Caltrans Bay Area Bike Plan Update 2024

Appendix C – Prioritization Methodology

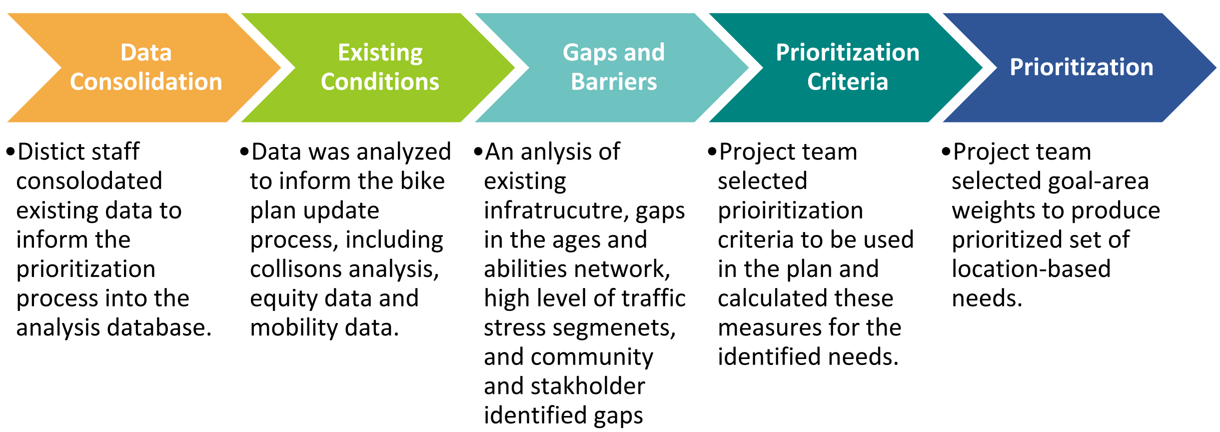
Executive Summary

The Caltrans Bay Area (District 4) Bike Plan Update prioritization methodology prioritizes location-based needs on and along the State Highway System to achieve the vision established in Towards an Active California. The methodology prioritizes biking improvements based on safety, mobility and equity. It creates a data-focused approach that is consistent with other Caltrans District's active transportation plans, but that also is also tailored to District 4's local context. The prioritization methodology will inform decision-making and improve outcomes in the transportation planning and project delivery process.

The three goals of the Caltrans Bay Area Bike Plan: Mobility, Safety, and Equity, provide the structure for the data framework. Existing statewide datasets are organized by these goals, to reflect, represent, and operationalize the goals in practice. Each metric was informed by data to establish high, mid and low scores for each location-based need.

The overall process of identifying and prioritizing goals is depicted below in Figure 1.

Figure 1: Caltrans Bay Area Bike Plan Update Process.



Data Framework and Methodology

Steps to Prioritization

This report lays out the steps and framework to the prioritization of biking location-based needs on and across the State Highway System in the Bay Area.

Step 1: Data Consolidation.

The first step of the process was to consolidate data to prepare for the study. Data was collected regarding infrastructure along the highway system as well as various contextual factors that was used in orienting the needs identification process and prioritizing needs, such as equity data, collision data, transit data and streetlight data. This data consolidation effort resulted in layers describing conditions for people bicycling along and across the state highway system and characteristics of the Bay Area.

Step 2: Evaluate Existing Conditions.

The second step in the data framework was to characterize existing conditions relating to biking on and across the State Highway System. This includes physical characteristics such as the presence of bike infrastructure and the level of bicycle stress. Other data sets were evaluated as well, including information such as the speed limit on roadways and safety information, such as the number and location of pedestrian and bicyclist fatalities and serious injuries.

This step also evaluated existing community characteristics such as proximity to transit, potential to capture short trips, and demographic characteristics to define and evaluate equity. The purpose of the existing conditions analysis is to inform the identification of location-based needs and engage stakeholders around active transportation needs for the Bay Area.

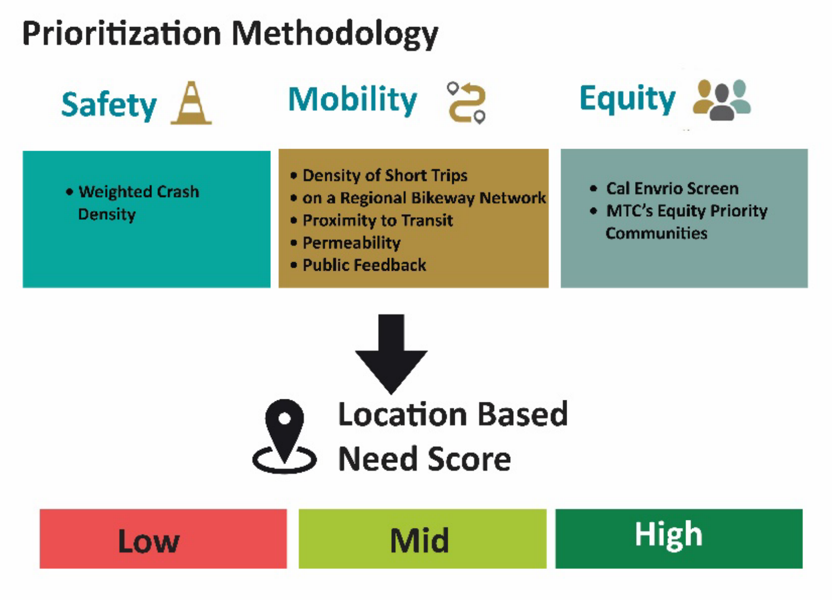
Step 3: Gaps and Barriers.

The third step was to identify location-based needs across the State Highway System. These needs were identified from two process: a data-driven, systemic perspective as well as a community/stakeholder driven process. This step built on the data collected in the existing conditions phase.

The needs identification process is fundamentally built around the Level of Traffic Stress (LTS) methodology, which speaks to the all ages and abilities, safety, and mode shift goals established in Toward an Active California. The fundamental goal of this step is to build out an all ages and abilities region wide network. This measure is grounded in research and assumptions made in the analysis process are clearly stated and transparent. The location-based needs identification process results in a comprehensive assessment of needs systemwide, ensuring that Caltrans staff can access recommendations for every segment and intersection as upcoming projects are considered, programmed, and implemented.

Gaps and barriers were also identified through the previous collision analysis hot spots. Locations with serious and fatal collisions were highlighted as location-based needs.

In addition to the data driven process to identify gaps, a community/stakeholder process was done to both verify projects identified and fill in gap where projects are needed. This process was completed by looking through existing bike plans and corridor plans, that already went through a community driven process. It also identified gaps through public and stakeholder outreach.



Step 4: Prioritization Criteria.

The fourth step in the data framework established the prioritization criteria. The goals from Toward an Active California serve as the baseline for this initial prioritization of needs. A layered approach was employed to highlight the areas with the most pressing needs in the district. For example, a corridor that has a high bicycle crash history, high opportunity to capture more short trips, and a relatively large percentage of low-income households is a higher priority than a corridor that has none of these characteristics. Similarly, a rural highway that serves as a Main Street or that connects two small towns in close proximity is a higher priority than one that is likely to have less demand for biking.

Table 1 below details the prioritization data and criteria used. It details the data source and the weight used to calculate the final score. This weight was determined through stakeholder and internal feedback.

Table 1: District 4 Location-Based Needs Prioritization Criteria summarizes the prioritization criteria.

Goal Area	Measure	Type	Data Source	Weight
Safety	Severity Weighted Crash Density	Float	SWITRS	33%
Mobility	On a Regional Bike Network	Binary	County/ MTC	8%
	Density of Short Trips	Float	Streetlight GIS Data	8%
	Proximity to Transit	Float	GIS transit dataset	7%
	Permeability	Float	Calculated from FHWA methodology	7%

	Public Feedback	Float	Public and Stakeholder Outreach	3%
Equity	MTC's Equity Priority Communities	Binary	MTC dataset	33%
	Cal Enviro Screen	Float	Cal Enviro Screen	

To calculate goal area need scores, the first step will be to calculate individual measure scores between 0 (lowest need) and 1 (highest need) for each project. There are two types of measures:

- Binary measures are scored either 0 (no) or 1 (yes).
- Float measures are scored as a fractional value between 0 (lowest value) and 1 (highest value), based on percentile level of location-based need.

Each metric was given a score from zero to three. Three representing a high score, two representing a medium score and one representing a low score. Some metrics were given a score of zero, meaning none, for instance is no collisions occurred at that location or if there is no transit within a set distance from that location. Each metric is described in detail of each of these three metrics were calculated for each location based need.

Safety Score

A safety score of high, medium, low, and none was calculated for each location-based need based on the weighted crash density of the collision history as reported in the Statewide Integrated Traffic Records System (SWITRS). The weighted crash score of each collision severity was calculated based on the Highway Safety Manual's Part B, see table 2. Each crash within the influence area of each location based need was weighted based on the score then totaled to a total crash score. The influence area of segments included all collisions that occurred on that roadway segment. The influence area of intersection was estimated to be 150 feet, meaning if a collision occurred within 150 ft of an intersection that crash was assigned to the location, given a weighted score and totaled. Interchanges were done on a case-by-case basis, since interchange's footprints varied significantly, with interchanges in suburban areas stretching to more than 1,500 feet. While interchanges in urban areas tend to be much more compact. The influence area for interchanges was estimated to include all of Caltrans right of way at those locations. The top third of locations were given a score of high (or three), mid third was given a score of medium (or two) and bottom third given a score of low (or one) and locations without a collision history were given a score of none. Using this methodology, if a location had a serve or fatal collision that location was given a safety score of high.

Using the crash weight density, locations were organized into high, mid, and low based on percentiles. The top one third was given the high safety score, the middle third was given a low safety score and the bottom third was given a low safety score. The over representation of zeros in the data corresponded to a higher amount of location given a none score and therefore a low safety score.

Table 2: Weighted Crash Severity

Crash Severity	Severity	Crash Cost*	Weighted Score
1	Fatal	$2,461,000	165
2	Severe Injury	$2,461,000	165
3	Other Visible Injury	$159,900	11
4	Complaint of Pain	$90,900	6
0	Property Damage Only	$14,900	1

*Based on Table 7-1, Highway Safety Manual (HSM), First Edition, 2010. Adjusted to 2022 Dollars

Mobility

To estimate mobility, a number of factors were used to determine which improvements will result in the highest modal shift. A mobility score of high, medium, low, and none was given to each location based need based on the five metrics: density of short trips, along a regional bike network, proximity to transit, permeability (a lack of connectivity), and public feedback. The following section details how each of these metrics was scored.

Density of short trips was estimated using streetlight data. Streetlight data uses data from a variety of sources to estimate trip characteristic. These sources include navigation-GPS and other location-based data from connected cars, trucks, and location apps collected on a "opt-in" basis. Short trip was defined as motor vehicle trips under 3 miles. Three miles was chosen based on research indicating that three miles is a distance most people are comfortable biking, meaning these trip have a high potential to mode shift to biking trips if more infrastructure was available (Dill & Gliebe, 2008)[1]. Short trip density was the total amount of short trips in a census tract divided by the area of that census tract. This was calculated for every census tract in the nine county Bay Area. Each census tract was then assigned a score of 3-0, based on the percentile, with the highest percentile given a score of 3, and the lowest given a score of 0. This generally gave place like Downtown San Francisco, Berkeley, San Jose, Palo Alto and Oakland a high score. Main Street Suburban and Rural communities also had pockets of high scoring census tracts, like the suburban centers of Napa, Petaluma and San Rafael.

Along a regional bike network was calculated using GIS data collected from Countywide agencies and MTC. Most counties in the Bay Area have an adopted regional bicycle network, Counties that didn't have this used MTC's data and manually added some locations, such as Marin County's north south greenway and countywide connections. A binary score of either zero or one was given to each location-based need on this network.

Proximity to transit was calculated based on MTC's transit GIS data. This data includes rail transit stations (such as BART, Amtrak, Caltrain, VTA light rail stations, Muni light rail stations and others), ferry terminals, BRT stations and major bus stops. A score of 3, 2, 1, and 0 were given to each location based need. A three (high score) was given to locations within a mile of transit. A two (medium) was given to location within two miles of transit. A one (low score) was given to locations within three miles of transit, and greater than three miles was given a zero.

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[1] Dill, Jennifer, & John Gliebe: "Understanding and Measuring Bicycling Behavior: A focus on travel time and route choice." Oregon Transportation and Education Retrieved from: https://nacto.org/wp-content/uploads/2012/02/Dill-and-Gliebe-2008.pdf

Permeability, or connectivity was score given to each location-based need. The permeability analysis for this Plan was conducted as a part of a case study for the Federal Highway Administration (FHWA) Guidebook for Measuring Multimodal Connectivity. Available low stress crossings were measured for each quarter mile segment of the State transportation network, and for the surrounding half mile and mile. These three observations — at a quarter mile, half mile, and one mile — provide a comprehensive indication of how easy it is to cross a State highway by bike. Where more low stress crossings are available, the highway network is more permeable — it is easier for bicyclists to cross. The FHWA Guidebook is available at https://www.fhwa.dot.gov/environment/bicycle_pedestrian/

Public feedback was given a high, medium or low score based on two sources: stakeholder feedback and survey results. A survey was conducted as part of this Bike Plan Update that allowed users to pin locations on a map of places where they would like to see biking improvements. Locations with the highest amount of locations pinned (top 1/3) was given a score of 3. Locations with the second highest amount of locations pinned (middle third), was given a score of 2, and locations with the lowest amount of comments pinned (bottom third) was given a score of 1. Locations where stakeholders identified needs at TAC meetings or through email comments, where given the highest score.

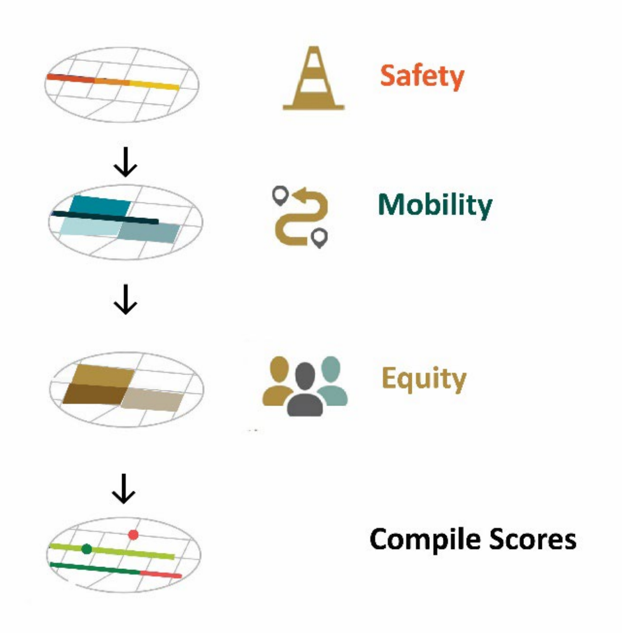
Generally, points and line segments used the same methodology in determining their score for each criteria. The assignment of each location-based need defaulted to the highest possible point value. For instance, if a potion of a line was within 1 mile of transit facility, that line was given the highest possible point, even if portions of that line were further than 1 mile from a transit facility. Similarly, if a line or point was located between two or more census tracts, the point or line would be assigned the score of the highest census tract it touched.

Using the above metrics, locations were organized into high, mid, and low based on percentiles. The top one third was given a high mobility score, the middle third was given a mid mobility score and the bottom third was given a low mobility score.

Equity

An equity score of high, medium, and low was given to each Location-based need based on MTC's equity priority community designation and Cal Enviro Screen's percentile score. A high score was given to a location based need that is either in an MTC defined equity priority community, or whose Cal Enviro Screen's percentile score is 75% or higher. A medium score was given to location based needs that was in a census tract whose Cal Enviros Screen's percentile score is <75% but greater that 50%. A low score was given to a location based needs that was in a census tract whose Cal Envrio Screen's percentile score is less than 50% but greater than 25%. A score of zero was given to location based needs that was in a census tract whose Cal Enviro Screen's percentile score is less than 25%.

Points and lines that are located between more than one census tract was assigned the highest scoring census tract that the line or point overlapped with.



Step 6: Identify Needs List.

The final step in the data framework is to generate a prioritized list of location-based needs that incorporates the results of all previous steps, including existing conditions, systemic needs, prioritized needs, and the application of weights to the initial priorities. The needs list will include high, medium, and low priorities. Attributes will be captured for all identified needs, including associated post mile numbers, actions, and the criteria that led to the respective priority rating.

A final score of high, medium, and low was given to each location-based need. The top one third was given the high priority ranking, the middle third was given a mid priority ranking and the bottom third was given a low priority ranking. After discussion and feedback from stakeholders, some location rankings were manually adjusted, if the need was a key location in the regional network and to regionally distribute the high priority rankings more evenly. The manual adjustments were done to acknowledge that no data is perfect, for instance, some locations had a low safety score even though those locations may have high safety needs. Since the safety scores relied on crash history, locations that cyclists avoided due to the perception of safety wouldn't score high on the safety metric.

The Caltrans Bike Plan Update prioritized location-based needs will inform decision-making and improve outcomes, positioning Caltrans to pursue active transportation improvements from both a reactive and a proactive perspective. The results of the analysis process will be generated and displayed with the purpose of feeding directly into the project development and asset management process to, over time, ensure that active transportation needs can compete on equal footing with the needs of other modes. This will help to achieve the vision and operationalize the goals established in Toward an Active California.