Segments Operating at Ratio Between 0.4 – 0.6	2%	13%
% of Segments Operating at Ratio Less Than 0.4	0%	2%

Notes:
1. Countywide data coverage for Transit Reliability is 240 miles.

TABLE 4
ALAMEDA COUNTYWIDE TRANSIT INRASTRUCTURE INDEX SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments with High Rating	11%	16%
% of Segments with Medium Rating	35%	33%
% of Segments with Low Rating	54%	51%

Notes:
1. Countywide data coverage for Transit Travel Speed is 180 miles, which only evaluates segments along major transit corridors or crosstown routes.

3.3.1 Existing Conditions

As shown in the tables above, 87 percent of segments operate at average PM peak hour transit speed less than 20 MPH and 49 percent of the segments operate at a PM peak hour speed to non-peak hour speed ratio less than 0.8. Only 11 percent of transit-serving segments provide bus stop design that results in a High Transit Infrastructure Index rating. **Table 5** presents the performance objective summary for high priority transit segments along the Arterial Network, the resulting Existing Conditions map is provided in **Figure 1**.

As shown in **Table 5**, only 12 miles of high priority transit segments along the Arterial Network operate at a PM peak hour transit speed greater than 75 percent of the automobile speed. However, when compared to the non-peak hour transit speed, 83 miles of Arterial Network segments operate at a PM peak hour transit speed above 70% of the non-peak hour speed. This suggests that PM peak hour transit speeds are considerably lower compared to automobile speeds but not that much lower compared to non-peak hour transit speeds.

The Needs Assessment evaluation also suggests the need for bus stop design improvements as only 17 miles of high priority transit segments along the Arterial Network provide a High Transit Infrastructure Index rating. Most segments that serve major corridor and crosstown bus routes provide a Low or Medium Transit Infrastructure Index rating due to bus stops not providing either of the following design elements:

- Far-side stops,
- Bus bulb-outs, or

- Minimum 80 foot red curb and four foot sidewalks.

The majority of high priority transit segments provide adequate pedestrian facilities.

TABLE 5
ALAMEDA COUNTYWIDE TRANSIT PERFORMANCE OBJECTIVE EVALUATION

Performance Measure Objective	Segment Miles That Meet Performance Objectives Along High Priority Transit Arterial Network Segments[1]		
	Existing	Year 2040 – Standard Forecasting Scenario	Net Difference
Transit Congested Speed	12 mi	21 mi	+9 mi
Transit Reliability	83 mi	56 mi	-27 mi
Transit Infrastructure Index	17 mi	27 mi	+10 mi

Notes:
1. Transit is considered high priority mode if they are categorized in the top two prioritized mode along an Arterial Network segment. A total of 150 Arterial Network miles have high transit priority.

3.3.2 Year 2040 Conditions – Standard Forecasting Scenario

As shown in **Table 2** and **Table 3**, Transit Travel Speed and Transit Reliability are expected to decrease substantially under Year 2040 – Standard Forecasting Scenario compared to Existing Conditions. The decrease in Transit Travel Speed is primarily due to the increase in traffic demand along mixed flow travel lanes. The East Bay Bus Rapid Transit (BRT) project is assumed to be constructed by Year 2040, which will improve transit operations along Arterial Network segments that will be modified by the project. Overall, 21 miles of high priority transit segments along the Arterial Network are expected to meet the Transit Travel Speed objective, a nine mile increase compared to Existing Conditions, primarily attributed to the East Bay BRT and Line 51 Improvement projects, in addition to lower Automobile Congested Speeds (Transit Travel Speed objective is based on Automobile Congested Speed). In addition, about 56 miles of segments would not meet the Transit Reliability objective, a 27 mile decrease compared to Existing Conditions.

Transit Infrastructure Index results are expected to improve under Year 2040 Conditions due to planned and funded improvements, such as improvements along AC Transit's Line 51 route and

the East Bay BRT project. Overall, planned improvements would improve bus stop design along 10 Arterial Network miles.

3.4 PEDESTRIAN NEEDS ASSESSMENT EVALUATION

The Existing and Year 2040 pedestrian performance evaluation was based on the Pedestrian Comfort Index rating. The performance objective is to achieve a High or Excellent rating along Study Network segments with high pedestrian priority. The Pedestrian Comfort Index was evaluated for about 52 percent, or 620 miles, of the Study Network based on available cross section data. **Table 6** presents a countywide summary of automobile congested speed for each analysis scenario.

TABLE 6
ALAMEDA COUNTYWIDE PEDESTRIAN COMFORT INDEX SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments with Excellent Rating	6%	5%
% of Segments with High Rating	54%	51%
% of Segments with Medium Rating	39%	42%
% of Segments with Low Rating	1%	2%

Notes:
1. Countywide data coverage for Pedestrian Comfort Index is 620 miles.

3.4.1 Existing Conditions

The majority of high priority pedestrian segments provide a High or Excellent Pedestrian Comfort Index rating. Higher rated pedestrian facilities are generally provided in the urbanized and downtown areas of jurisdictions. As expected, lower rated pedestrian facilities are provided in rural areas of the County due to the lack of sidewalks and high automobile posted speed limits. North and Central County Planning Areas tend to provide higher rated facilities compared to South and East County. South County shows the greatest percentage of lower rated pedestrian facilities, primarily as a result of sidewalk widths less than six feet along six-lane arterials with high traffic volumes and posted speed limits of 40 MPH or greater. **Table 7** presents the performance

objective summary for high priority pedestrian segments, the resulting Existing Conditions Needs Assessment map is provided in **Figure 3**.

As shown in **Table 7**, about 135 miles high priority pedestrian segments along the Arterial Network provide higher rated facilities. In contrast, lower rated facilities can be a result of the following conditions:

- Lack of sidewalks,
- Narrow sidewalk widths,
- High traffic volumes,
- Posted speed limits of 40 MPH or greater,
- Arterials with five or more travel lanes, and/or
- Lack of buffers (landscaped or hardscaped) between sidewalk and adjacent travel lanes.

TABLE 7
ALAMEDA COUNTYWIDE PEDESTRIAN PERFORMANCE OBJECTIVE EVALUATION

Performance Measure Objective	Segment Miles That Meet Performance Objective Along High Priority Pedestrian Arterial Network Segments[1]		
	Existing	Year 2040 – Standard Forecasting Scenario	Net Difference
Pedestrian Comfort Index	135 mi	133 mi	- 2 mi

Notes:
1. Pedestrians are considered high priority mode if they are categorized in the top two prioritized mode along an Arterial Network segment. A total of 207 Arterial Network miles have high pedestrian priority.

3.4.2 Year 2040 – Standard Forecasting Scenario

The majority of segments are expected to continue to provide a High or Excellent Pedestrian Comfort Index rating under Year 2040 Conditions. The primary difference between Existing and Year 2040 Conditions is that traffic volumes are expected to be higher in Year 2040. Higher traffic volumes in Year 2040 can result in a lower Pedestrian Comfort Index rating compared to Existing Conditions. As shown in **Table 7**, 133 miles of high priority pedestrian segments would provide higher rated facilities along the Arterial Network assuming Year 2040 Conditions, a two mile decrease compared to Existing Conditions.

3.5 BICYCLE NEEDS ASSESSMENT EVALUATION

The Existing and Year 2040 bicycle performance evaluation was based on the Bicycle Comfort Index rating. The performance objective is to achieve a High (Level of Traffic Stress 2) or Excellent (Level of Traffic Stress 1) rating along Study Network segments with high bicycle priority. The Bicycle Comfort Index was evaluated for about 56 percent, or 670 miles, of the Study Network based on available cross section data. **Table 8** presents a countywide summary of Bicycle Comfort Index for each analysis scenario.

TABLE 8
ALAMEDA COUNTYWIDE BICYCLE COMFORT INDEX SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments with Excellent Rating	1%	1%
% of Segments with High Rating	14%	14%
% of Segments with Medium Rating	26%	27%
% of Segments with Low Rating With Class 2 Bicycle Lanes Provided	19%	21%
% of Segments with Low Rating Without Class 2 Bicycle Lanes	40%	37%

Notes:
1. Countywide data coverage for Bicycle Comfort Index is 670 miles.

3.5.1 Existing Conditions

The majority of roadway segments in Alameda County provide a Bicycle Comfort Index rating of Medium or Low (LTS 3 or 4), only 15 percent of segments provide a High or Excellent rating (LTS 2 or 1). North and Central County Planning Areas provide higher rated facilities compared to South and East County. A Low or Medium Bicycle Comfort Index rating can be a result of either of the following conditions:

- Lack of dedicated on-street bicycle facilities,
- Lack of buffer separation between Class 2 bicycle lanes and travel lanes, especially along segments that provide four or more travel lanes,

- Posted speed limits of 30 MPH or greater for segments that do not provide dedicated Class 2 bicycle lanes, or 35 MPH or greater for segments that do provide Class 2 bicycle lanes, and/or
- Class 2 bicycle lane plus parking lane widths less than 13.5 feet.

As shown in **Table 8**, providing dedicated on-street Class 2 bicycle lanes can result in a Low rating due to the lack of buffer separation and/or having a posted speed limit of 40 MPH or greater. The majority of segments that provide Class 2 bicycle lanes but result in a Low Bicycle Comfort Index rating are located in the South and East County Planning Areas. In general, not many Class 4 bicycle facilities are provided within the County, which explains the low number of Excellent rated facilities. **Table 9** presents the performance objective summary for high priority bicycle segments, the resulting existing conditions map is provided in **Figure 5**.

TABLE 9
ALAMEDA COUNTYWIDE BICYCLE PERFORMANCE OBJECTIVE EVALUATION

Performance Measure Objective	Segment Miles That Meet Performance Objective Along High Priority Bicycle Arterial Network Segments[1]		
	Existing	Year 2040 – Standard Forecasting Scenario	Net Difference
Bicycle Comfort Index	35 mi	35 mi	0 mi

Notes:
1. Bicycles are considered high priority mode if they are categorized in the top two prioritized mode along an Arterial Network segment. A total of 268 Arterial Network miles have high bicycle priority.

As shown in **Table 9**, only 35 miles of high priority bicycle segments along the Arterial Network provide adequate bicycle facilities under Existing Conditions. This indicates that the bicycle network (along with the transit network) has a great need for improvements throughout the County.

3.5.2 Year 2040 – Standard Forecasting Scenario Conditions

As shown in **Table 8**, the mileage of high priority bicycle segments that provide adequate bicycle facilities along the Arterial Network remains similar between Existing and Year 2040 Conditions. Therefore, the bicycle network is expected to continue to have a great need for improvements in Year 2040.

3.6 AUTOMOBILE NEEDS ASSESSMENT EVALUATION

The Existing and Year 2040 automobile performance evaluation was primarily based on the following performance measures:

- Automobile Congested Speed, the performance objective is to achieve a speed greater than 40 percent of the posted speed limit. PM peak period (4 – 6 PM) speed data was summarized for about 82 percent, or 980 miles, of the Study Network. **Table 10** presents a countywide summary of automobile congested speed for each analysis scenario.
- Automobile Reliability, which is a measure of the PM peak hour volume-to-capacity (V/C) ratio; the performance objective is to achieve a V/C ratio less than 0.8. PM peak hour Automobile Reliability data was summarized for about 53 percent, or 640 miles, of the Study Network. **Table 11** presents a countywide summary for this measure.

The automobile performance and Needs Assessment evaluation for Existing and Year 2040 Conditions is summarized below.

TABLE 10
ALAMEDA COUNTYWIDE AUTOMOBILE CONGESTED SPEED SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments Operating Greater Than 40 MPH	4%	3%
% of Segments Operating Between 30 – 40 MPH	24%	22%
% of Segments Operating Between 20 – 30 MPH	58%	56%
% of Segments Operating Between 10 – 20 MPH	14%	18%
% of Segments Operating Less Than 10 MPH	0%	1%

Notes:
1. Countywide data coverage for Automobile Congested Speed is 980 miles.

TABLE 11
ALAMEDA COUNTYWIDE AUTOMOBILE RELIABILITY SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments Operating at V/C Ratio Less Than 0.8	74%	74%
% of Segments Operating at V/C Ratio Between 0.8 – 1.0	9%	12%
% of Segments Operating at V/C Ratio Greater Than 1.0	17%	14%

Notes:
1. Countywide data coverage for Automobile Reliability is 640 miles.

3.6.1 Existing Conditions

About 86 percent of roadway segments operate at a PM peak period automobile congested speed of 20 miles per hour (MPH) or greater under Existing Conditions. Study Network segments in the North and Central County Planning Areas generally operate at lower speeds during the PM peak period compared to study segments in South and East County. Low PM peak period speeds can be attributed to various factors, including:

- Low automobile posted speed limits,
- High traffic volumes,
- Capacity constraints at intersections, including inefficient signal timings,
- High density of driveways/automobile access points along corridors, and/or
- High volume of pedestrian crossings within urban areas.

About 74 percent of roadway segments operate at a V/C ratio less than 0.8 during the PM peak hour, nine percent operate at a V/C ratio between 0.8 and 1.0 while 17 percent of segments operate over capacity. **Table 12** presents the performance objective summary for high priority automobile Study Network segments, the resulting existing conditions map is shown on **Figure 7**.

As shown in **Table 12**, 231 miles of high priority automobile segments along the Arterial network operate at a congested speed greater than 40 percent of the speed limit during the PM peak period, while 140 miles of Arterial Network segments operate at a V/C ratio less than 0.8 during the PM peak hour.

TABLE 12
ALAMEDA COUNTYWIDE AUTOMOBILE PERFORMANCE OBJECTIVE EVALUATION

Performance Measure Objective	Segment Miles That Meet Performance Objective Along High Priority Automobile Arterial Network Segments[1]		
	Existing	Year 2040 – Standard Forecasting Scenario	Net Difference
Automobile Congested Speed	231 mi	210 mi	-21 mi
Automobile Reliability	140 mi	138 mi	-2 mi

Notes:
1. Automobiles are considered high priority mode if they are categorized in the top two prioritized mode along an Arterial Network segment. A total of 250 Arterial Network miles have high automobile priority.

3.6.2 Year 2040 – Standard Forecasting Scenario

The Year 2040 analysis assumes various planned and funded roadway widening improvements. Roadway widening improvements are expected to increase Automobile Congested Speed and improve Automobile Reliability. Overall, segments under Year 2040 – Standard Forecasting Scenario Conditions are expected to operate at lower automobile speeds during the PM peak period compared to Existing Conditions; resulting in a 21 mile decrease along high priority automobile Arterial Network segments that would meet the Automobile Congested Speed performance objective. As shown in **Table 12**, mileage of high priority automobile Arterial Network segments that meet the Automobile Reliability performance objective would remain similar as Existing Conditions.

3.7 GOODS MOVEMENT NEEDS ASSESSMENT EVALUATION

The Existing and Year 2040 goods movement performance evaluation was based on the Truck Route Accommodation Index rating, which is a measure of the curb lane width. The performance objective is to achieve a High (curb lane width of 12 feet or greater) rating along Study Network segments with high priority goods movement. The Truck Route Accommodation Index was evaluated for about 56 percent, or 670 miles, of the Study Network based on available cross section data. **Table 13** presents a countywide summary of Truck Route Accommodation Index for each analysis scenario.

TABLE 13
ALAMEDA COUNTYWIDE TRUCK ROUTE ACCOMODATION INDEX SUMMARY[1]

Threshold	Existing	Year 2040 – Standard Forecasting Scenario
% of Segments with High Rating	56%	56%
% of Segments with Medium Rating	36%	36%
% of Segments with Low Rating	8%	8%

Notes:
1. Countywide data coverage for Truck Route Accommodation Index is 670 miles.

3.7.1 Existing Conditions

As shown in **Table 13**, the majority of high priority goods movement segments provide a minimum 12 foot curb lane width. A curb lane width of 12 feet or greater is preferred for high priority goods movement segments to minimize the probability that trucks will off-track into the adjacent lane or shoulder. Curb lane widths less than 12 feet are considered inadequate. **Table 14** presents the performance objective summary for high priority goods movement segments, the resulting Existing Conditions Needs Assessment map is provided in **Figure 9**.

As shown in **Table 14**, about 86 miles of high priority goods movement segments along the Arterial Network provide curb lane widths greater than 12 feet. Generally, North County Arterial Network segments provide more segments with curb lane widths less than 12 feet compared to the Central, South and East County.

TABLE 14
ALAMEDA COUNTYWIDE GOODS MOVEMENT PERFORMANCE OBJECTIVE EVALUATION

Performance Measure Objective	Segment Miles That Meet Performance Objective Along High Priority Goods Movement Arterial Network Segments[1]		
	Existing	Year 2040 – Standard Forecasting Scenario	Net Difference
Truck Route Accommodation Index	86 mi	86 mi	0 mi

Notes:
1. Goods movement is considered high priority mode if categorized in the top two prioritized mode along an Arterial Network segment. A total of 135 Arterial Network miles have high goods movement priority.

3.7.2 Year 2040 – Standard Forecasting Scenario Conditions

Figure 10 identifies segments with improvement needs for Study Network segments with high goods movement priority. As shown in **Table 14**, the needs evaluation for Year 2040 Conditions is similar to Existing Conditions since the majority of curb lane widths are expected to be the same between both Existing and Year 2040 Conditions.

3.8 PAVEMENT CONDITION INDEX

The Pavement Condition Index (PCI) was evaluated for Existing Conditions only. The PCI performance objective is to achieve a PCI rating of Good or Very Good. However, PCI was not applied to the Existing Conditions Needs Assessment evaluation. PCI will be utilized later in the MAP development process to prioritize improvements.

PCI was summarized for about 80 percent, or 960 miles, of the Study Network. Of the Study Network segments with available data:

- 35% of segments result in a Very Good PCI rating,
- 41% of segments result in a Good PCI rating,
- 19% of segments result in a At-Risk PCI rating, and
- 5% of segments result in a Poor PCI rating

3.8 COLLISION RATES

Collision Rates were evaluated along the Study Network for Existing Conditions. Existing Collision Rates were summarized for about 71 percent, or 850 miles, of the Study Network. Of the Study Network segments with available data:

- 48% of segments result in an annual collision rate less than 1.0 collision per million vehicle-miles of travel
- 32% of segments result in an annual collision rate between 1.0 and 2.0 collisions per million vehicle-miles of travel
- 8% of segments result in an annual collision rate between 2.0 and 3.0 collisions per million vehicle-miles of travel
- 4% of segments result in an annual collision rate between 3.0 and 4.0 collisions per million vehicle-miles of travel

- 8% of segments result in an annual collision rate greater than 4.0 collisions per million vehicle-miles of travel

Performance measure objectives do not apply to Collision Rates; therefore the Existing Conditions Needs Assessment evaluation did not incorporate the collision rate assessment. Collision Rates will be utilized later in the MAP development process to prioritize improvements.

4. ALTERNATIVE SCENARIOS

The Social and Behavioral Trends and Next Generation Vehicle Scenarios were evaluated as supplemental scenarios to inform Alameda County jurisdictions on how emerging social and technology trends may impact future travel patterns and resulting improvement needs. **Table 15** through **Table 20** compare applicable performance measure results for all three Year 2040 scenarios. Key findings by mode are presented below.

Transit Network Results

As shown in **Table 15** and **Table 16**, both alternative scenarios would result in a substantial increase to Transit Travel Speed and Transit Reliability compared to the Standard Forecasting Scenario, with the highest increase expected for the Next Generation Vehicle Scenario.

Pedestrian Network Results

The primary difference between the Standard Forecasting Scenario and Social and Behavioral Trends Scenario is that traffic volumes are expected to be five to 10 percent lower assuming the latter, which would result in a slight improvement for pedestrians. The Next Generation Vehicle Scenario would not impact the Pedestrian Comfort Index evaluation.

Bicycle Network Results

Neither alternative Scenario would impact the Bicycle Comfort Index evaluation.

Automobile Network Results

As shown in **Table 18** and **Table 19**, both alternative scenarios would result in a substantial improvement to Automobile Congested Speed and Reliability compared to the Standard

Forecasting Scenario, with the highest increase expected for the Next Generation Vehicle Scenario.

Goods Movement Network Results

Neither alternative Scenario would impact the Truck Route Accommodation Index evaluation.

TABLE 15
ALAMEDA COUNTYWIDE TRANSIT TRAVEL SPEED SUMMARY[1]

Threshold	Year 2040 – Standard Forecasting Scenario	Year 2040 – Social and Behavioral Trends Scenario	Year 2040 – Next Generation Vehicle Scenario
% of Segments Operating Between 20 – 30 MPH	9%	10%	11%
% of Segments Operating Between 10 – 20 MPH	44%	49%	50%
% of Segments Operating Between 5 – 10 MPH	44%	39%	38%
% of Segments Operating Less Than 5 MPH	3%	2%	1%

Notes:
1. Countywide data coverage for Transit Travel Speed is 240 miles.

TABLE 16
ALAMEDA COUNTYWIDE TRANSIT RELIABILITY SUMMARY[1]

Threshold	Year 2040 – Standard Forecasting Scenario	Year 2040 – Social and Behavioral Trends Scenario	Year 2040 – Next Generation Vehicle Scenario
% of Segments Operating at Ratio Greater Than 0.8	33%	40%	44%
% of Segments Operating at Ratio Between 0.6 – 0.8	52%	49%	48%
% of Segments Operating at Ratio Between 0.4 – 0.6	13%	10%	8%
% of Segments Operating at Ratio Less Than 0.4	2%	1%	0%

Notes:
1. Countywide data coverage for Transit Reliability is 240 miles.

TABLE 17
ALAMEDA COUNTYWIDE PEDESTRIAN COMFORT INDEX SUMMARY[1]

Threshold	Year 2040 – Standard Forecasting Scenario	Year 2040 – Social and Behavioral Trends Scenario	Year 2040 – Next Generation Vehicle Scenario
% of Segments with Excellent Rating	5%	5%	5%
% of Segments with High Rating	51%	51%	51%
% of Segments with Medium Rating	42%	42%	42%
% of Segments with Low Rating	2%	2%	2%

Notes:
1. Countywide data coverage for Pedestrian Comfort Index is 620 miles.

TABLE 18
ALAMEDA COUNTYWIDE AUTOMOBILE CONGESTED SPEED SUMMARY[1]

Threshold	Year 2040 – Standard Forecasting Scenario	Year 2040 – Social and Behavioral Trends Scenario	Year 2040 – Next Generation Vehicle Scenario
% of Segments Operating Greater Than 40 MPH	3%	4%	4%
% of Segments Operating Between 30 – 40 MPH	22%	24%	25%
% of Segments Operating Between 20 – 30 MPH	56%	57%	57%
% of Segments Operating Between 10 – 20 MPH	18%	15%	14%
% of Segments Operating Less Than 10 MPH	1%	0%	0%

Notes:
1. Countywide data coverage for Automobile Congested Speed is 980 miles.

TABLE 19
ALAMEDA COUNTYWIDE AUTOMOBILE RELIABILITY SUMMARY[1]

Threshold	Year 2040 – Standard Forecasting Scenario	Year 2040 – Social and Behavioral Trends Scenario	Year 2040 – Next Generation Vehicle Scenario
% of Segments Operating at V/C Ratio Less Than 0.8	74%	77%	83%
% of Segments Operating at V/C Ratio Between 0.8 – 1.0	12%	12%	9%
% of Segments Operating at V/C Ratio Greater Than 1.0	14%	11%	8%

Notes:
1. Countywide data coverage for Automobile Reliability is 640 miles.

TABLE 20
ALAMEDA COUNTYWIDE TRANSIT PERFORMANCE OBJECTIVE EVALUATION

Performance Measure Objective	Segment Miles That Meet Performance Objectives Along High Priority Transit, Pedestrian or Automobile Arterial Network Segments		
	Year 2040 – Standard Forecasting Scenario	Year 2040 – Social and Behavioral Trends Scenario	Year 2040 – Next Generation Vehicle Scenario
Transit Congested Speed[1]	21 mi	21 mi	21 mi
Transit Reliability[1]	56 mi	66 mi	69 mi
Pedestrian Comfort Index[2]	133 mi	133 mi	133 mi
Automobile Congested Speed[3]	210 mi	217 mi	221 mi
Automobile Reliability[3]	138 mi	147 mi	166 mi

Notes:
1. Transit is considered high priority mode if they are categorized in the top two prioritized mode along an Arterial Network segment. A total of 150 Arterial Network miles have high transit priority
2. Pedestrians are considered high priority mode if they are categorized in the top two prioritized mode along an Arterial Network segment. A total of 207 Arterial Network miles have high pedestrian priority.
3. Automobiles are considered high priority mode if they are categorized in the top two prioritized mode along an Arterial Network segment. A total of 250 Arterial Network miles have high automobile priority.

5. CONCLUSIONS

The comprehensive Needs Assessment evaluation presented in this memo provides a thorough multimodal infrastructure review of Alameda County arterials; this is the first time that a multimodal evaluation has been performed at this scale within the County. As such, the evaluation provides an extensive amount of analysis results and conclusions. The main conclusion that can be derived from the results is that out of the five primary modes served by the arterial system, the transit and bicycle networks generally have the greatest need for improvements based on the performance measures that were evaluated for this study. Although all modes have needs for improvements throughout Alameda County, the expectation is that proposed Arterial Network improvements would provide the greatest benefit to transit and bicycle modes while benefiting all other modes.

6. NEXT STEPS

The performance and Needs Assessment evaluation was the basis for identifying proposed improvements along Arterial Network segments. Draft proposed improvements are presented in a separate memo titled *Alameda Countywide Multimodal Arterial Plan – Draft Proposed Improvements* (Fehr & Peers, February 22, 2016). Fehr & Peers and Alameda CTC will meet with each Alameda County jurisdiction between February 29th and March 7th to present the Needs Assessment evaluation and proposed improvements. Please contact Francisco Martin at f.martin@fehrandpeers.com or (510) 587-9422 if you have any questions or comments regarding the information presented in this memo.

Memo Attachments:

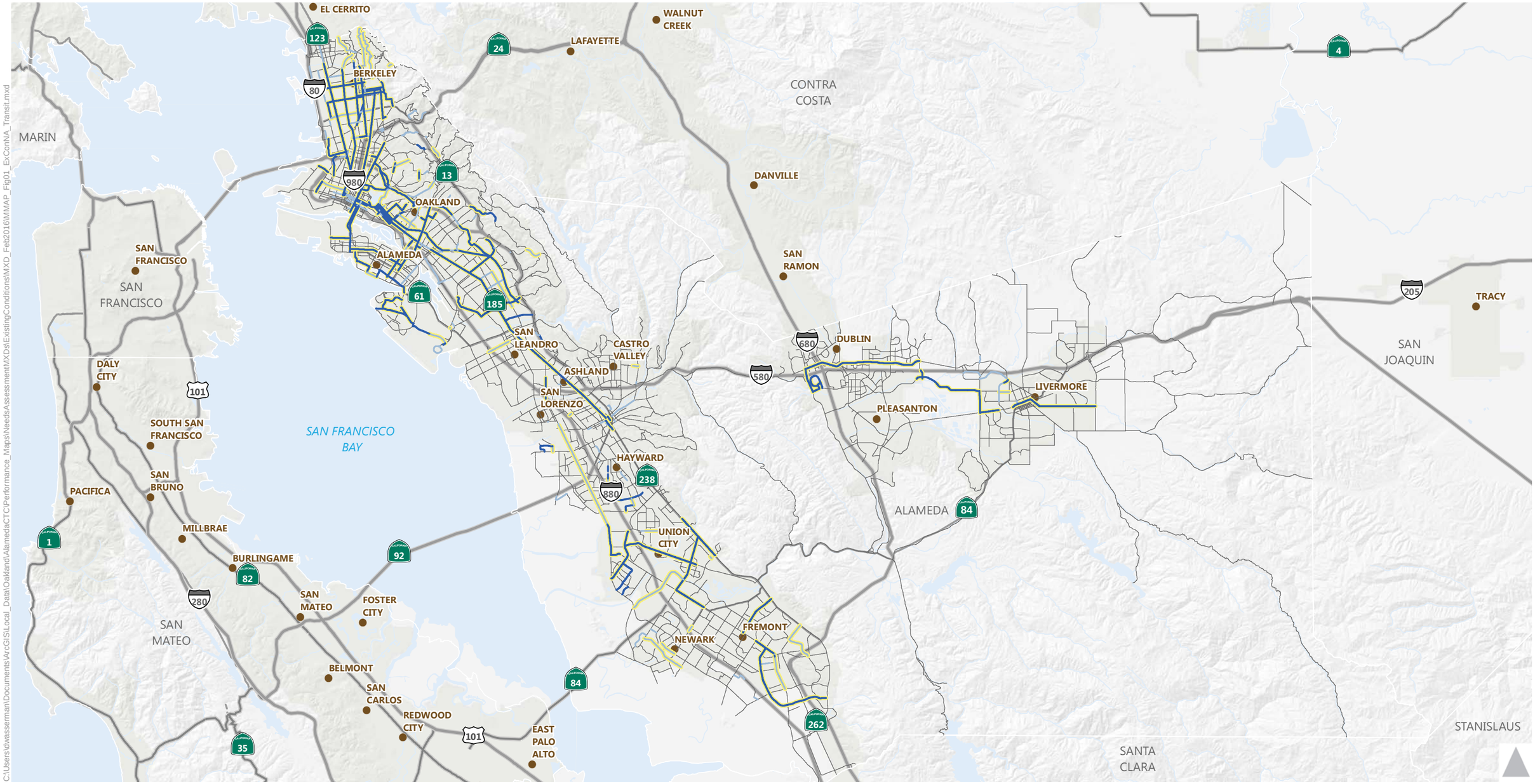
Figure 1 – Roadway Segments with Transit Improvement Needs – Existing Conditions

Figure 2 – Roadway Segments with Transit Improvement Needs – 2040 Standard Forecasting Scenario Conditions

Figure 3 – Roadway Segments with Pedestrian Improvement Needs – Existing Conditions

Figure 4 – Roadway Segments with Pedestrian Improvement Needs – 2040 Standard Forecasting Scenario Conditions

Figure 5 – Roadway Segments with Bicycle Improvement Needs – Existing Conditions



Alameda Countywide Multimodal Arterial Plan

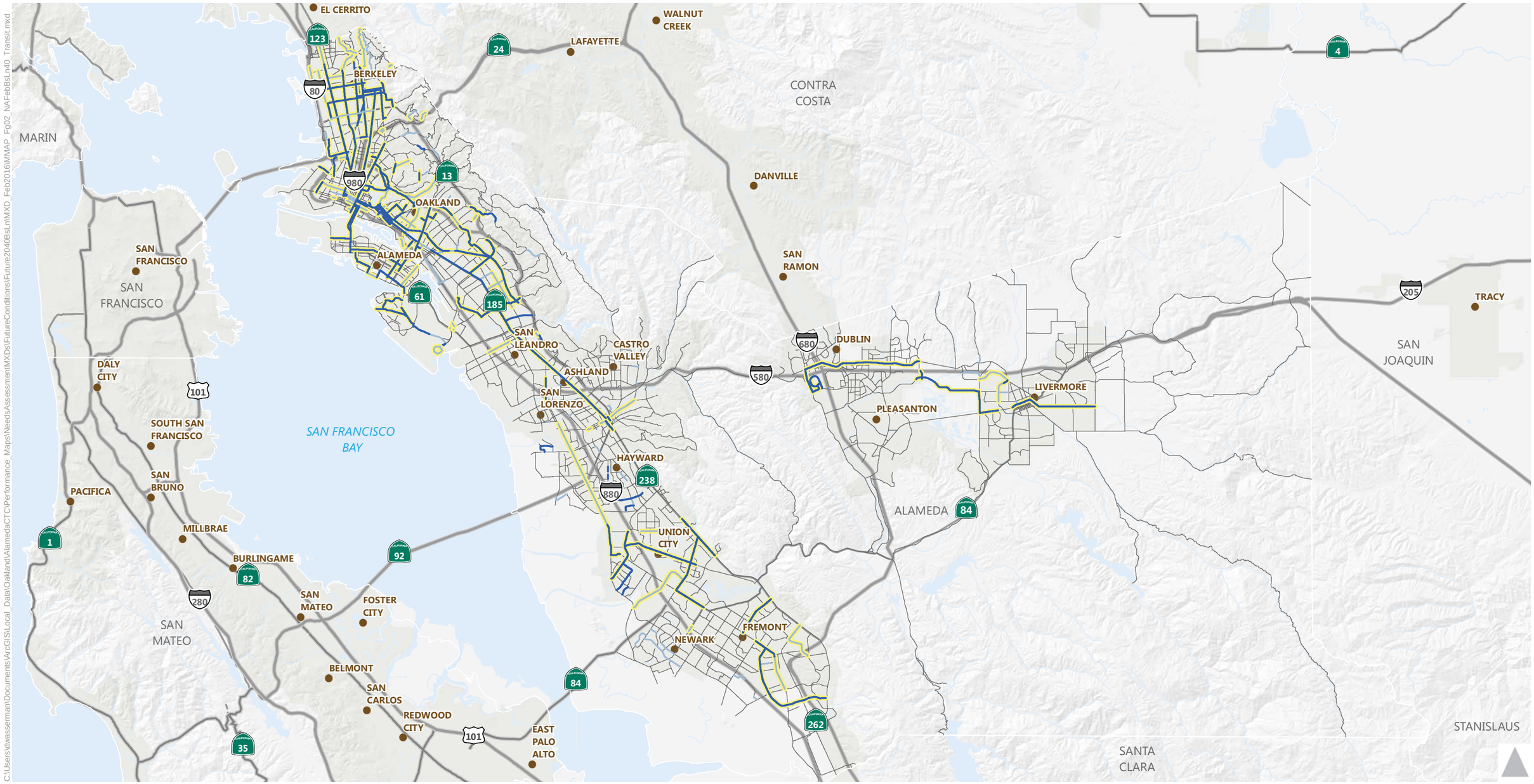
Transit Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

ALAMEDA County Transportation Commission

Figure 1

Roadway Segments with Transit Improvement Needs
Existing Conditions



*The transit needs assessment is only evaluated on roadways with transit major corridors and crosstown routes.

Alameda Countywide Multimodal Arterial Plan

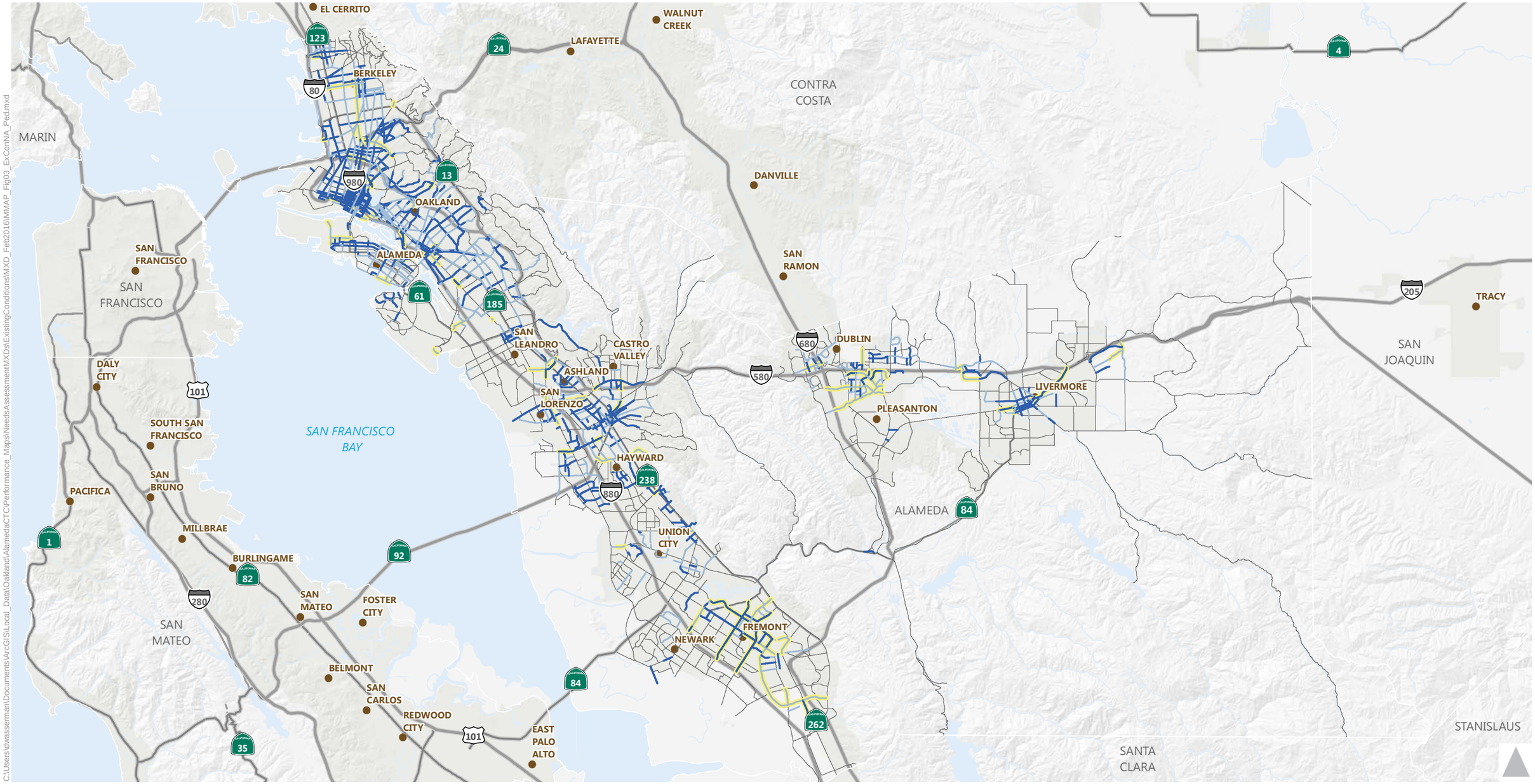
Transit Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

ALAMEDA County Transportation Commission

Figure 2

Roadway Segments with Transit Improvement Needs
2040 Standard Forecasting Scenario Conditions



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Alameda Countywide Multimodal Arterial Plan

Pedestrian Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

Figure 3

Roadway Segments with Pedestrian Improvement Needs
Existing Conditions

EL CERRITO
WALNUT CREEK
LAFAYETTE
BERKELEY
CONTRA COSTA
MARIN
DANVILLE
OAKLAND
SAN FRANCISCO
ALAMEDA
SAN RAMON
SAN FRANCISCO
SAN LEANDRO
CASTRO VALLEY
DUBLIN
TRACY
SAN JOAQUIN
DALY CITY
ASHLAND
LIVERMORE
SAN LORENZO
PLEASANTON
SOUTH SAN FRANCISCO
SAN FRANCISCO BAY
HAYWARD
SAN BRUNO
PACIFICA
UNION CITY
ALAMEDA
MILLBRAE
BURLINGAME
SAN MATEO
FOSTER CITY
FREMONT
NEWARK
SAN MATEO
BELMONT
SAN CARLOS
REDWOOD CITY
EAST PALO ALTO
STANISLAUS
SANTA CLARA

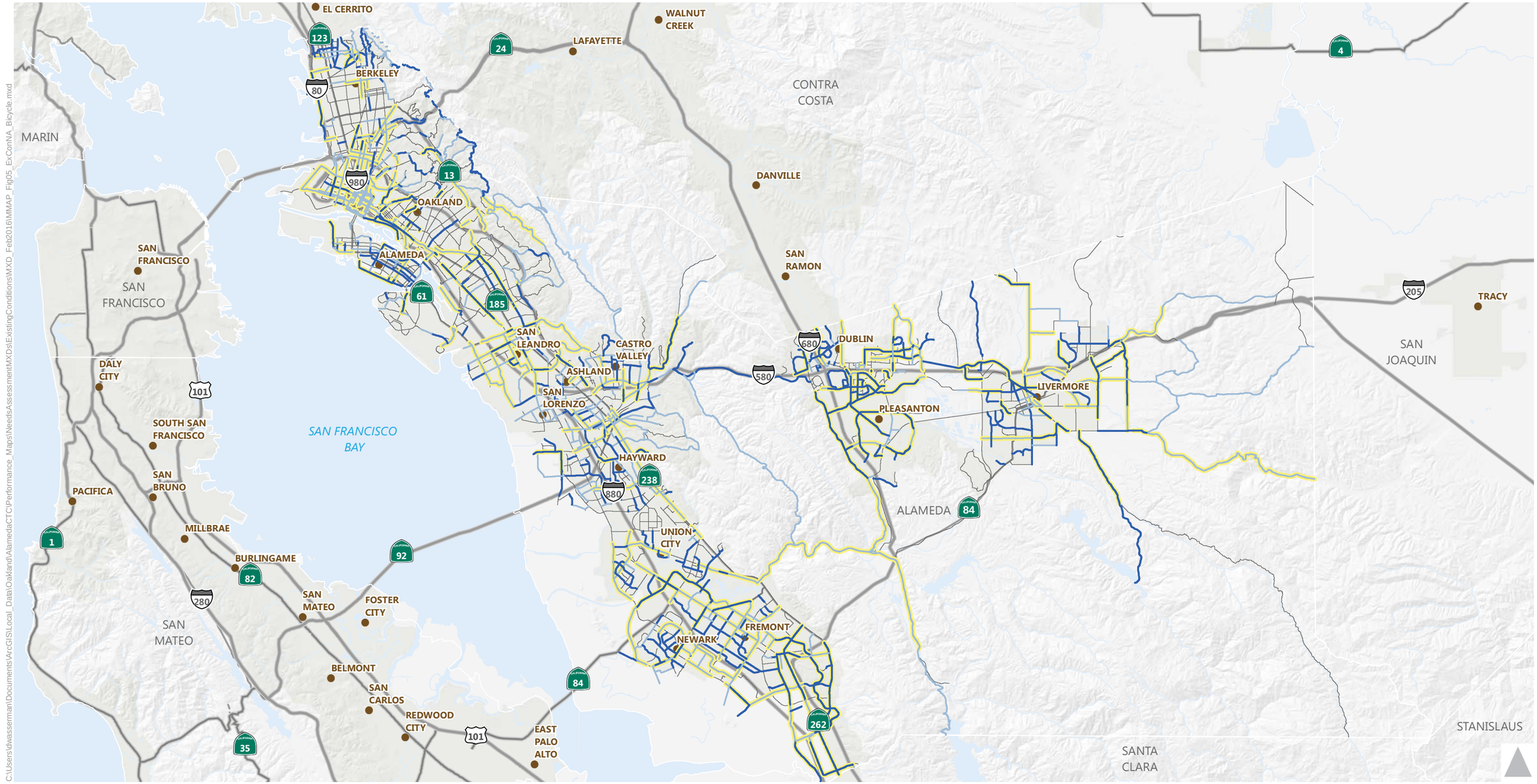
Alameda Countywide Multimodal Arterial Plan

Pedestrian Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

Figure 4

Roadway Segments with Pedestrian Improvement Needs
2040 Standard Forecasting Scenario Conditions



Alameda Countywide Multimodal Arterial Plan

Bicycle Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

ALAMEDA County Transportation Commission

Figure 5

Roadway Segments with Bicycle Improvement Needs
Existing Conditions

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EL CERRITO
WALNUT CREEK
LAFAYETTE
BERKELEY
CONTRA COSTA
MARIN
DANVILLE
OAKLAND
SAN FRANCISCO
ALAMEDA
SAN RAMON
SAN LEANDRO
CASTRO VALLEY
DUBLIN
TRACY
SAN JOAQUIN
ASHLAND
SAN LORENZO
LIVERMORE
PLEASANTON
DALY CITY
SOUTH SAN FRANCISCO
SAN FRANCISCO BAY
HAYWARD
PACIFICA
SAN BRUNO
ALAMEDA
UNION CITY
MILLBRAE
BURLINGAME
SAN MATEO
FOSTER CITY
FREMONT
NEWARK
SAN MATEO
BELMONT
SAN CARLOS
REDWOOD CITY
EAST PALO ALTO
STANISLAUS
SANTA CLARA

Alameda Countywide Multimodal Arterial Plan

Bicycle Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

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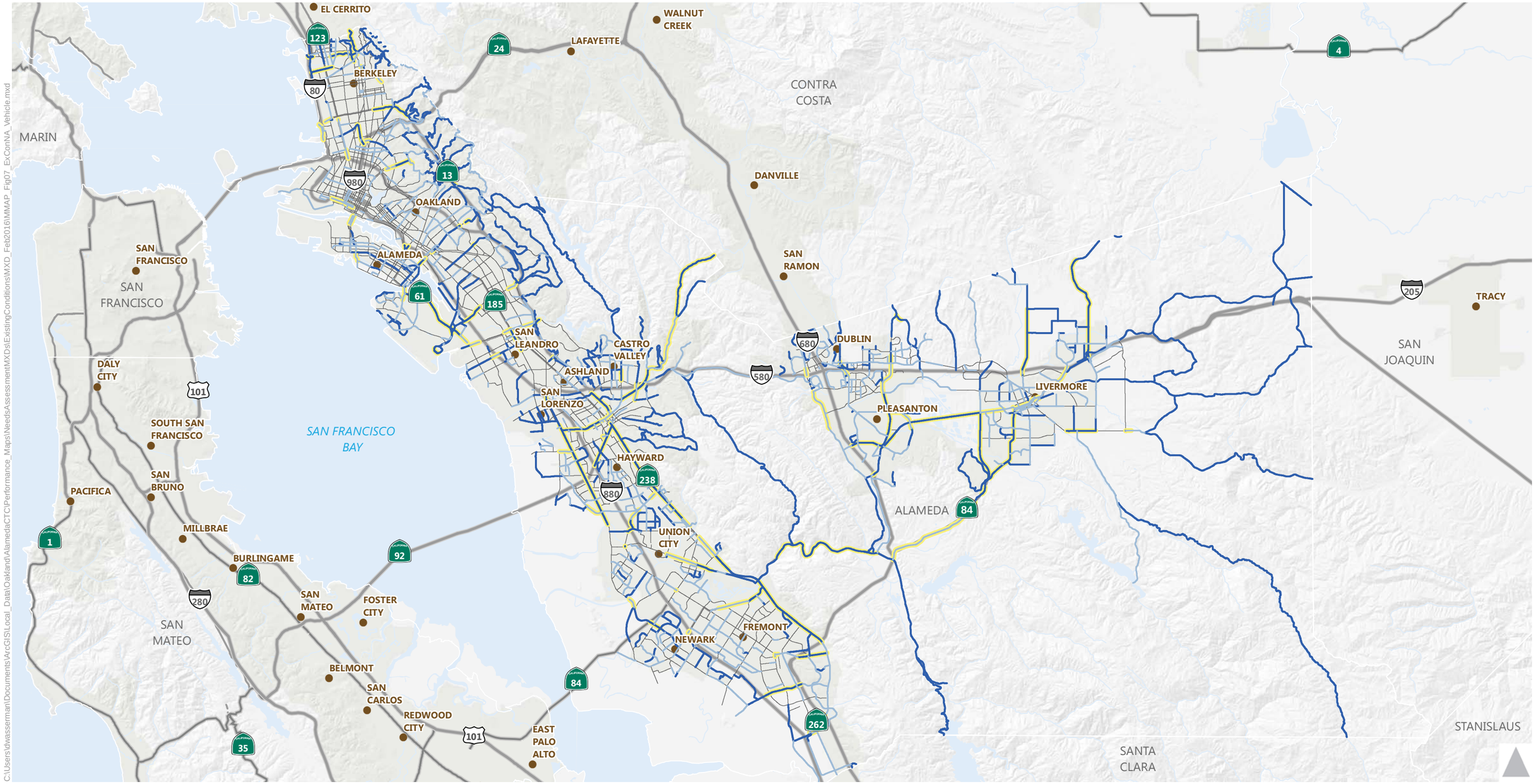
Figure 6

Roadway Segments with Bicycle Improvement Needs
2040 Standard Forecasting Scenario Conditions



Alameda Countywide Multimodal Arterial Plan

Vehicle Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

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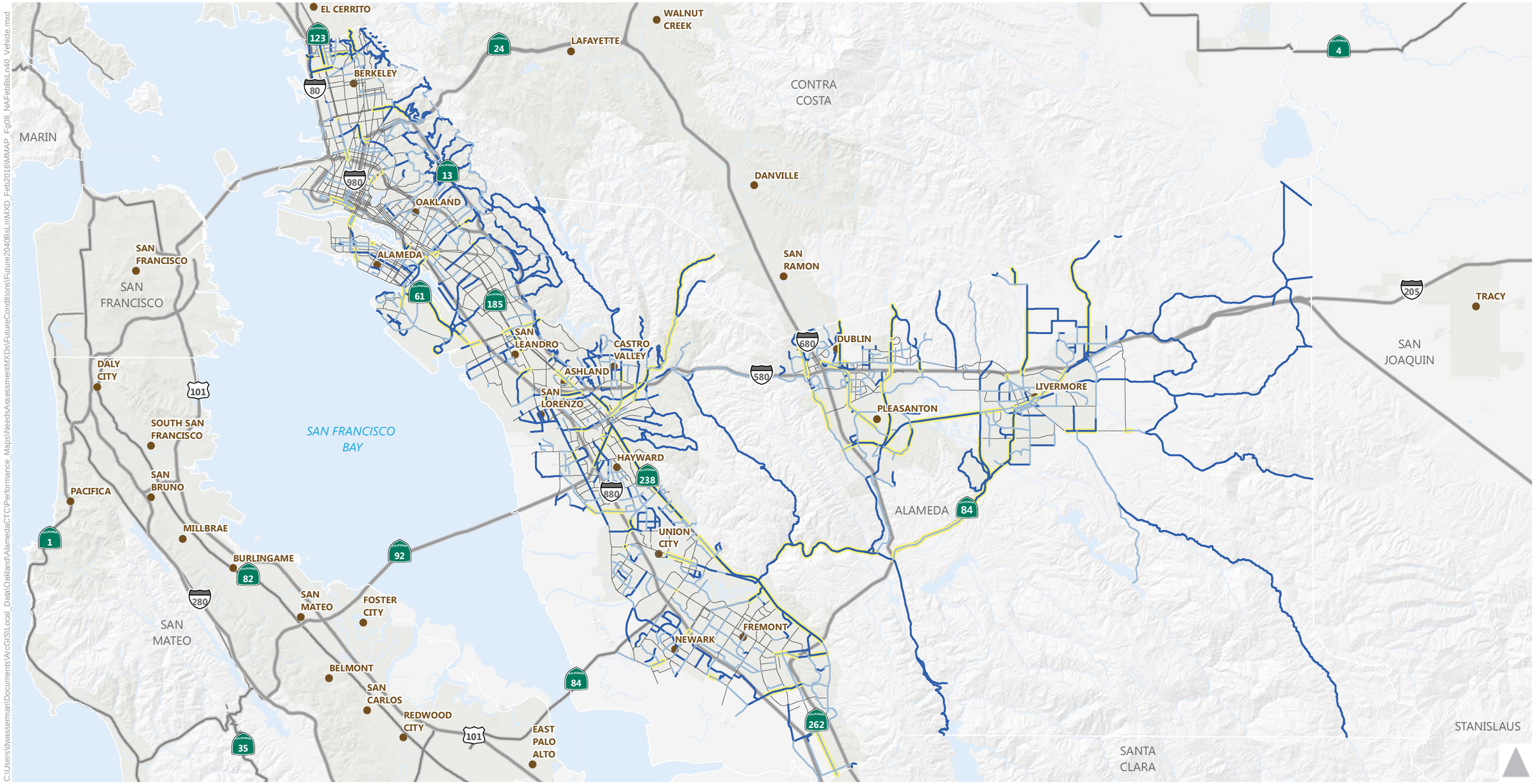
Figure 7

Roadway Segments with Vehicle Improvement Needs
Existing Conditions



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Alameda Countywide Multimodal Arterial Plan

Vehicle Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

ALAMEDA County Transportation Commission

Figure 8

Roadway Segments with Vehicle Improvement Needs
2040 Standard Forecasting Scenario Conditions

EL CERRITO
WALNUT CREEK
LAFAYETTE
BERKELEY
CONTRA COSTA
MARIN
DANVILLE
OAKLAND
SAN FRANCISCO
SAN RAMON
ALAMEDA
SAN LEANDRO
CASTRO VALLEY
DUBLIN
TRACY
SAN JOAQUIN
DALY CITY
ASHLAND
LIVERMORE
SAN LORENZO
PLEASANTON
SOUTH SAN FRANCISCO
SAN FRANCISCO BAY
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SAN MATEO
FOSTER CITY
FREMONT
NEWARK
SAN MATEO
BELMONT
SAN CARLOS
REDWOOD CITY
EAST PALO ALTO
STANISLAUS
SANTA CLARA

123 24 4 80 13 980 61 185 205 680 580 238 880 1 92 82 280 84 262 101 35

Alameda Countywide Multimodal Arterial Plan

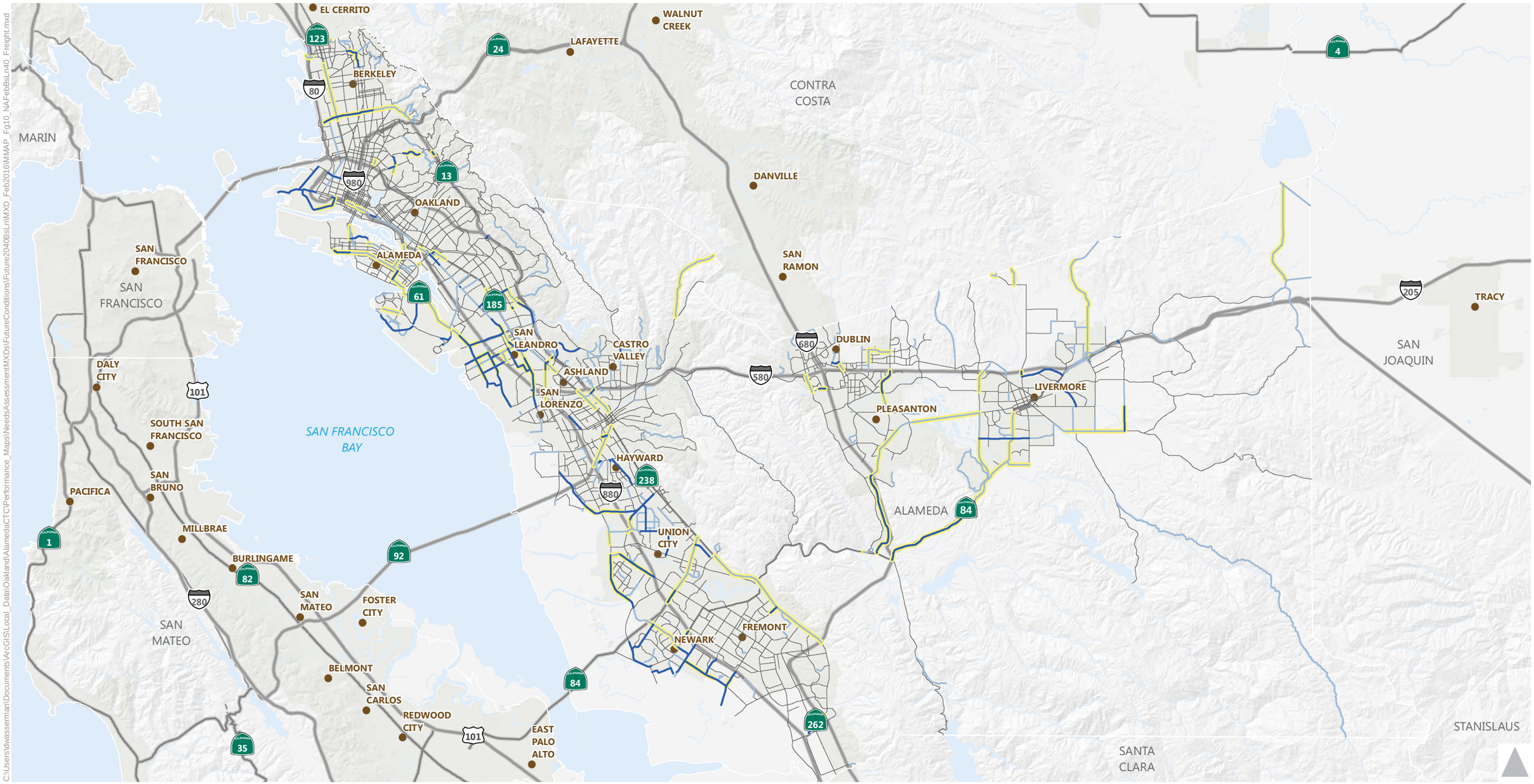
Goods Movement Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

ALAMEDA County Transportation Commission

Figure 9

Roadway Segments with Goods Movement Improvement Needs
Existing Conditions



Alameda Countywide Multimodal Arterial Plan

Goods Movement Priority Mode

No Improvements Needed	Improvements Needed
#1 Priority	#1 Priority
#2 Priority	#2 Priority

Figure 10

Roadway Segments with Goods Movement Improvement Needs
2040 Standard Forecasting Scenario Conditions