APPENDIX

03

Transit Supportive Infrastructure Inventory

MEMORANDUM

To: Tyler Brown, Sergio Ruiz, and Wingate Lew; Caltrans Bay Area (District 4)
From: Mauricio Hernández; Alta Planning + Design
CC: Doug Arseneault, Kelly Dunn, Alta; Stuart Geltman, TMD
Date: August 27, 2024
Re: Caltrans Bay Area Transit Plan – Transit Supportive Infrastructure Inventory (FINAL)

Introduction

Caltrans Bay Area (District 4) is planning how to improve transit on the State Transportation Network (STN) in the Bay Area. This Plan—referred to as the Caltrans Bay Area Transit Plan—is being developed in coordination with transit agencies, regional partners, and the public to identify and prioritize infrastructure improvements that improve transit reliability and access, and encourage more transit use—for a safer, healthier, and more sustainable transportation system.

Overview

This memo provides an inventory of existing transit services and transit supportive infrastructure along and near the STN (see **Figure 1** below). Transit supportive infrastructure includes transit priority and transit access infrastructure.

Transit priority infrastructure (TPI) consists of on-street facilities that help transit be faster, more reliable, and consequently more attractive for people. Some examples include dedicated transit lanes (bus-only lanes), transit signal prioritization, and managed lanes (high-occupancy vehicle [HOV] lanes, express lanes, reversible lanes) among others.

Transit access infrastructure (TAI) includes treatments or projects that make it easier for people to get to transit stops and stations. Some of these improvements include designated pick-up and drop-off areas for microtransit, safety enhancements at intersections, first- and last-mile improvements for walking and cycling connections and micromobility (e.g., Bikeshare) parking facilities.

Alta collected data from the Metropolitan Transportation Commission (MTC) and public transit agencies throughout the Bay Area via a survey, supplemented by publicly available data from the US Census and OpenStreetMap. Alta summarized the major takeaways in each section, coupled with relevant maps of the region and subregions. Each map includes baseline features of the STN, passenger railways, county boundaries, and major parks and waterways.

Figure 1: Caltrans District 4

Memo Organization

The memo begins with an overview of population demographics of likely transit riders in the Bay Area. Sections on transit-priority and service and transit access infrastructure follow. The Transit Priority Infrastructure and Service section details current and planned transit service, existing transit priority infrastructure, and common bottlenecks throughout the region. The Transit Access Infrastructure section includes current pedestrian and bicycle facilities, on-demand transit, stop amenities at major transfer points including park-and-rides and planned mobility hub locations, and areas of need for safety improvements in the region. This Transit Supportive Infrastructure Inventory is the culmination of Task 5: Transit Inventory and Existing Conditions consisting of the Transit Agency Survey and this memo.

Summary of Findings

For this project, the Caltrans Service Area (service area) has been defined as all locations within ¼ mile of STN as noted in **Figure 1**. Residents in the core of the region, which includes the counties of Alameda, Contra Costa, San Francisco, Santa Clara, and San Mateo, benefit from the greatest level of transit service, both in terms of frequency and available amenities. Service aligns well with populations of likely transit riders, including low-income and zero car households as well as youth (under 18 years of age), young adults (18 to 24 years of age), and seniors (over 65 years of age). These areas are also home to major transit-generating destinations including major employment centers. However, smaller clusters also exist throughout the nine-county area. The density of likely transit rider populations and transit-inducing destinations, along US-101, I-80, I-880, SR-82, SR-85, SR-185, SR-4, and SR-12 indicate transit supportive infrastructure improvements may be warranted along these corridors.

Transit signal priority (TSP) is the most common TPI, with the most robust networks in urban areas. Buses benefit from existing HOV/express lanes as well as dedicated bus-only lanes. Of the corridors that offer no TPI, the corridors with the highest ridership include East 14th Street/Mission Boulevard/SR-185 (San Leandro/Hayward); Thornton Avenue/SR-84 (Fremont); and Ashby Avenue/SR-13 (Berkeley) in Alameda County; and Sloat Boulevard/SR-35 in the City and County of San Francisco. Based on these findings, these corridors may be good candidates for TSP improvements. Despite the existence of TPI, the data provided by agencies also identified bottlenecks (i.e., locations where there is a delay in the normal flow of transit) along El Camino Rea/SR-82l, SR-4, I-80 through Solan and Alameda Counties and crossing the Bay Bridge to and from San Francisco, and I-680. The Richmond-San Rafael and Bay bridges were also identified as areas in need of TPI, along with segments of US-101 and I-280 in San Francisco.

Transit access infrastructure (TAI), such as sidewalks and bike lanes, exists in many urban areas such as Berkeley and Oakland in Alameda County, and along other major corridors. TAI is more limited in suburban areas, although high-traffic regional corridors do include some TAI features. Based on the limited data shared with Alta, TAI is sparse in rural areas. The most common bus stop amenities are benches, real-time signage, shelters, lighting, and bike racks. Bikeshare stations operated by Bay Wheels also provide connections to transit in Alameda, San Francisco, and Santa Clara counties. Most of the STN offers some level of pedestrian and bicycle infrastructure (e.g., sidewalks and on-street bike lanes), and the Bay Trail and SMART trail offer dedicated bike paths that connect to many transit stations. However, Alta identified 52 stops with more than 10 crashes in the vicinity clustered in 10 areas, all of which fall in either East Bay or the San Francisco Peninsula areas.[1] Therefore, TAI improvements may be necessary to enhance the safety of transit users accessing the network along the STN.

[1] University of California Berkeley Safe Transportation Research and Education Center. (2023). *Transportation Injury Mapping System (TIMS), 2018 - 2022*. https://tims.berkeley.edu.

Major transfer points (i.e., transit locations served by multiple bus or rail lines) throughout the region, could benefit from improved TAI by improving the actual and perceived safety and comfort for transit riders and TSP to improve access and egress for buses. Transfers points are focused on BART stations, other rail stations (e.g. SMART, Muni), and transit centers. Additional areas for potential investment include MTC's planned mobility hubs . On-demand microtransit zones in suburban Alameda, Napa, Solano, Sonoma, Santa Clara, and San Mateo counties help to fill gaps in fixed-route service and may benefit from improved planning around transit access to optimize these trips around virtual stops. For example, microtransit service planning could be informed by where major barriers or a lack of existing supportive infrastructure such as crossings and sidewalks prevent realistic access to virtual stops. Transfer points that are not along the STN are not likely candidates for improvement.

The findings from this memo will be used to inform the prioritization of transit supportive infrastructure along the STN. As noted, STN corridors and connecting roadways in urban areas of San Francisco, Alameda, and Santa Clara counties, as well as suburban and rural areas in Contra Costa, Napa, and Sonoma counties need investments in transit supportive infrastructure. Corridors of focus in these areas include US-101, I-80, I-280, I-680, I-880, SR-1, SR-4, SR-12, SR-29, SR-82, SR-85, and SR-116 based on the findings. A focus on equity and safety will serve as guides to prioritize segments and stop locations for enhanced transit priority and access infrastructure.

It is important to note that while some agencies collect comprehensive sets of data on TAI, TSP, and ridership among others, other agencies' data collection practices are limited. To that end, this analysis does not provide an exhaustive analysis of existing infrastructure as there were limits in what data was collected and shared with Alta by transit agencies.

Demographics of Likely Transit Riders

Introduction

Approximately 2 million people and approximately 750,000 households live within the Caltrans service area (compared to 7.7 million people living in the nine-county Bay Area).[2,3] For this project, the Caltrans service area has been defined as all locations within ¼ mile of STN, as noted in **Figure 1**, however, the demographic analysis includes the entire nine-county region. Understanding the demographics of this service area helps to identify the populations that are most likely to ride transit and benefit from access improvements, so that investments can be focused where they will have the highest impact, however, it is important to see the full nine-county demographics as transit users may only travel through the STN service area and not necessarily have origins or destinations along the STN.

General Findings

As outlined in the Best Practices Literature Review, the populations most likely to use transit include zero car households, low-income residents, youth (under 18), young adults (ages 18 to 24), and seniors (ages 65+). The analysis highlighted that likely transit riders tend to be centered in western Alameda, San Francisco, and Northern Santa Clara counties, with several smaller pockets of likely riders in each of the other counties as well.

Concentrations of low-income population as well as zero car households tend to be significant drivers of transit ridership.[4] Zero car households are concentrated in Alameda (primarily in Oakland) and San Francisco counties as well as surrounding the campuses of the University of California – Berkeley in Alameda County and Stanford University in Santa Clara County. As noted in **Figure 4**, Equity Priority Communities (EPCs) and California Disadvantaged Communities (CDCs) are most concentrated along the I-880, SR-185, and Mission Boulevard in Alameda County; the I-80 and SR-4 corridor in Contra Costa County, US-101 in Santa Clara County, and SR-12 in Solano County.

Transit riders typically fall within three age demographics: youth (under 18), young adults (18 to 24) and seniors (65+). Concord, Fremont, and Livermore have the highest concentrations of children under 18, while young adults are clustered around university/college campuses in Berkeley (Alameda), Hayward (Alameda), Palo Alto (Santa Clara), San Francisco (San Francisco), San José (Santa Clara), and Santa Clara (Santa Clara). The Caltrans service area has several concentrations of seniors, with over 20% in Sonoma, Marin, and west Santa Clara counties.

[2] Metropolitan Transportation Commission Vital Signs. (2023). *Population*. https://vitalsigns.mtc.ca.gov/indicators/population.
[3] US Census Bureau. (2023). *American Community Survey 5-Year Data (2009-2022)*. https://www.census.gov/data/developers/data-sets/acs-5year.html.
[4] American Public Transit Association. (2017). *Who Rides Public Transportation*. https://www.apta.com/wp-content/uploads/Resources/resources/reportsandpublications/Documents/APTA-Who-Rides-Public-Transportation-2017.pdf.

Data Analysis

Zero Vehicle Households

As noted in **Figure 2**, households without cars are concentrated in central San Francisco, Oakland, and around the campuses of Stanford University and the University of California – Berkeley. Within the service area, 10.7% of households, or about 80,700 households, have no cars, according to data from the latest figures from US Census American Community Survey (ACS).[5,6]

Low-Income

Low-income populations are among the most likely to rely on transit for most trips.[7] **Figure 3** shows the distribution of low-income households throughout the region, defined as households earning less than 200% of Federal Poverty Level.[8] This measure of income was used as it is consistent with income evaluations in high cost of living regions and existing regional equity areas such as EPCs.

Tracts with significant low-income populations are found in every county, but the highest concentrations of low-income tracts are found in San Francisco and Oakland (Alameda). Smaller pockets are also found in San Mateo (San Mateo) and San José (Santa Clara). Within the service area, 19.8% of individuals have incomes below 200% of the Federal Poverty Level. Areas with the largest concentration of equity communities in the service area are located along the I-880 and SR-185 corridors in Oakland and Mission Boulevard in Hayward (Alameda County).[9] In Contra Costa County, the I-80 corridor in San Pablo and SR-4 around Pittsburg also show concentrations of low-income residents. In Santa Clara County, populations near US-101 in San José are also highlighted as EPCs. Finally, in Solano County, SR-12 includes sizable pockets of low-income residents.

[5] US Census Bureau. (2023). *American Community Survey 5-Year Data (2009-2022)* [Table DP04], 2022. https://www.census.gov/data/developers/data-sets/acs-5year.html.
[6] ACS data was accessed from the Census API using the tidycensus package in R. Citation: Walker K, Herman M (2024). *tidycensus: Load US Census Boundary and Attribute Data as 'tidyverse' and 'sf'-Ready Data Frames*. R package version 1.6.3. https://walker-data.com/tidycensus/.
[7] American Public Transit Association. (2017). *Who Rides Public Transportation*. https://www.apta.com/wp-content/uploads/Resources/resources/reportsandpublications/Documents/APTA-Who-Rides-Public-Transportation-2017.pdf.
[8] US Census Bureau. (2023). *American Community Survey 5-Year Data (2009-2022)* [Table S1701], 2022. https://www.census.gov/data/developers/data-sets/acs-5year.html.
[9] US Census Bureau. (2023). *American Community Survey 5-Year Data (2009-2022)* [Table S1701]. https://www.census.gov/data/developers/data-sets/acs-5year.html.

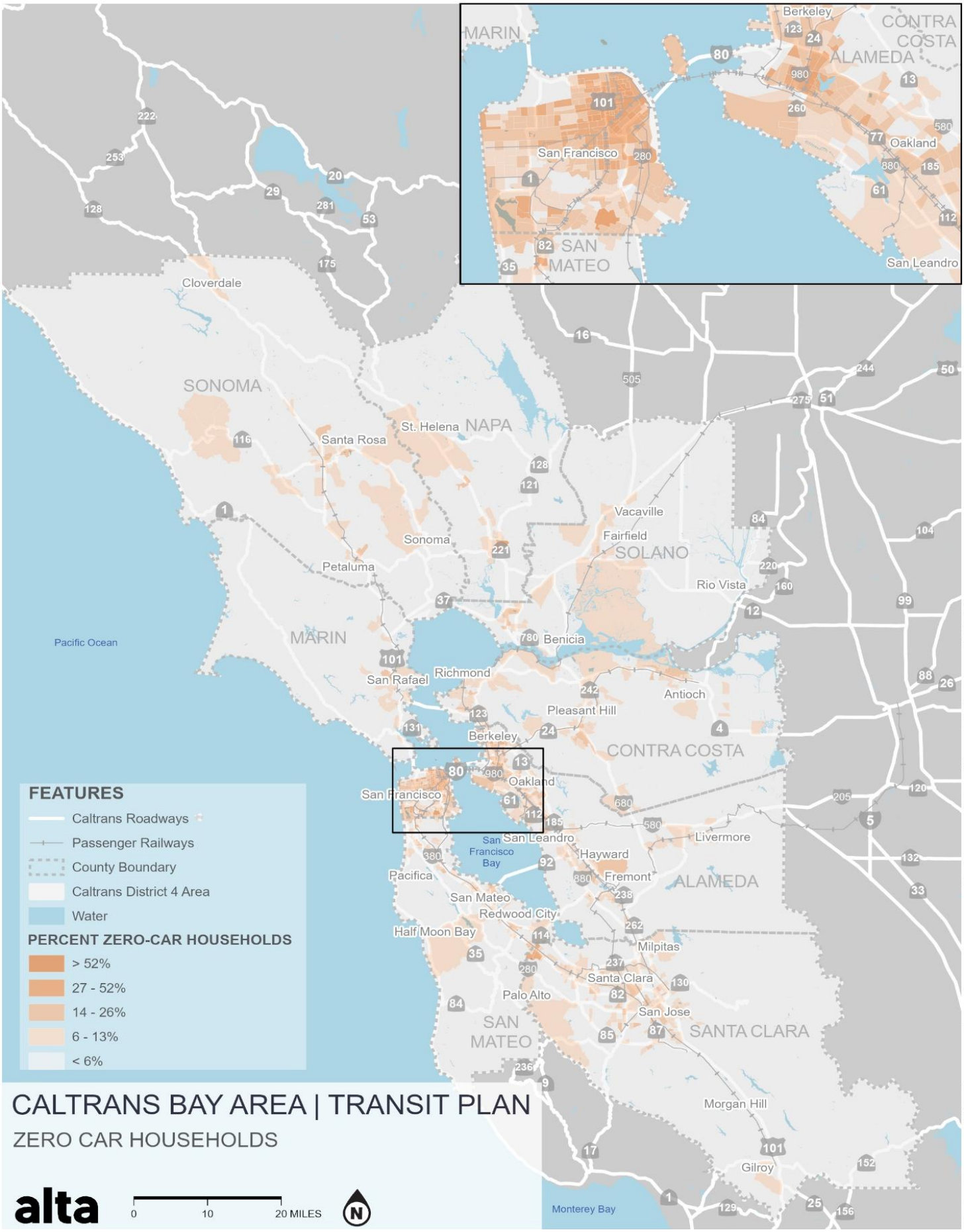

Figure 2: Concentration of zero-car households

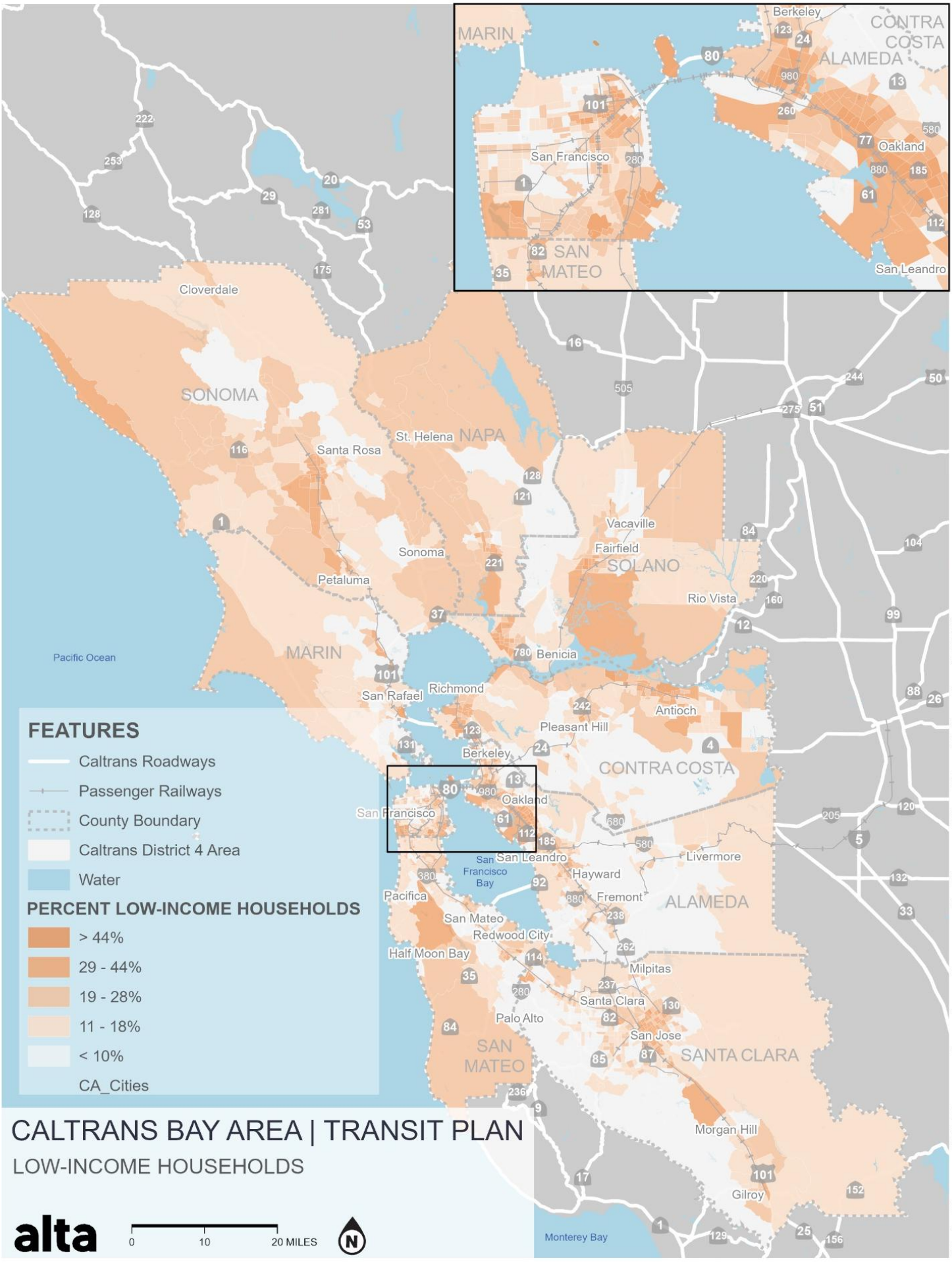

Figure 3: Concentration of low-income households

Vulnerable Communities

The Bay Area has two principal indicators of vulnerable communities. **California Disadvantaged Communities** (CDCs) are designated by the California Environmental Protection Agency based on data from CalEnviroScreen.[10] These census tracts meet one of four criteria:[11]

- In the top 25th percentile of overall scores in CalEnviroScreen 4.0 which applies a framework for assessing cumulative impacts that OEHHA developed in 2010, based in large part on input from a statewide working group on environmental justice that pointed out the unmet need to assess cumulative burdens and vulnerabilities affecting California communities (OEHHA 2010).
- Lacks an overall CalEnviroScreen score but was in the top fifth percentile of cumulative pollution burden scores
- Identified as disadvantaged in the 2017 Disadvantaged Communities legislation
- Tribal lands

Equity Priority Communities (EPCs) were designated by MTC in the Bay Area 2050+ Plan as areas deserving of priority. This designation was a result of a demographic analysis that met or exceeded these criteria:[12]

- 72% people of color and 24% low-income households[13]
- 24% low-income and three of the following:
    - 11% limited English proficiency
    - 16% zero vehicle households
    - 10% age 75 or older
    - 12% people with disabilities
    - 16% single parent families
    - 14% severely rent-burdened households[14]

Within the Caltrans service area, 28% of the population live in an EPC, and 10.5% live in a CDC. Many tracts have both designations; they are not mutually exclusive. These areas are shown in **Figure 4.**

[10] California Office of Environmental Health Hazard Assessment. (2023). *CalEnviroScreen 4.0*. https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40.

[11] California Office of Environmental Health Hazard Assessment. (2022). *SB 535 Disadvantaged Communities*. https://oehha.ca.gov/calenviroscreen/sb535

[12] Metropolitan Transportation Commission. (2024). *Spatial-Analysis-Mapping-Projects: MTC Plan Bay Area 2050+ Equity Priority Communities*. https://bayareametro.github.io/Spatial-Analysis-Mapping-Projects/Project-Documentation/Equity-Priority-Communities/#summary-of-mtc-epc-demographic-factors--demographic-factor-definitions

[13] Defined as having a household income below 200% of the Federal Poverty Level.

[14] Defined as renters paying at least 50% of their income for rent, as a portion of all households (both renters and owners).

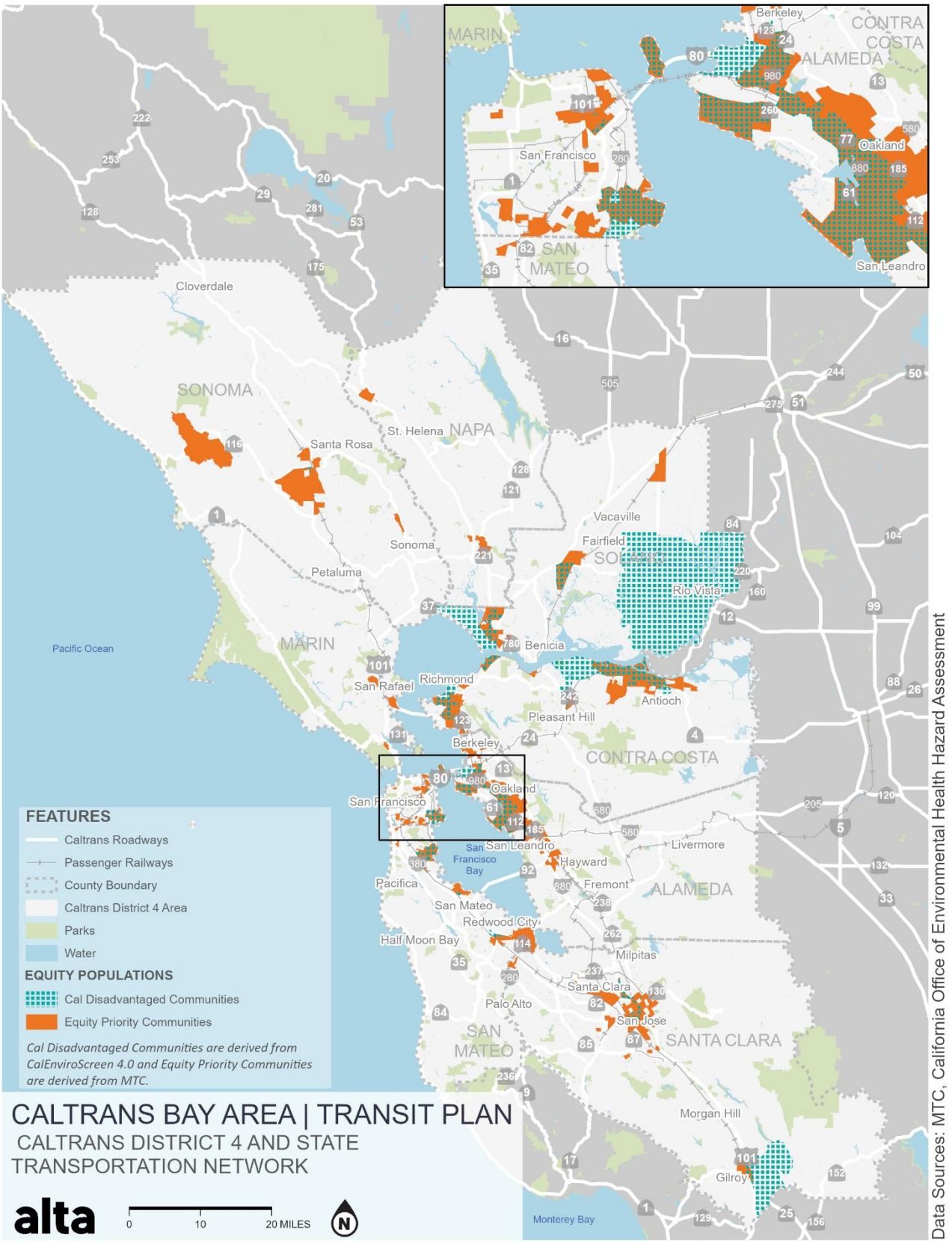

Figure 4: Equity Priority Communities

Children and Youth (under 18)

Figure 5 provides a summary of proportions of children and youth (under 18 years of age) in the Bay Area. Within the service area, 19.2% of residents, or about 393,000 people, are under the age of 18. The cities of Fremont and Livermore in Alameda County, as well as Concord in Contra Costa County, have the highest proportions of children according to the 2022 ACS. The lowest proportions of children are found in San Francisco and many parts of Napa County.[15]

Young Adults (Ages 18 to 24)

In the Caltrans service area, 8.1% of residents, or about 162,000 people, are between the ages of 18 and 24. As shown in Figure 6, young adults are clustered around the university campuses of California State University – East Bay, San José State University, Santa Clara University, San Francisco State University, Stanford University, and University of California – Berkeley, as well as surrounding the US Coast Guard Station at Vallejo. Smaller pockets of young adults are also found throughout the Bay Area.[16]

Seniors (Age 65 and over)

About 14.9% of the population of the Caltrans service area, or 304,000 people, are aged 65 or older (ACS, 2022). This is slightly lower than the proportion of seniors in the Bay Area region overall. Figure 7 demonstrates that the Bay Area region has several areas with high shares of seniors, with over 20% in Sonoma and Marin County as well as West Santa Clara County. The lowest proportion of senior residents are found in San José and San Francisco and eastern Alameda County.[17]

[15] US Census Bureau. (2023). *American Community Survey 5-Year Data (2009-2022)* [Table S0101], 2022. https://www.census.gov/data/developers/data-sets/acs-5year.html.
[16] Ibid, 2023.
[17] Ibid, 2023.

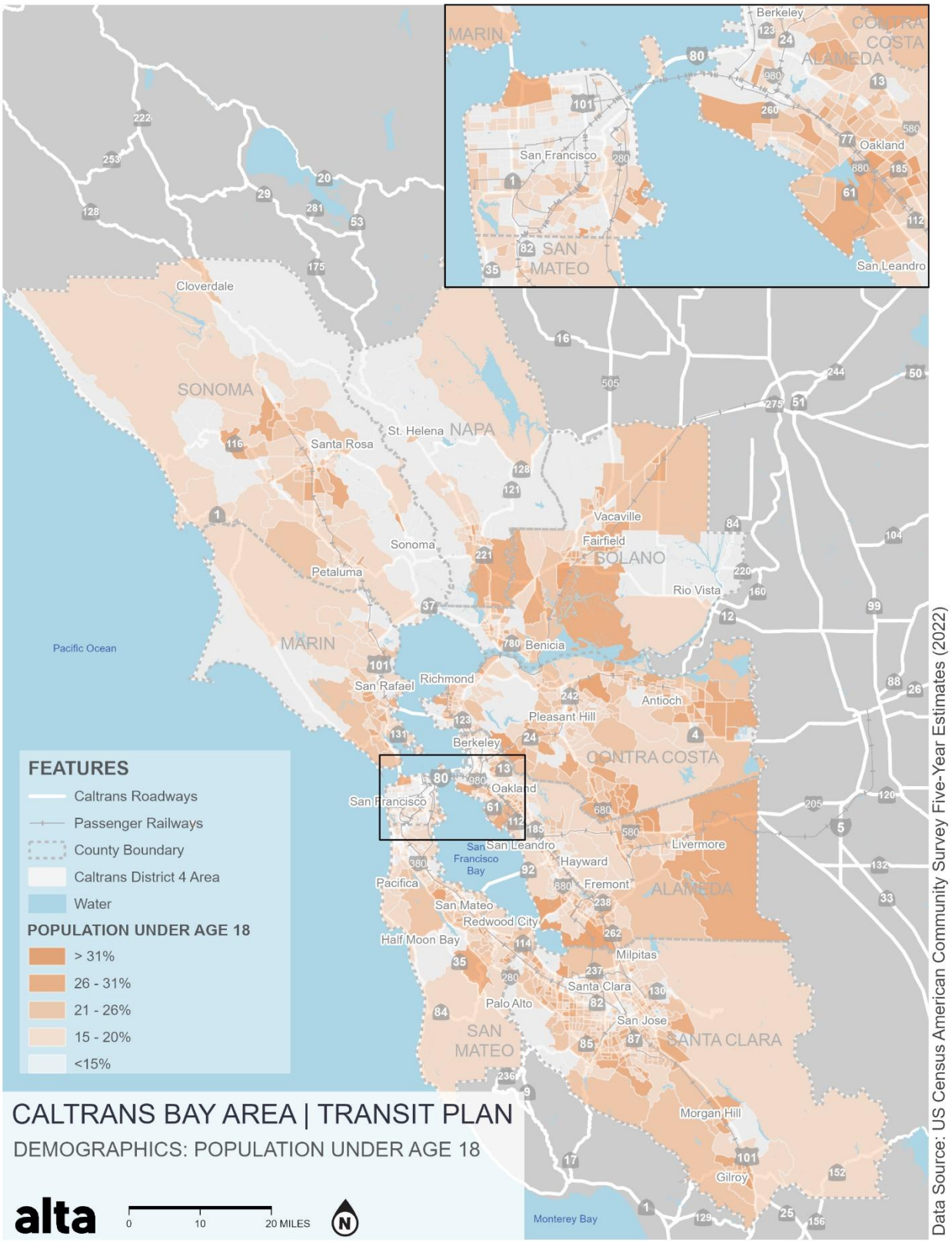

Figure 5: Concentration of population under 18

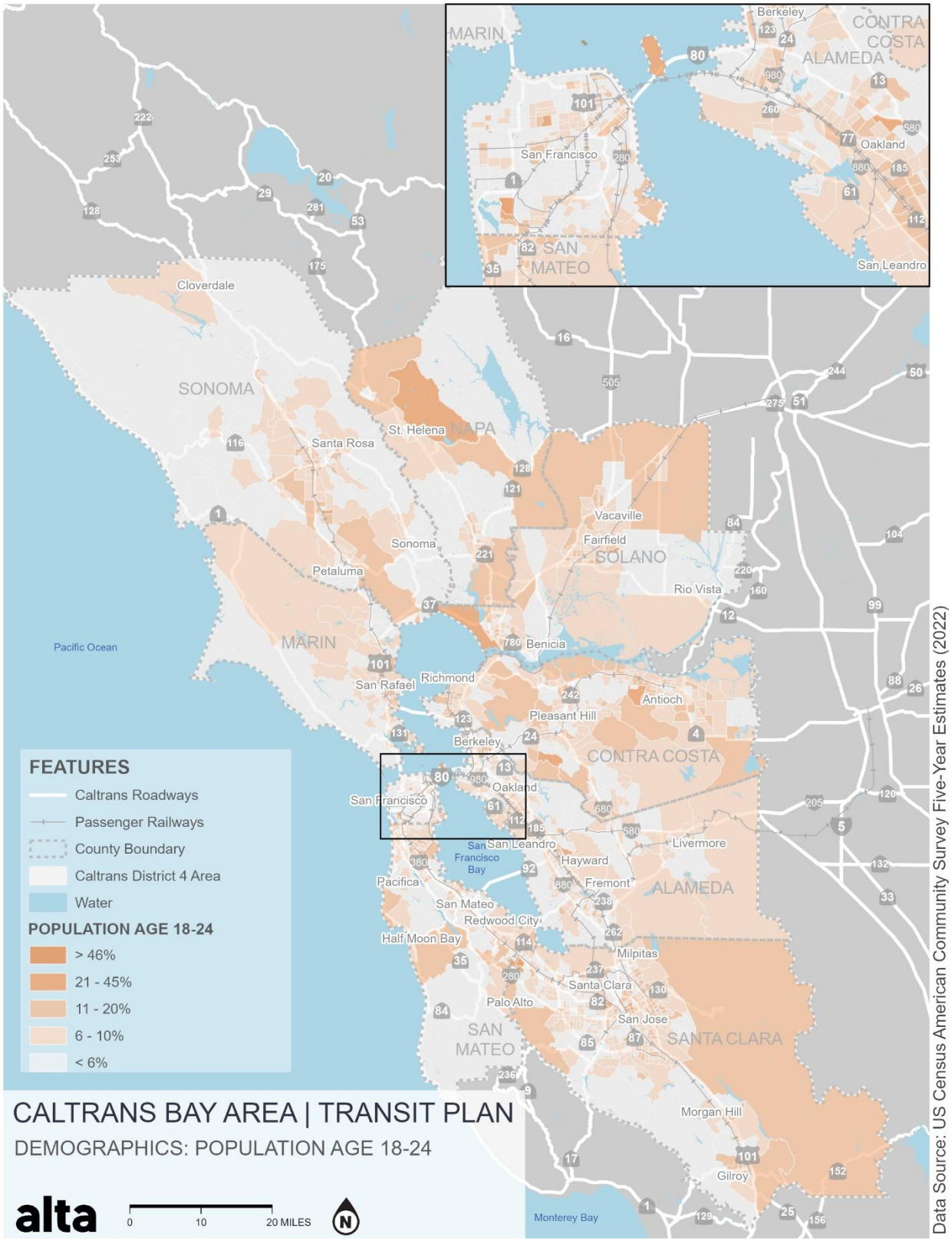

Figure 6: Concentration of population age 18-24

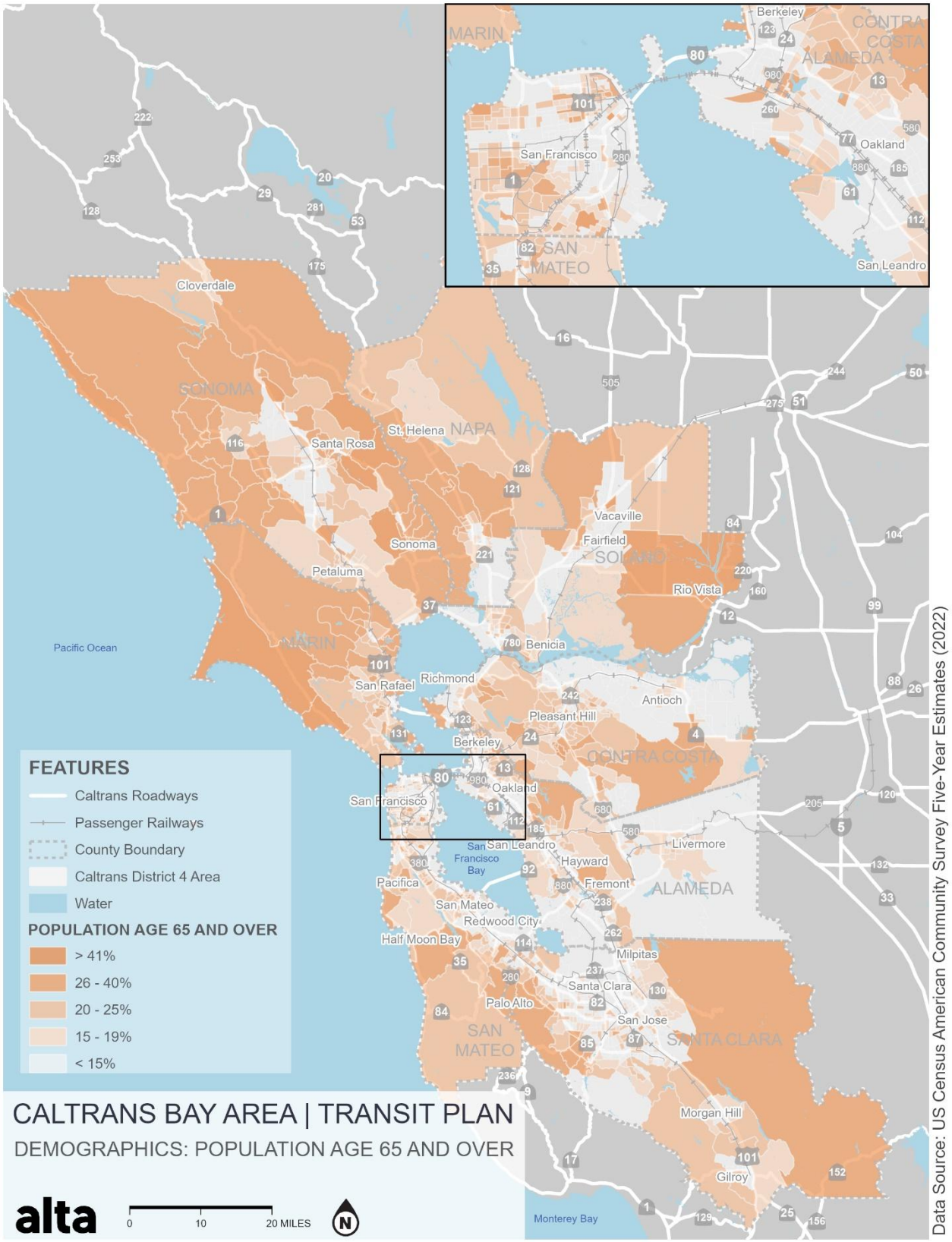

Figure 7: Concentration of population over age 65

Transit Generators

The Bay Area is home to a wealth of destinations that drive transportation activity including by transit. This analysis focused on understanding employment density throughout the region to identify clusters of current and potential transit activity (based on the presence of transit generators including location of large employers). The analysis also reviewed additional destinations that are likely to attract transit riders—such as hospitals, supermarkets, shopping malls, colleges and universities, high schools, and stadiums—to determine where improvements could benefit the greatest number of current and potential transit riders.

General Findings

The City/County of San Francisco and other large cities, such as Oakland in Alameda County and San José in Santa Clara County, are home to major employment centers and other regional destinations that tend to generate transit ridership. Destinations along US-101 in San Francisco, Marin, and Sonoma counties also drive transit activity, with several clusters of employment and community-serving businesses and institutions. I-880 in the East Bay as well as SR-82 and SR-85 connecting cities in Silicon Valley are also rich with destinations that have the potential to generate transit trips.

Data Analysis

Population Density

Population density is an important driver of transit demand. Denser areas can support more frequent transit more efficiently because there are more people making trips to and from the same places. Travel by private vehicle is also less convenient in denser areas due to congestion and parking concerns, giving transit another advantage. **Figure 8** through **Figure 12** show population density through the region overlaid with MTC's Transit Priority Areas.[18] As shown the Transit Priority Areas tend to be in higher-density areas. As noted **Table 1** and the figures previously referenced, the highest-density census tracts are in Oakland and Berkeley in Alameda County, San José in Santa Clara County, San Rafael in Marin County, and San Francisco. San Francisco leads the region in density of both people and housing units.

Table 1: Top 50 Block Groups Based on Population Density

GEOID	City/Area Name	County	Persons per Acre
GEOID060750601001	Downtown	San Francisco County	640.0
GEOID060750123012	Downtown	San Francisco County	277.4
GEOID060750122012	Downtown	San Francisco County	275.9
GEOID060750125021	Downtown	San Francisco County	258.9
GEOID060750611002	Downtown	San Francisco County	251.4
GEOID060750125022	Downtown	San Francisco County	245.9
GEOID060750124012	Downtown	San Francisco County	237.3
GEOID060750107004	Downtown	San Francisco County	225.9
GEOID060750119012	Downtown	San Francisco County	210.1
GEOID060750119021	Downtown	San Francisco County	192.1
GEOID060750124011	Downtown	San Francisco County	185.4
GEOID060750123021	Downtown	San Francisco County	182.9

[18] Defined as areas located within ½ mile of a major transit stop which are rail/BRT stops or stops that have service better than 15 minutes

GEOID	City/Area Name	County	Persons per Acre
GEOID060750122011	Downtown	San Francisco County	179.2
GEOID060750332042	Downtown	San Francisco County	178.1
GEOID060855009022	South University San Jose	Santa Clara County	168.7
GEOID060750121001	Downtown	San Francisco County	161.2
GEOID060750122021	Downtown	San Francisco County	155.1
GEOID060750611003	Downtown	San Francisco County	150.9
GEOID060750125011	Downtown	San Francisco County	149.2
GEOID060816008001	Downtown	San Mateo County	148.1
GEOID060750120002	Downtown	San Francisco County	147.4
GEOID060750113001	Downtown	San Francisco County	145.3
GEOID060014034004	Oakland	Alameda County	143.6
GEOID060750119011	Downtown	San Francisco County	138.1
GEOID060750107003	Downtown	San Francisco County	130.5
GEOID060014228002	Berkeley	Alameda County	128.2
GEOID060411122012	San Rafael Creek Area	Marin County	125.8
GEOID060750112001	Downtown	San Francisco County	120.6
GEOID060750108002	Downtown	San Francisco County	119.6
GEOID060750107002	Downtown	San Francisco County	117.3
GEOID060014034003	Oakland	Alameda County	115.8
GEOID060014228001	Berkeley	Alameda County	111.1
GEOID060750120001	Downtown	San Francisco County	110.8
GEOID060750118001	Downtown	San Francisco County	110.5
GEOID060014227003	Berkeley	Alameda County	108.8
GEOID060133361023	Concord	Contra Costa County	108.8
GEOID060750163003	Lower Haight	San Francisco County	107.2
GEOID060750161004	Japan Town	San Francisco County	106.8
GEOID060750124023	Downtown	San Francisco County	106.0
GEOID060750112002	Downtown	San Francisco County	103.6
GEOID060750229013	Dolores Height	San Francisco County	103.5
GEOID060750159002	Japan Town	San Francisco County	101.6
GEOID060750121002	Downtown	San Francisco County	101.3
GEOID060750113002	Downtown	San Francisco County	100.4
GEOID060750131012	Downtown	San Francisco County	99.3
GEOID060014062013	Fruitvale	Alameda County	99.2
GEOID060750110002	Downtown	San Francisco County	99.0
GEOID060750201004	Mission District	San Francisco County	97.9
GEOID060750176015	Downtown	San Francisco County	97.2

Employment Density

As noted in **Figure 13** through **Figure 16,** the highest concentrations of jobs in the region per square mile are found in San Francisco, as well as, Oakland, San José, Menlo Park, Palo Alto, Walnut Creek, and Berkeley.[19] Many jobs are found in and around the SR-82 and I-880 corridors. Smaller clusters of jobs are also found along the US-101 corridor in Marin and Sonoma counties. These maps reflect job locations in 2021, the latest year for which data is available. It should be noted that post-pandemic work locations for many workers were still in flux at this time, and commute and travel patterns may have shifted since then.

Other Ridership Generators

The analysis also identified the following major transit-generating destinations in the Caltrans service area: hospitals, supermarkets, shopping malls, colleges and universities, high schools, and stadiums.[20] These destinations, shown in **Figure 17** through **Figure 20**, tend to generate ridership and induce transit demand in different ways: stadiums create surges of demand before and after special events, while hospitals, high schools, and colleges generate steady ridership from commuters and students, albeit at different hours of the day and somewhat seasonally. Visits to supermarkets and shopping malls, on the other hand, are often in the midday or on weekends. The number of trips to these destinations ranges significantly. For example, University of California – Berkeley is a much larger transit-generating destination than a neighborhood-serving high school.

The data indicated large clusters of transit generators along US-101 in San Francisco as well as along the SR-82 corridor in San Mateo County, SR-85 connecting Silicon Valley cities, and San Pablo Avenue in the East Bay.[21] A list of generators is provided in the Appendix.

[19] US Census Bureau. (2022). *LEHD Snapshot Release S2022*. [Computer file], U.S. Census Bureau Center for Economic Studies Research Data Centers [distributor], Washington, DC.

[20] OpenStreetMap contributors. (2024). *OpenStreetMap* [Data set]. OpenStreetMap Foundation. Available as open data under the Open Data Commons Open Database License (ODbL) at openstreetmap.org.

[21] OpenStreetMap contributors. (2024). *OpenStreetMap* [Data set]. OpenStreetMap Foundation. Available as open data under the Open Data Commons Open Database License (ODbL) at openstreetmap.org.

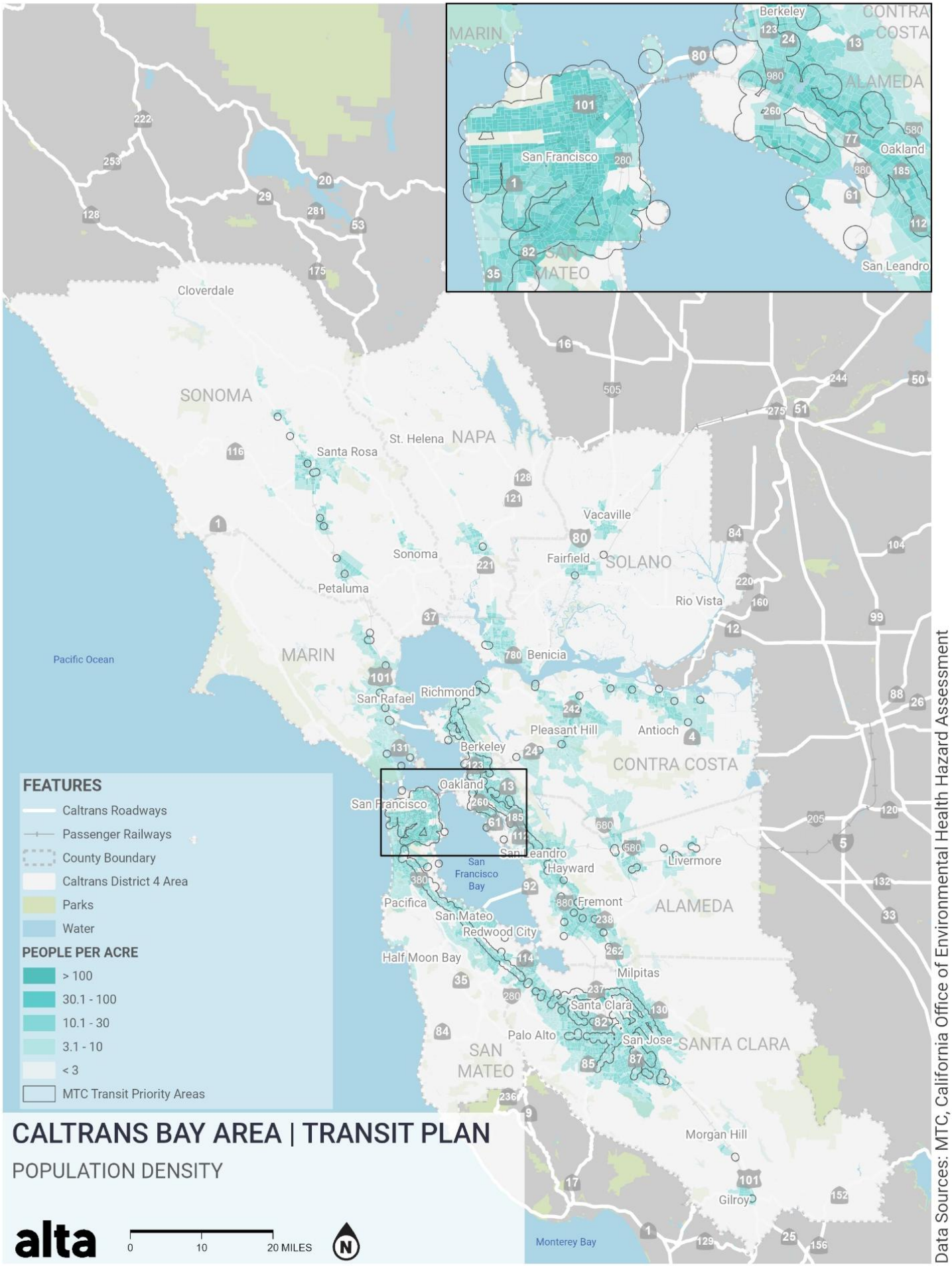

Figure 8: Population density

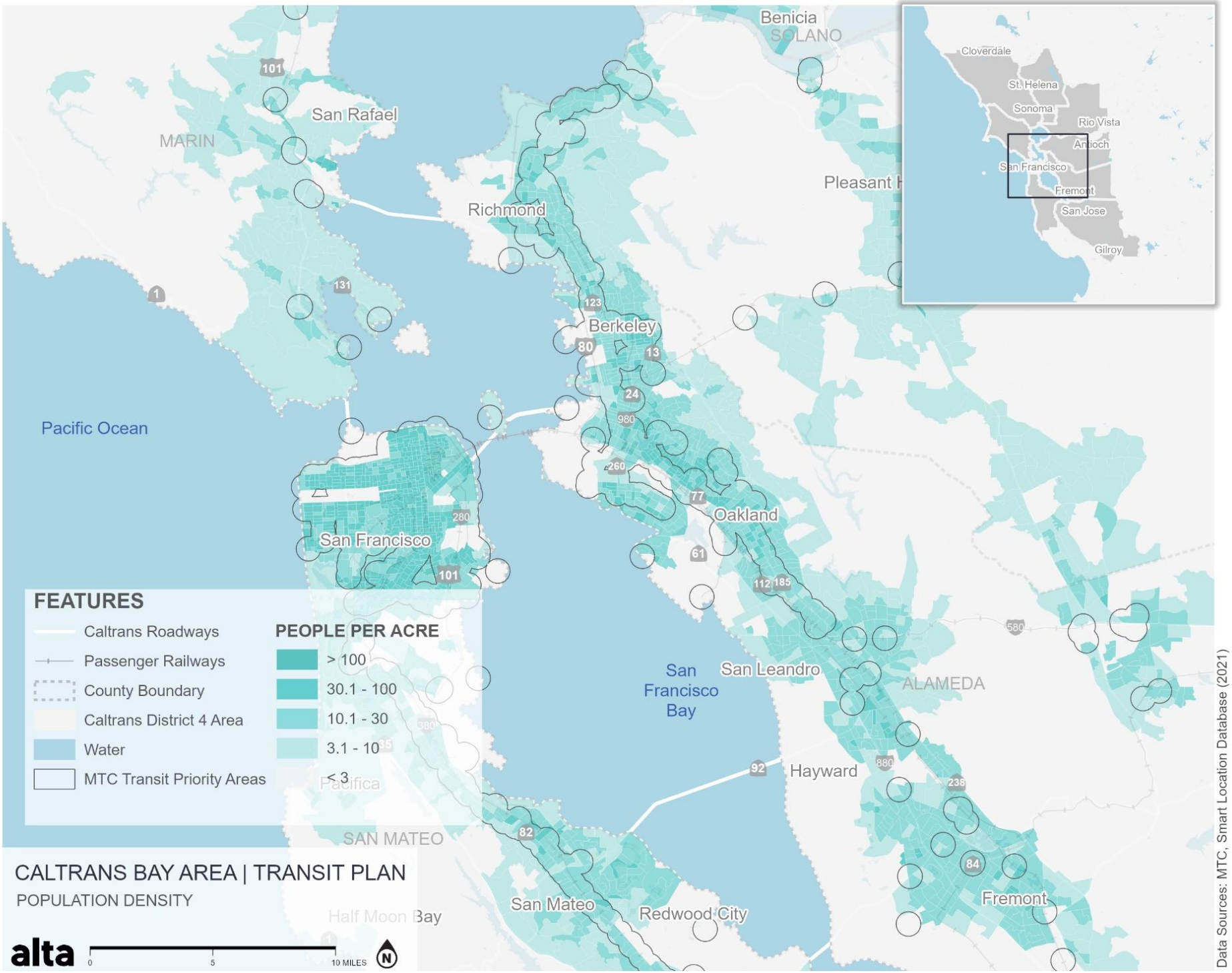

Figure 9: Transit generators – population density (CORE)

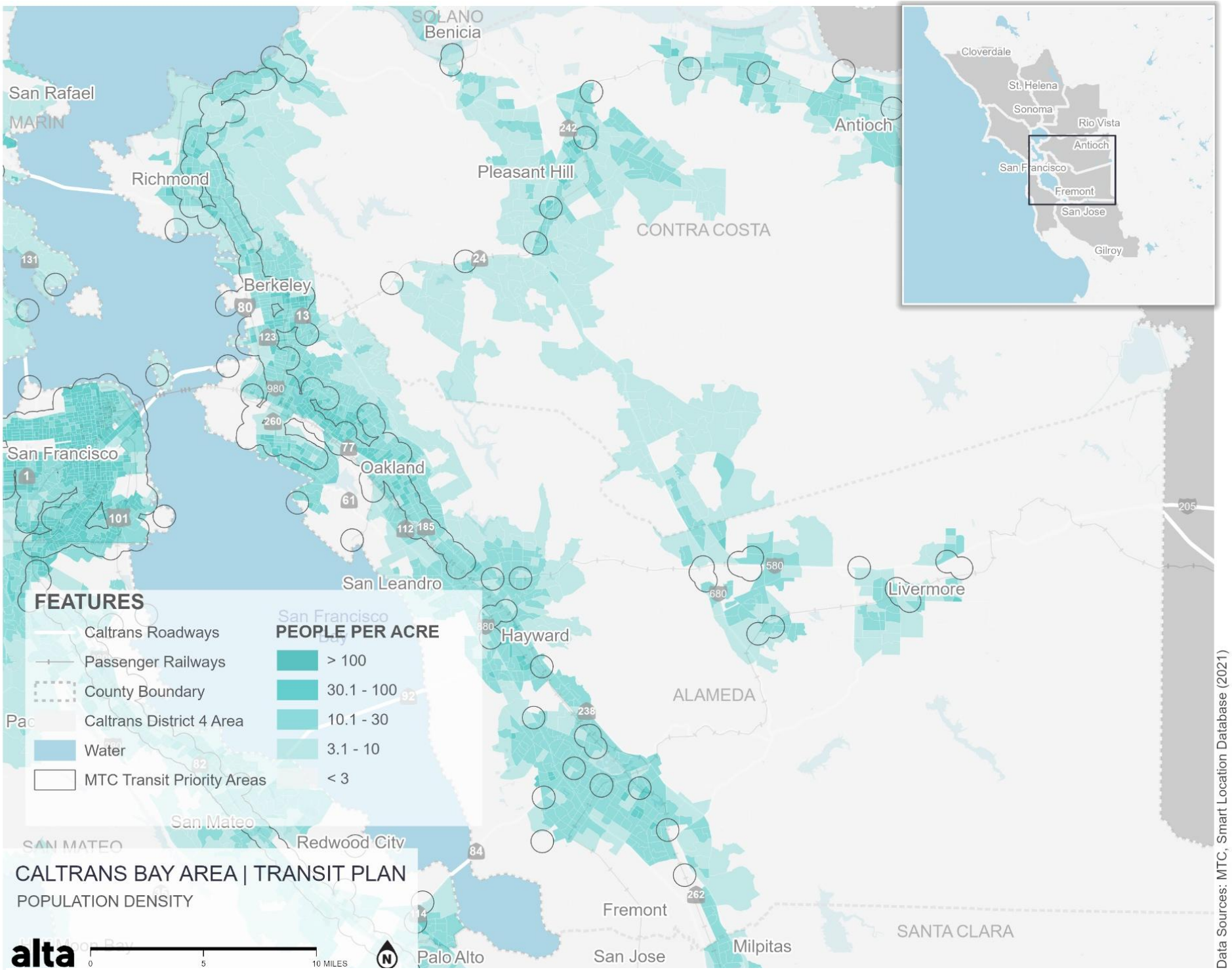

Figure 10: Transit generators – population density (EAST)

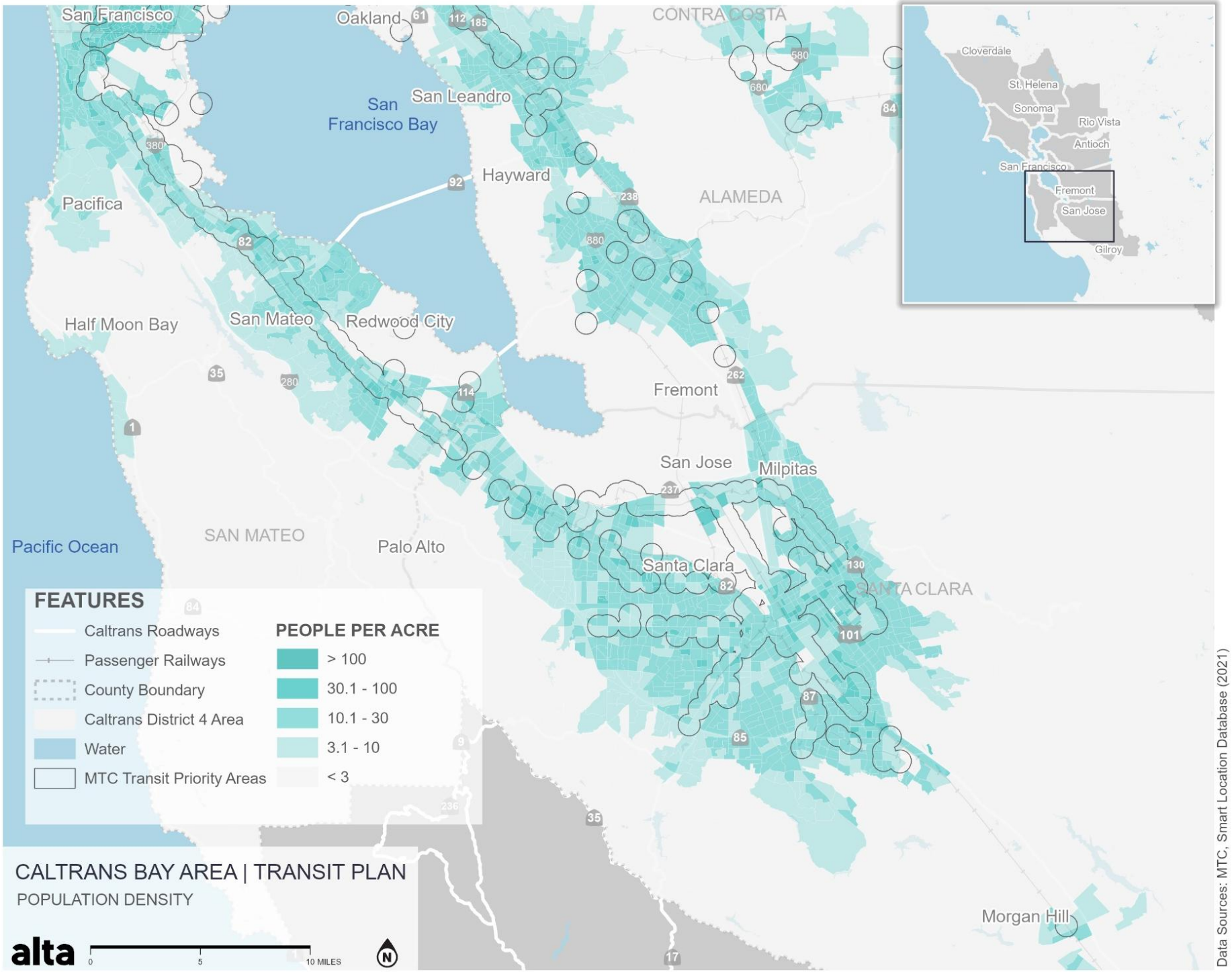

Figure 11: Transit generators – population density (SOUTH)

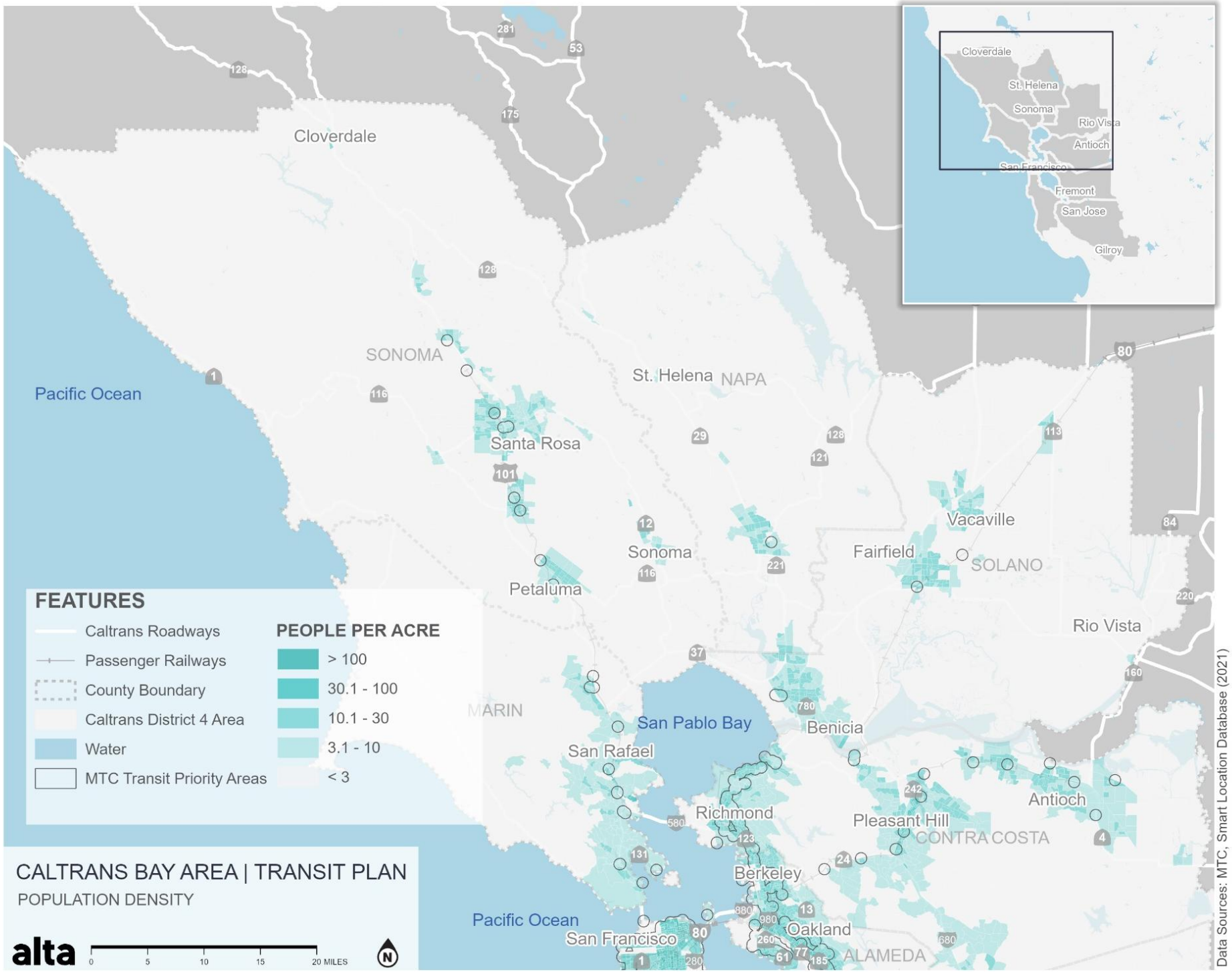

Figure 12: Transit generators – population density (NORTH)

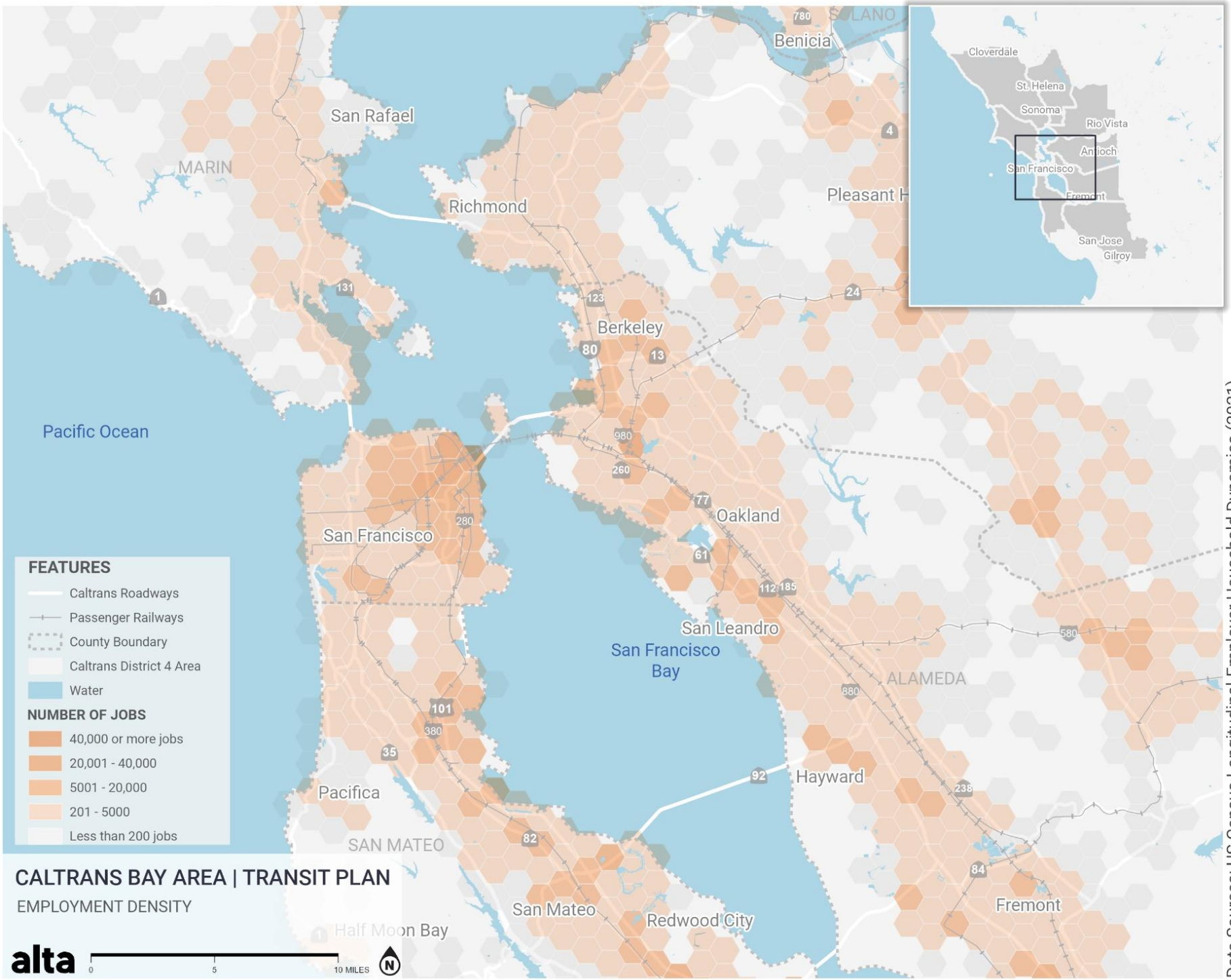

Figure 13: Transit generators – employment density (CORE)

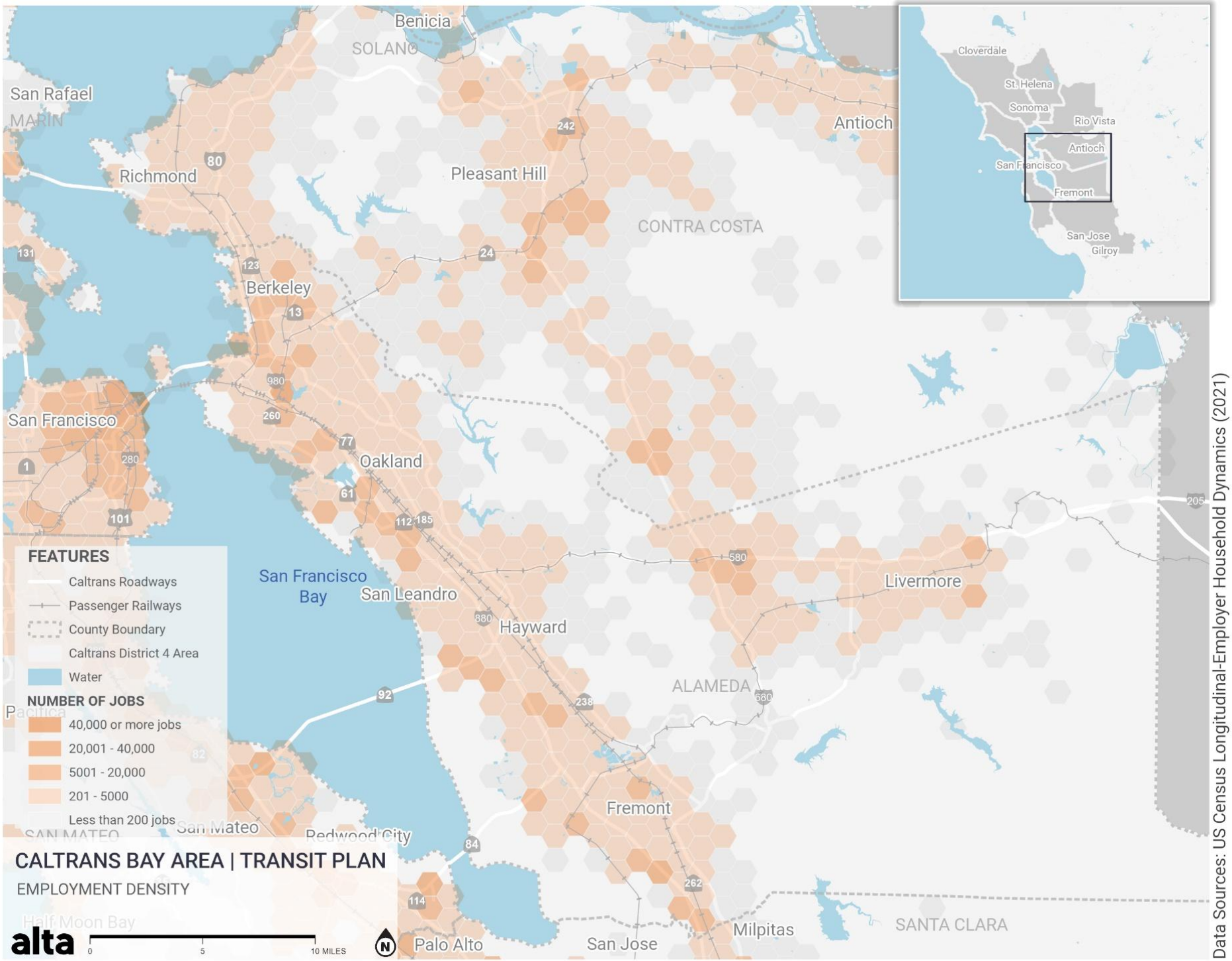

Figure 14: Transit generators - employment density (EAST)

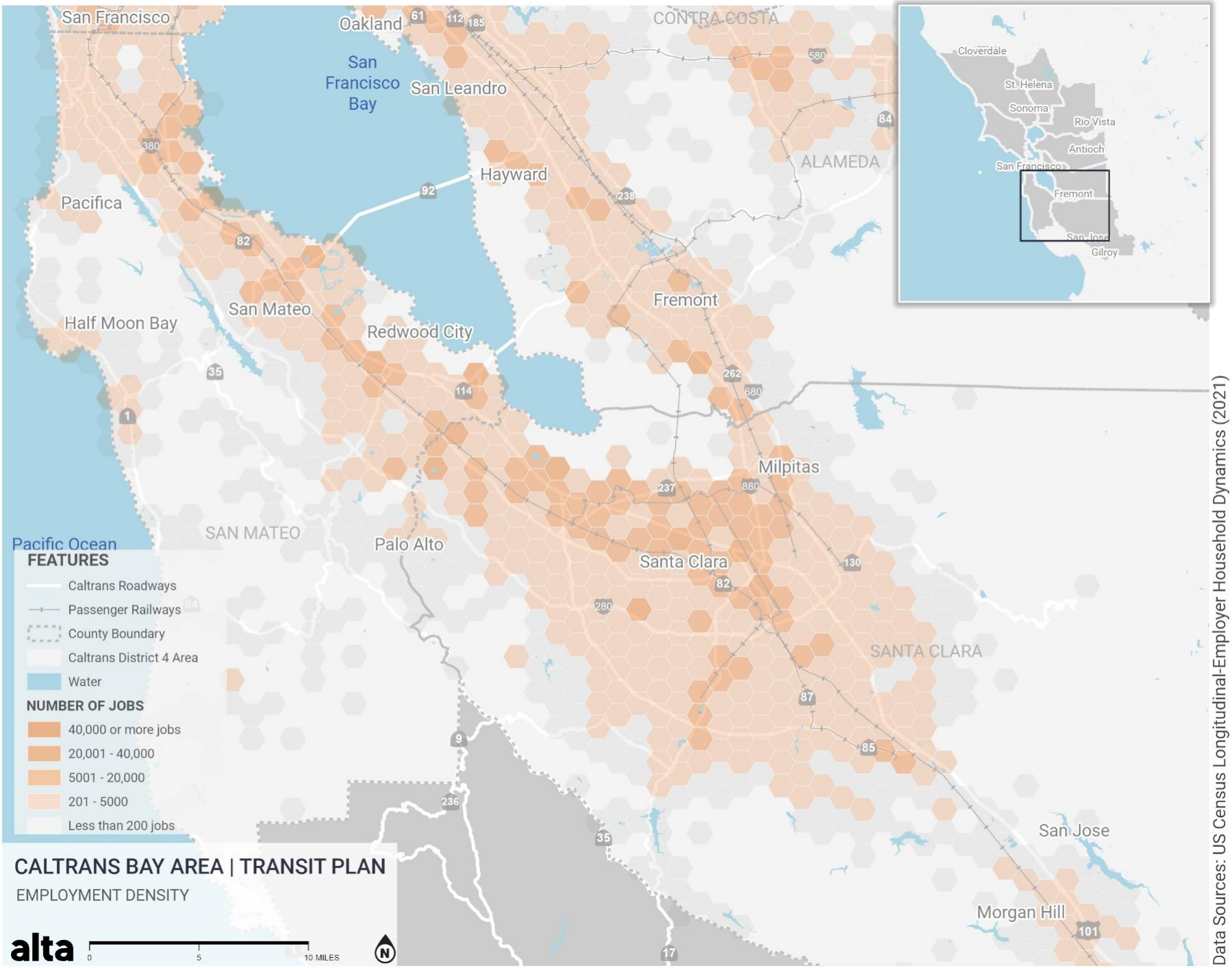

Figure 15: Transit generators - employment density (SOUTH)

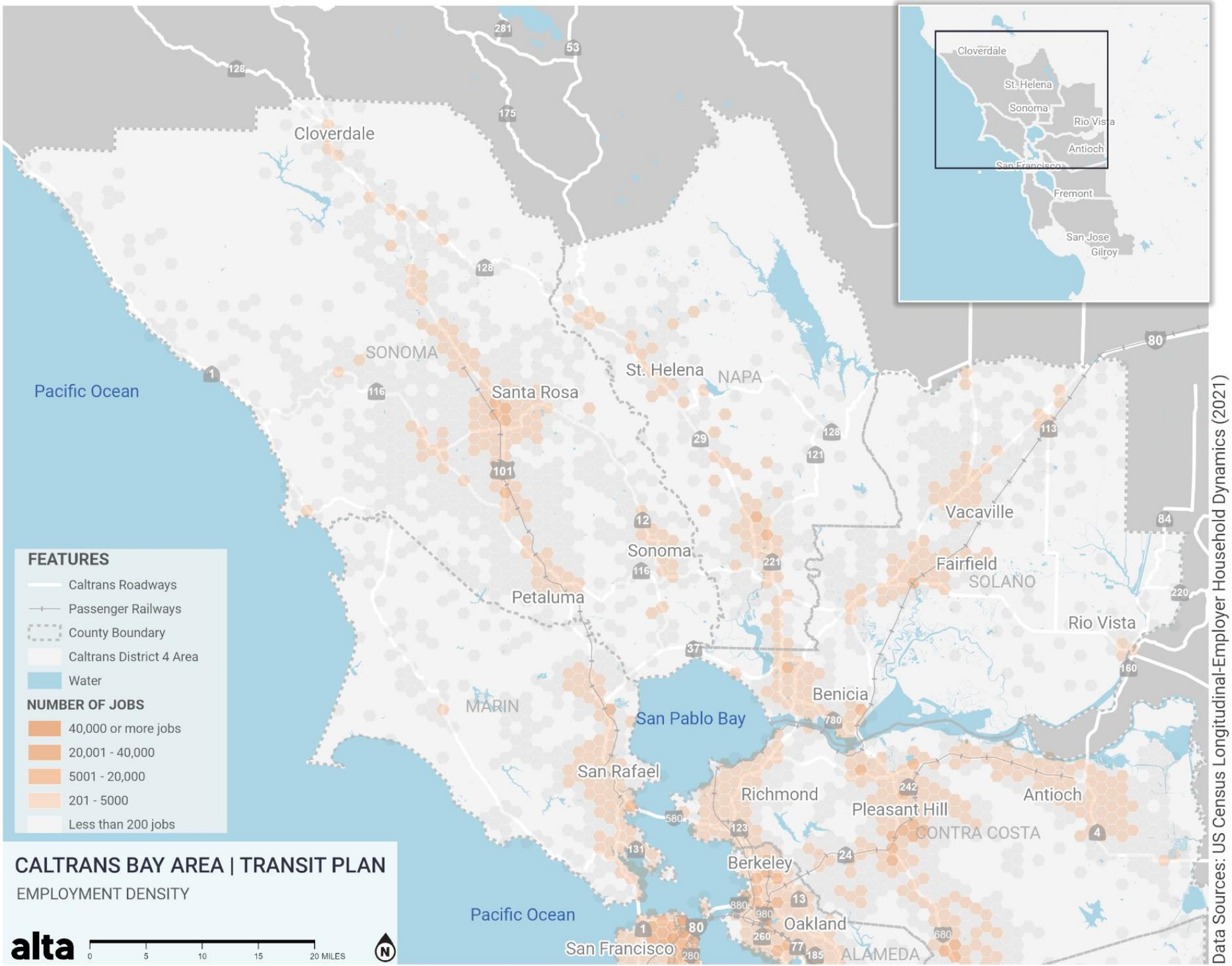

Figure 16: Transit generators – employment density (NORTH)

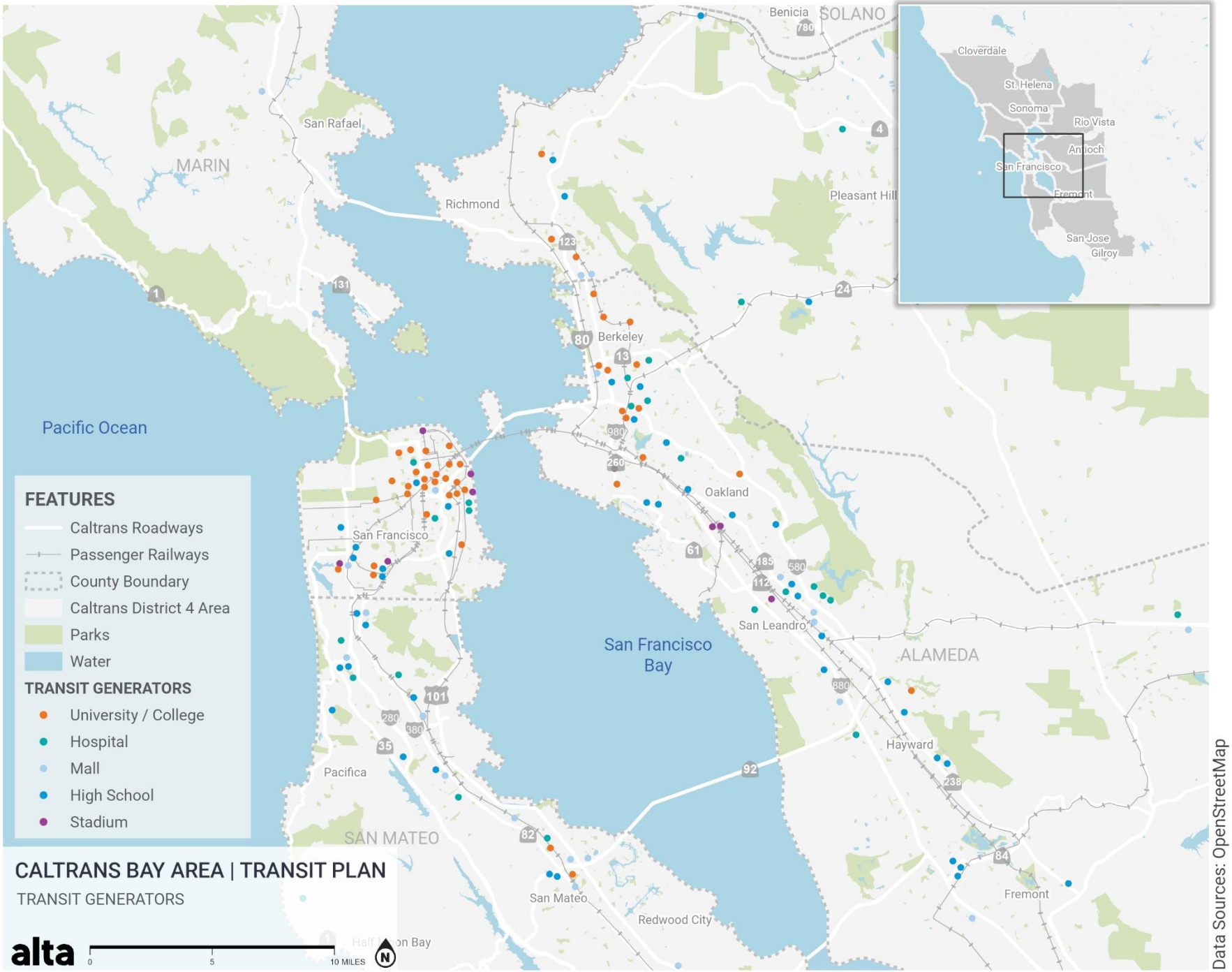

Figure 17: Transit generators - regional destinations (CORE)

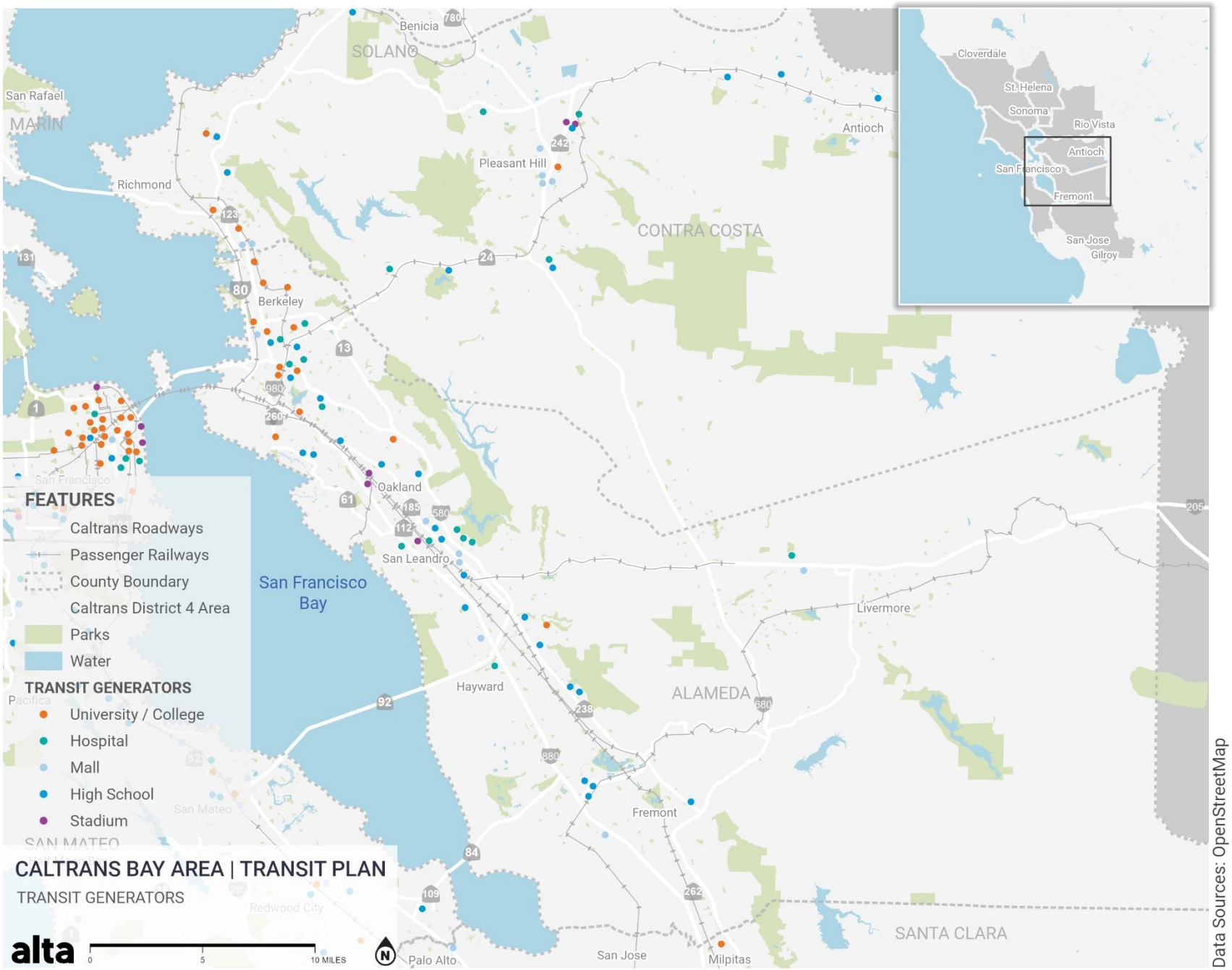

Figure 18: Transit generators - regional destinations (EAST)

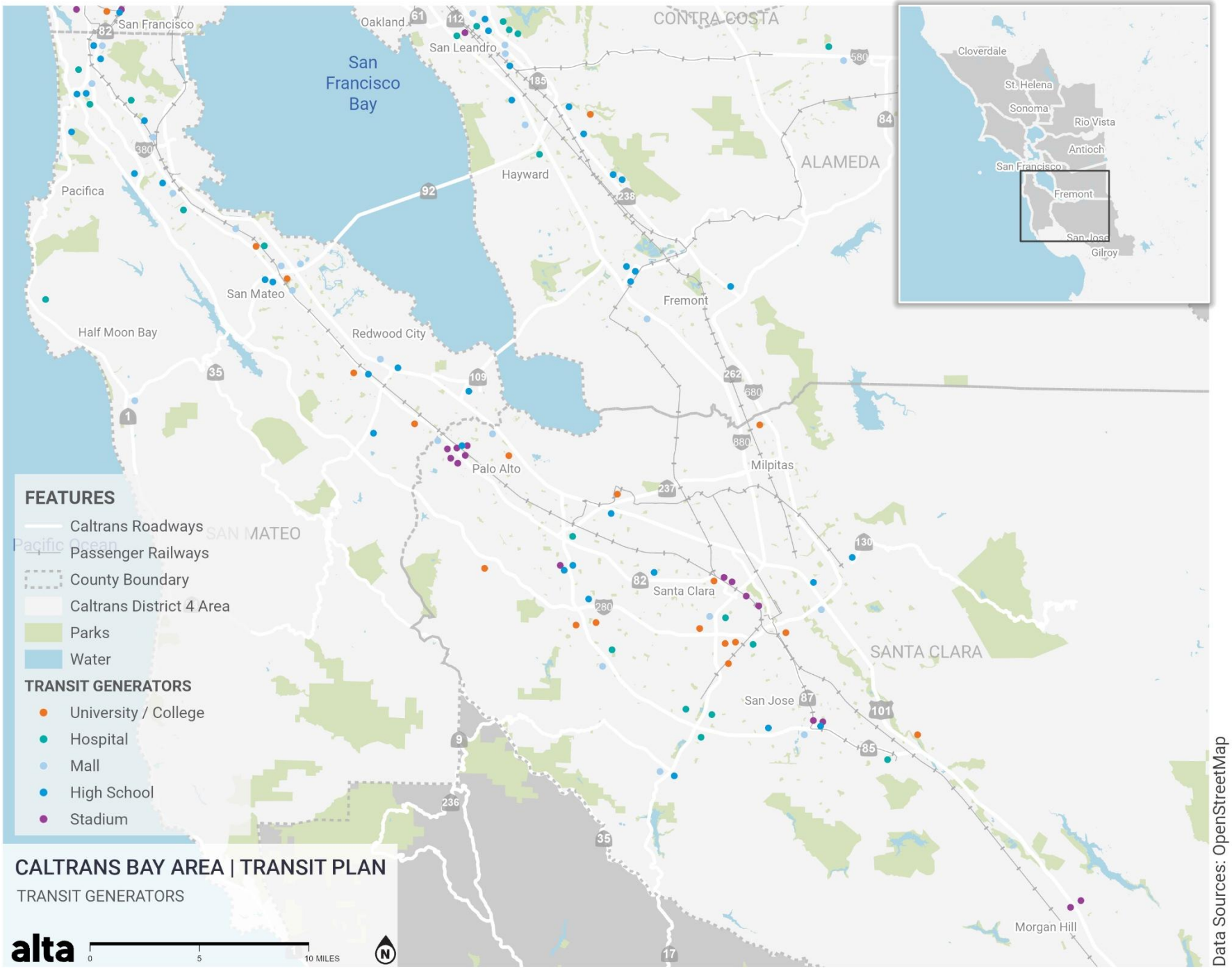

Figure 19: Transit generators - regional destinations (SOUTH)

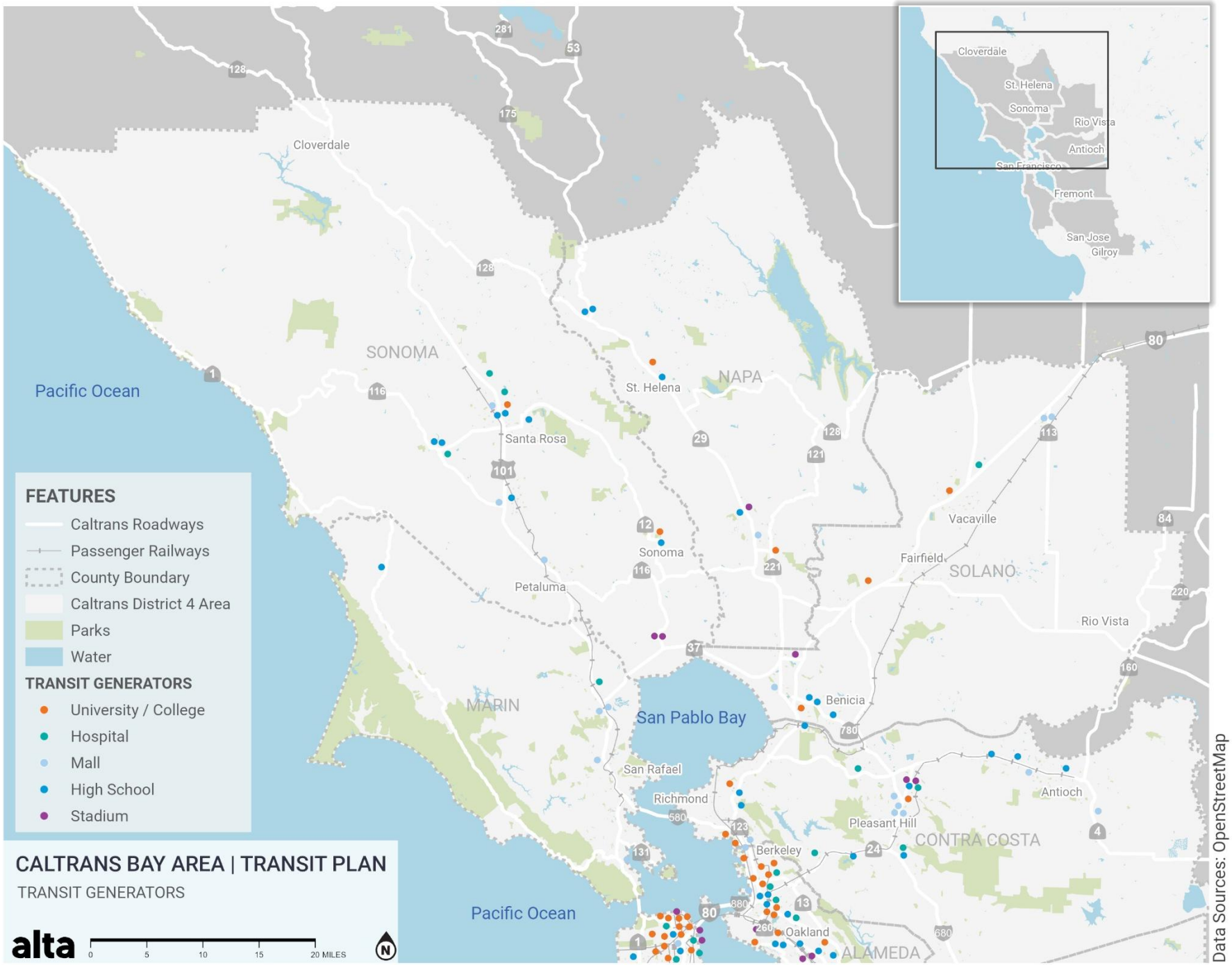

Figure 20: Transit generators - regional destinations (NORTH)

Transit Priority Infrastructure and Service

Alta conducted an analysis of current and planned transit service in the Bay Area, TPI, and common bottlenecks where improvements may be justified. To this end, Alta worked with local and regional stakeholders and transit operators to collect and aggregate the data. The following section provides a summary of findings.

General Findings

The Caltrans service area is well covered by transit, with the most robust service in San Francisco, Alameda, Contra Costa, and Santa Clara counties. Local services are primarily focused on serving major cities in these counties, connecting BART stations to surrounding destinations and employment clusters. There are services that are geared to major corridors providing regular all day service along a corridor. Transbay service connects east-bay residential communities and job centers along the Peninsula. Intercity, commuter rail, DMU rail, heavy metro rail, and light rail services provide a higher speed and higher capacity connection between communities as well as within communities.

Based on frequency, Downtown San Francisco, where multiple lines converge along a small number of streets and rail corridors, has the most frequent rail and bus service with train service every three minutes and bus service every five minutes, on average. In suburban San Mateo and Sonoma counties, routes along SR-1 and SR-116 offer regular 30-minute or better service, with higher frequencies during peak morning and afternoon commute periods. SR-29 in Napa County and segments of SR-116 in Sonoma County offer service approximately every half hour, offering the most frequent service among rural areas. Higher frequency services tend to have higher ridership as seen in many of the urban areas within District 4.H.

Transit Signal Priority is the most common TPI. The most robust networks of TSP-controlled right of way (ROW) is in the more urban parts of District 4. Transit vehicles also benefit from access to HOV/express lanes on freeways throughout District 4, although it's unclear how significantly this TPI impacts transit service delivery since transit vehicles must compete with private vehicles. Caltrans does track the degradation of HOV lane speed and District 4 HOV lanes are degraded, operating at an average speed of 45 miles per hour close to 20 percent of the time during peak periods[22]with lower speeds the remaining 80 percent of the time. Dedicated bus-only lanes are the least common, only existing in Alameda and San Francisco counties. Only Alameda-Contra Costa Transit (AC Transit) and San Francisco Municipal Transportation Agency (SFMTA) reported bus-only lanes in their districts. Several high-ridership corridors offer no TPI, including; Sloat Boulevard/SR-35 (San Francisco); East 14th Street/Mission Boulevard/SR-185/SR-238 (San Leandro//Hayward/other areas in Alameda County);) Thornton Avenue/SR-84 (Fremont); and Ashby Avenue/SR-13 (Berkeley).

Findings from the data received from transit agencies identified several corridors that exhibit bottlenecks and could benefit from enhanced TPI. Notably, SamTrans reports bottlenecks along El Camino Real, despite a high prevalence of TSP there. HOV or express lanes along SR-4, I-80, and I-680 were reported as bottlenecks that may benefit from dedicated transit lanes. The Richmond-San Rafael and Bay bridges were also identified as areas in need of TPI, along with segments of US-101 and I-280 in San Francisco. It is important to note, however, that this is not an exhaustive list of transit bottlenecks on this particular issue, as data was not received from every transit agency in the district.

[22] 2023 CA HOV Facilities Degradation Report figure 5

Data Analysis

Current Transit Service on STN (2023)

The Caltrans service area is well served by transit, with 27 public transit service agencies. The BART rail service provides a regional rail network with bus service connecting BART stations to major destinations in the surrounding areas. Transit service is most robust in San Francisco, Alameda, west Contra Costa, and north Santa Clara counties. The maps in **Figure 21** through **Figure 28** show bus route and rail alignments, as of December 2023.

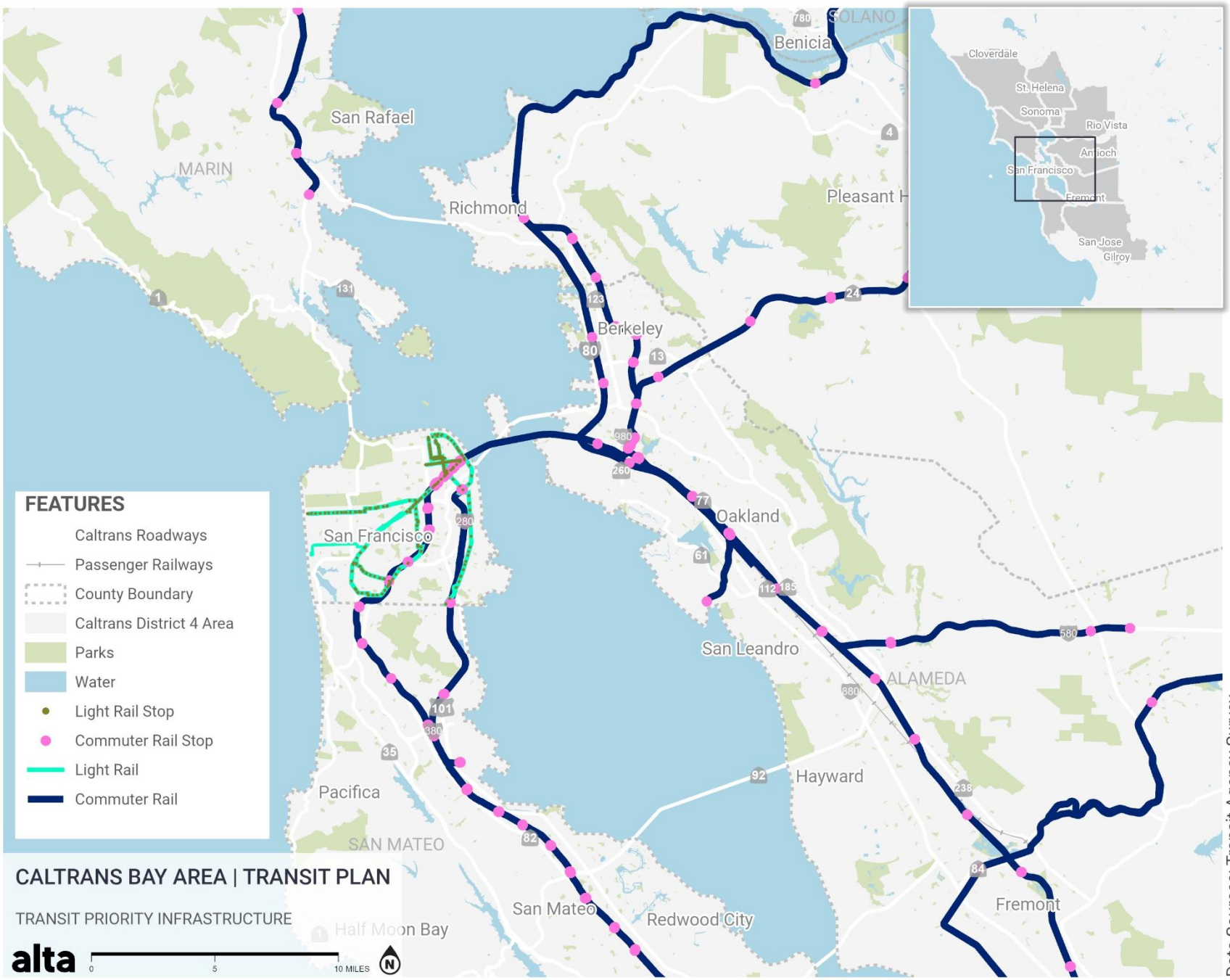

Figure 21: Passenger rail routes (CORE)

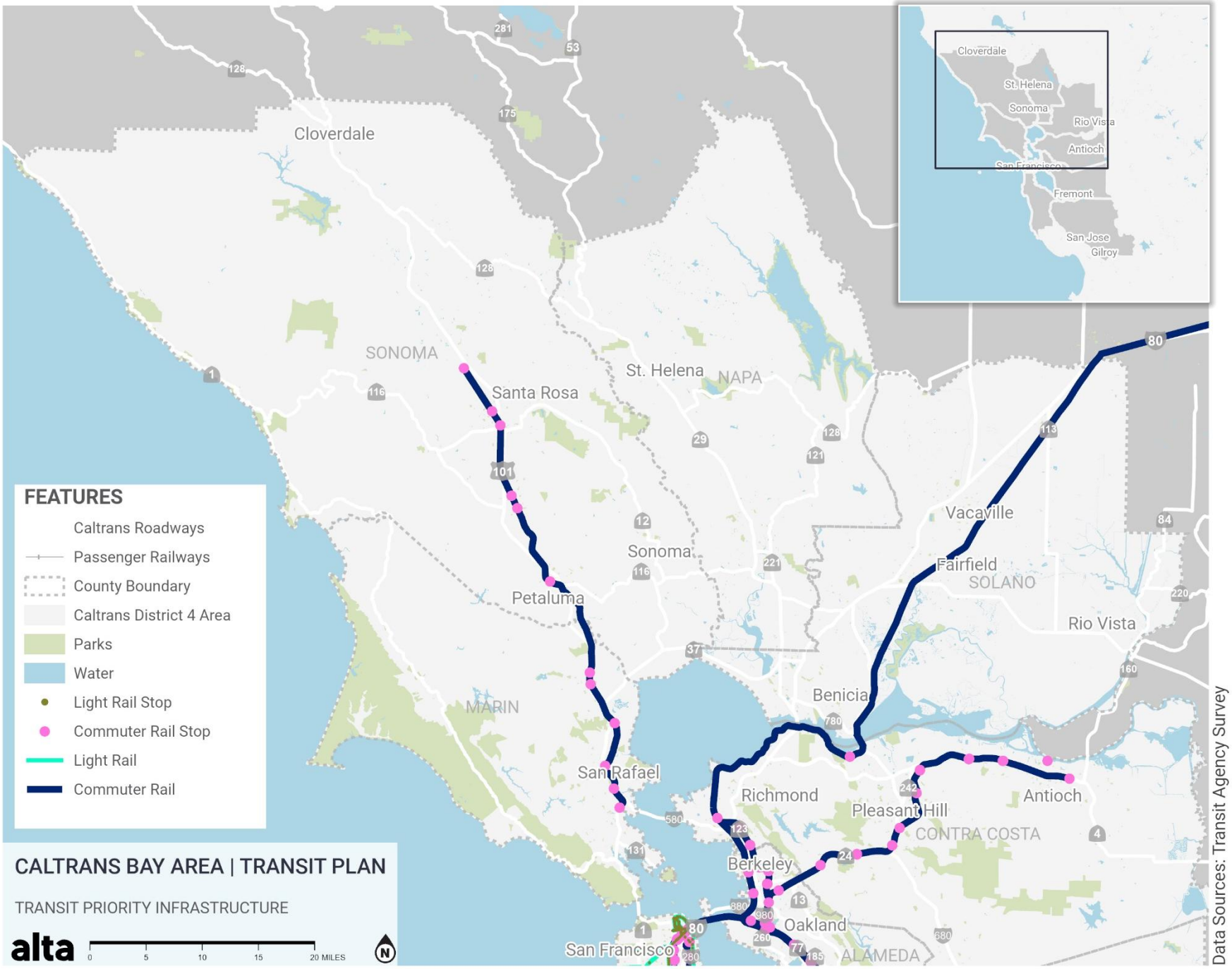

Figure 22: Passenger rail routes (NORTH)

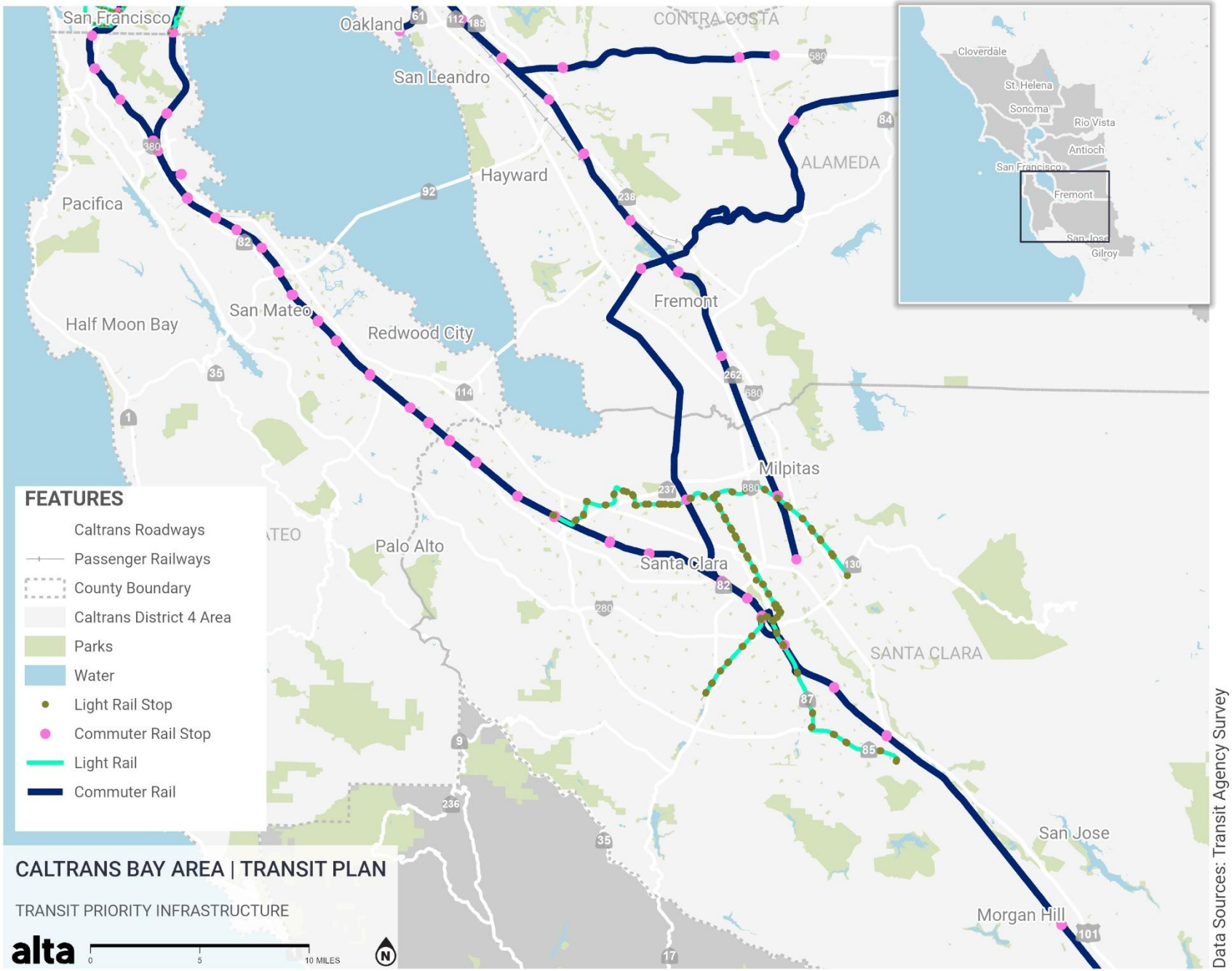

Figure 23: Passenger rail routes (SOUTH)

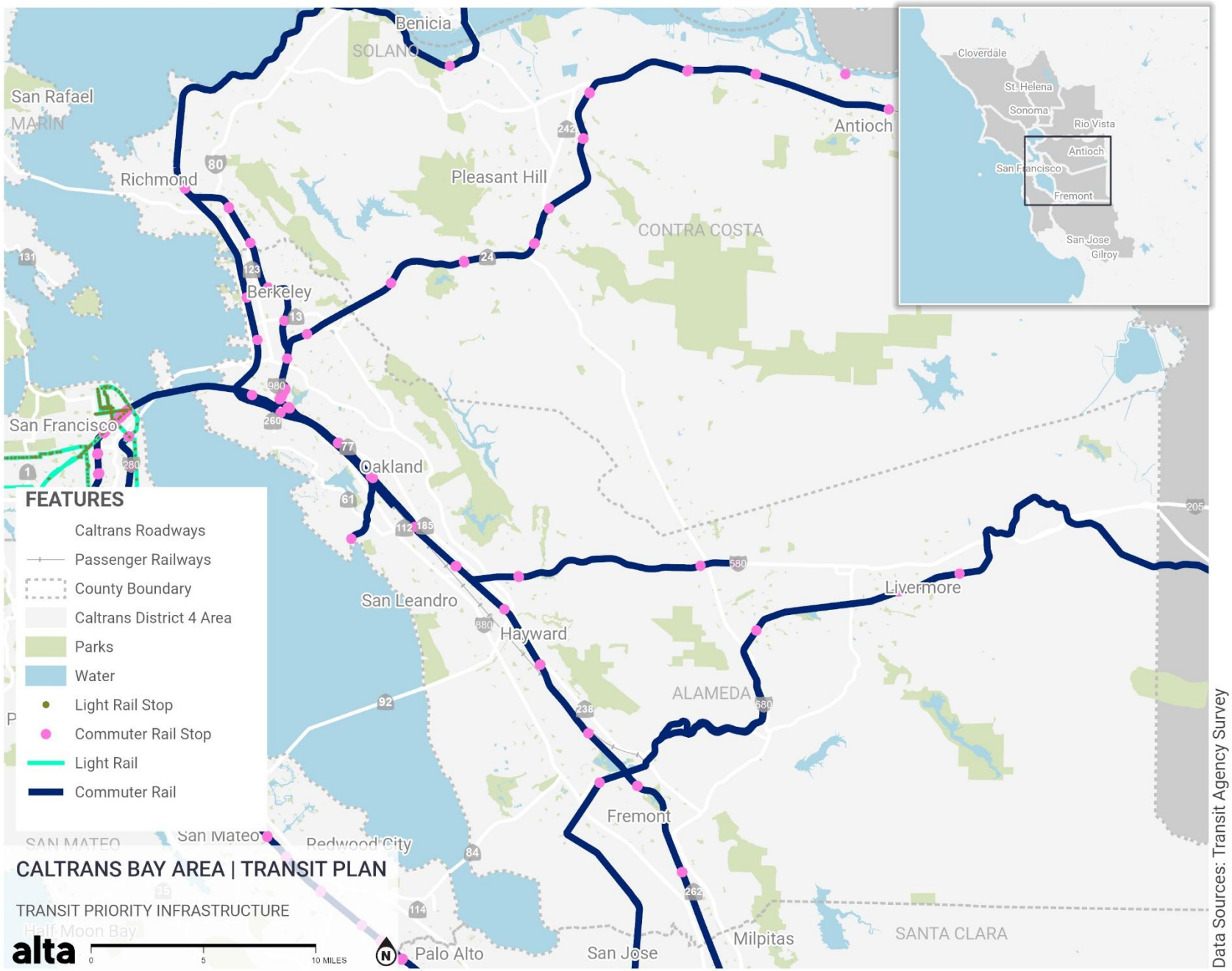

Figure 24: Passenger rail routes (EAST)

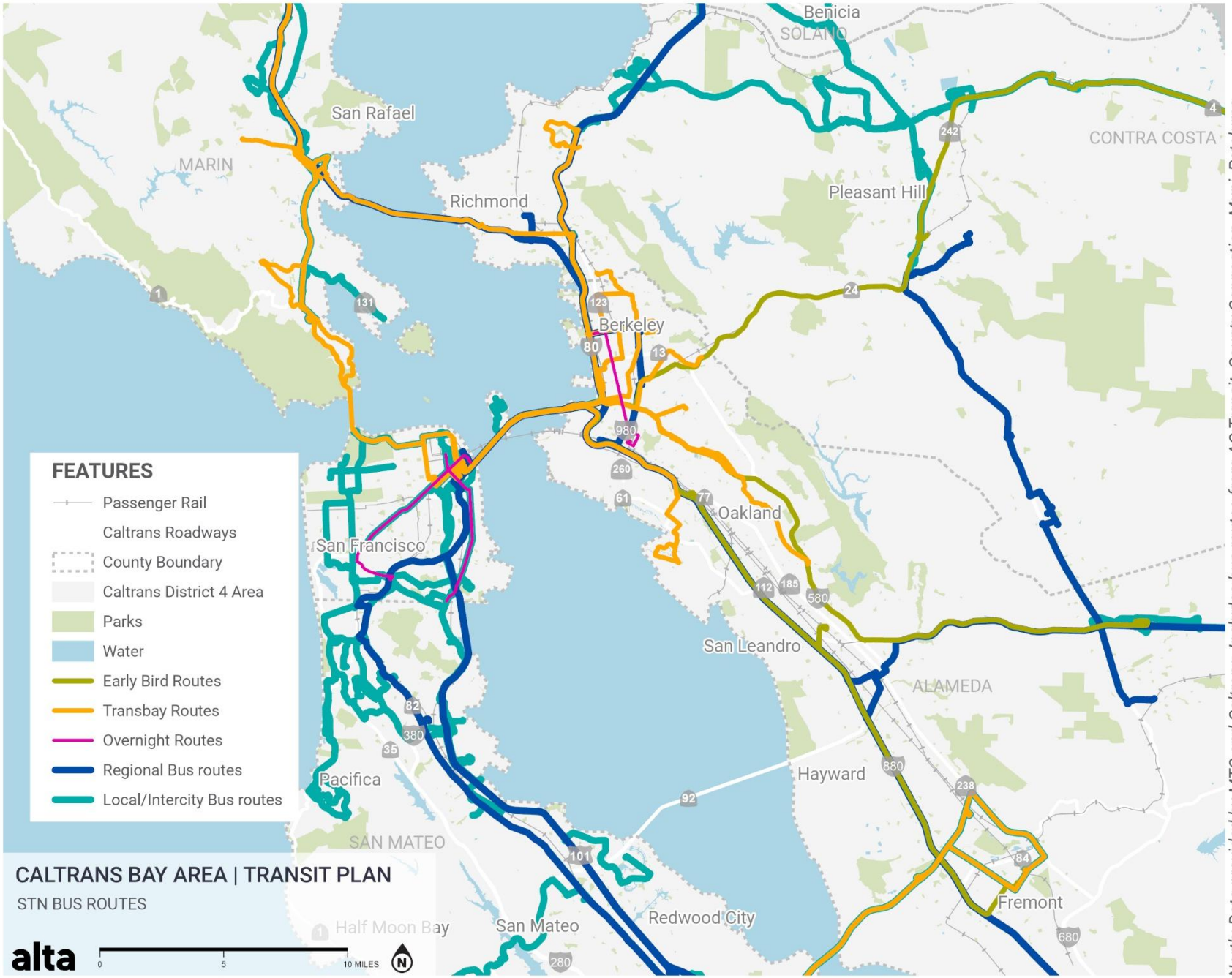

Figure 25: Bus routes (CORE)

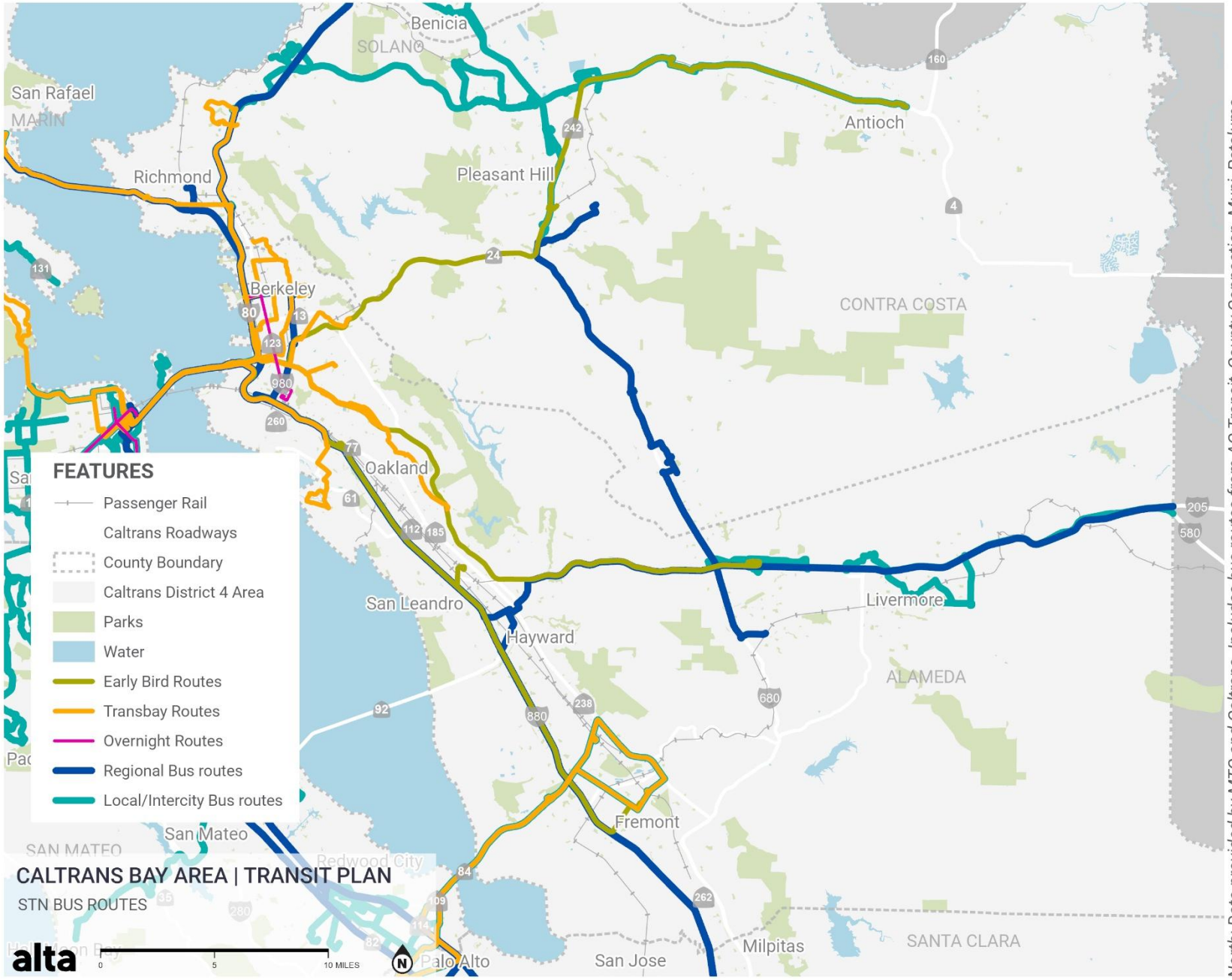

Figure 26: Bus routes (EAST)

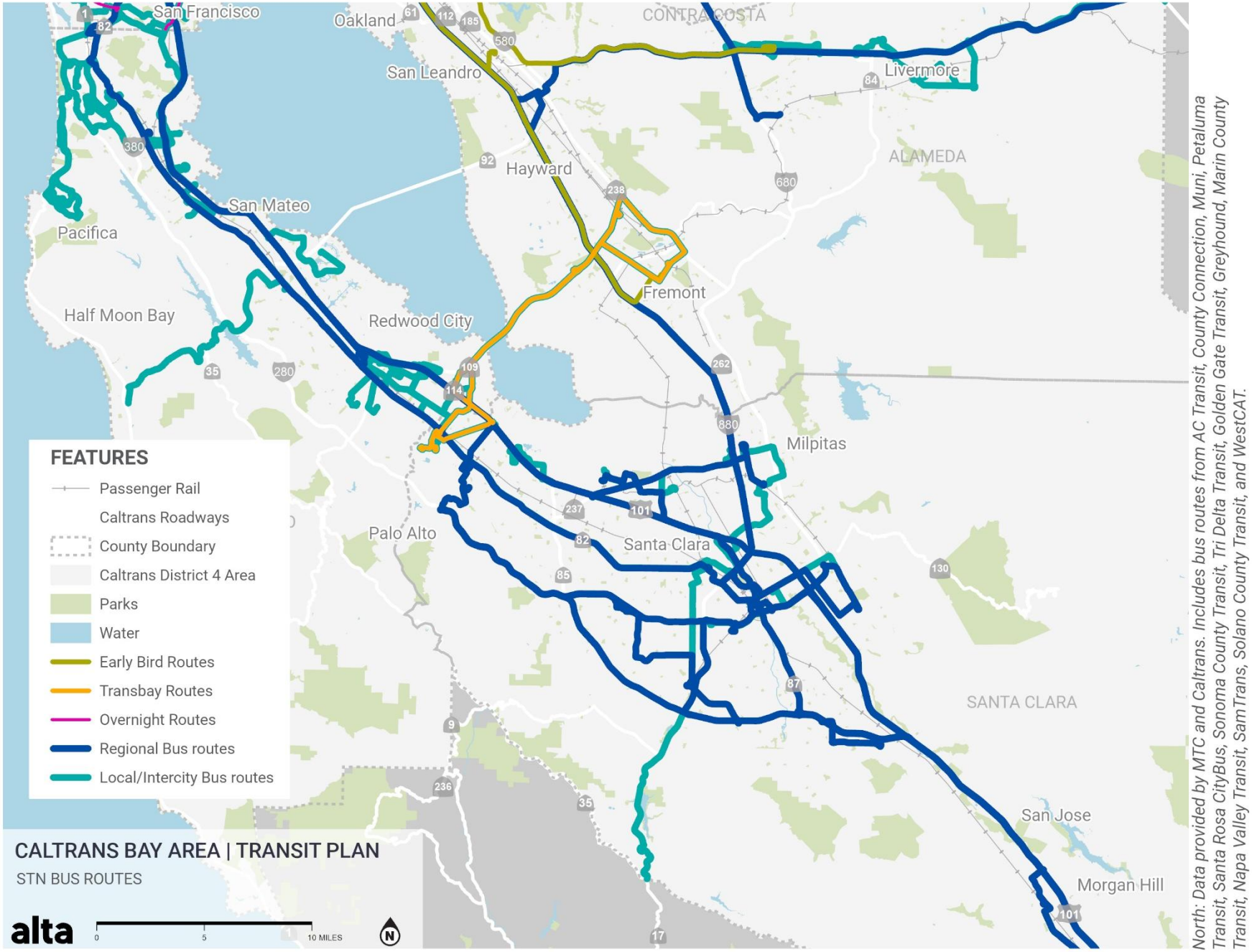

Figure 27: Bus routes (SOUTH)

Figure 28: Bus routes (NORTH)

Planned Service Changes

Capital Investments

Alta collected information through the transit agency survey and followed up with targeted research to understand the scope of proposed changes. Unfortunately, there was not sufficient data to conduct extensive analysis and reporting on capital investments. The data presented only includes data from a small number of transit providers. However, through conversations with stakeholders and MTC, Alta found that several rail agencies are planning significant capital improvements in the coming years, particularly the Capital Corridor, Sonoma-Marin Area Rail Transit (SMART), and BART.

South Bay Connect, a project of the Capitol Corridor, is a long-term plan that will reroute trains between Oakland and Newark, saving passengers up to 15 minutes of travel time.[23] It will create a new station at Ardenwood at the intersection with I-84, complementing the existing park-and-ride while reducing redundancy with the BART Green and Orange lines. Capitol Corridor service will be discontinued at Fremont and Hayward Stations.

SMART is currently planning an extension of service along existing railroad right-of-way (ROW). The extension will include three new stations at Cloverdale, Healdsburg, and Windsor along the extended line as well as an infill station at Petaluma North.[24]

Another plan of note is Link21, which aims to better connect BART and regional rail. The primary project, which is still in the planning phases, is a second train crossing underneath the San Francisco Bay.[25] Additionally, BART is working with the Santa Clara Valley Transportation Authority (VTA) to extend BART to Silicon Valley. The 16-mile extension is intended to provide a fast, reliable and transit service through some of the most congested highway corridors in the Bay Area.[26]

There are a few other major projects that have been identified from other sources. Caltrain electrification is a major project that will result in more frequent and faster Caltrain service. The VTA Eastridge to BART regional connector will extend VTA's LRT network. One Bay Area Grant program (OBAG) round 3 will be a new funding source for buses. The Bus Accelerated Infrastructure Delivery Program plans work with transit agencies to identify and create solutions to address "hotspot" bus issues. MTC's Forward Projects series of improvements to major regional corridors and bridges will benefit transit services. Valley Link will provide a connection between BART at Dublin/Pleasanton and the Central Valley. Additionally, there are plans to replace the Martinez Rail Bridge, a Martinez Transfer/Turnaround Study, and a potential Dumbarton Rail service.

Bus Service Changes

Alta received very limited information from transit agencies about planned bus service changes through 2030. The maps in **Figure 29** through **Figure 32** show expected alignment changes provided by SamTrans (San Mateo County), Central Contra Costa County Transit Authority dba County Connection (Contra Costa County), and the City of Fairfield (Solano County)), along with the capital investments described above. Further data collection will be useful to understand changes to bus service throughout the nine-county Bay Area.

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[23] Capitol Corridor Joint Powers Authority. (2024). *Capital Corridor South Bay Connect*. https://www.southbayconnect.com/.
[24] Sonoma-Marin Area Rail Transit. (2023, July 5). *SMART Secures Critical Funding for Construction of Extensions to Windsor and Healdsburg*. [Press Release]. https://www.sonomamarintrain.org/node/548.
[25] Link21 Program. (2024). *About Link21*. https://link21program.org/en/about.
[26] Valley Transportation Authority. (2023). *VTA's BART Silicon Valley Phase II.* https://www.vta.org/projects/bart-sv/phase-ii.

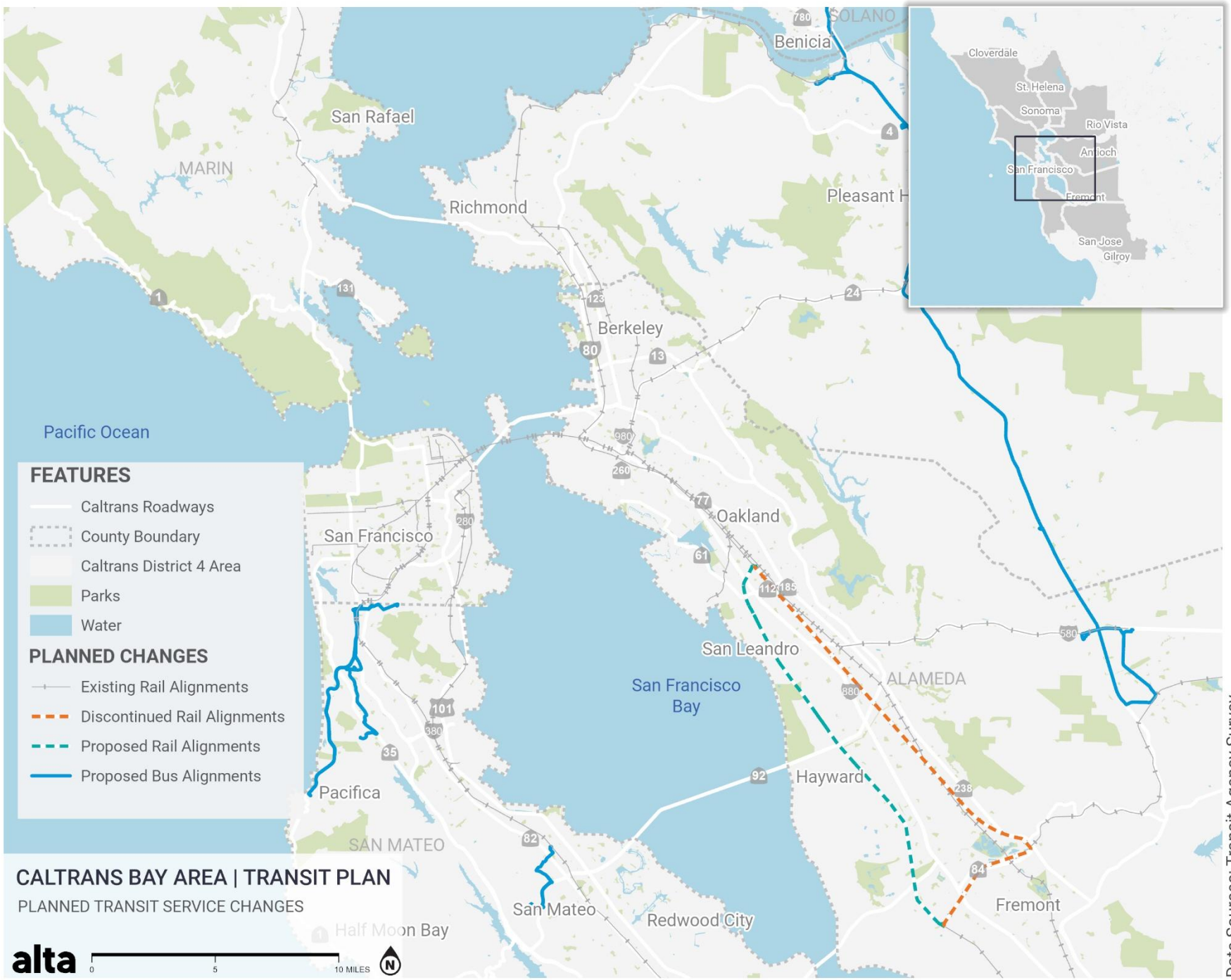


Figure 29: Planned transit service changes (CORE)

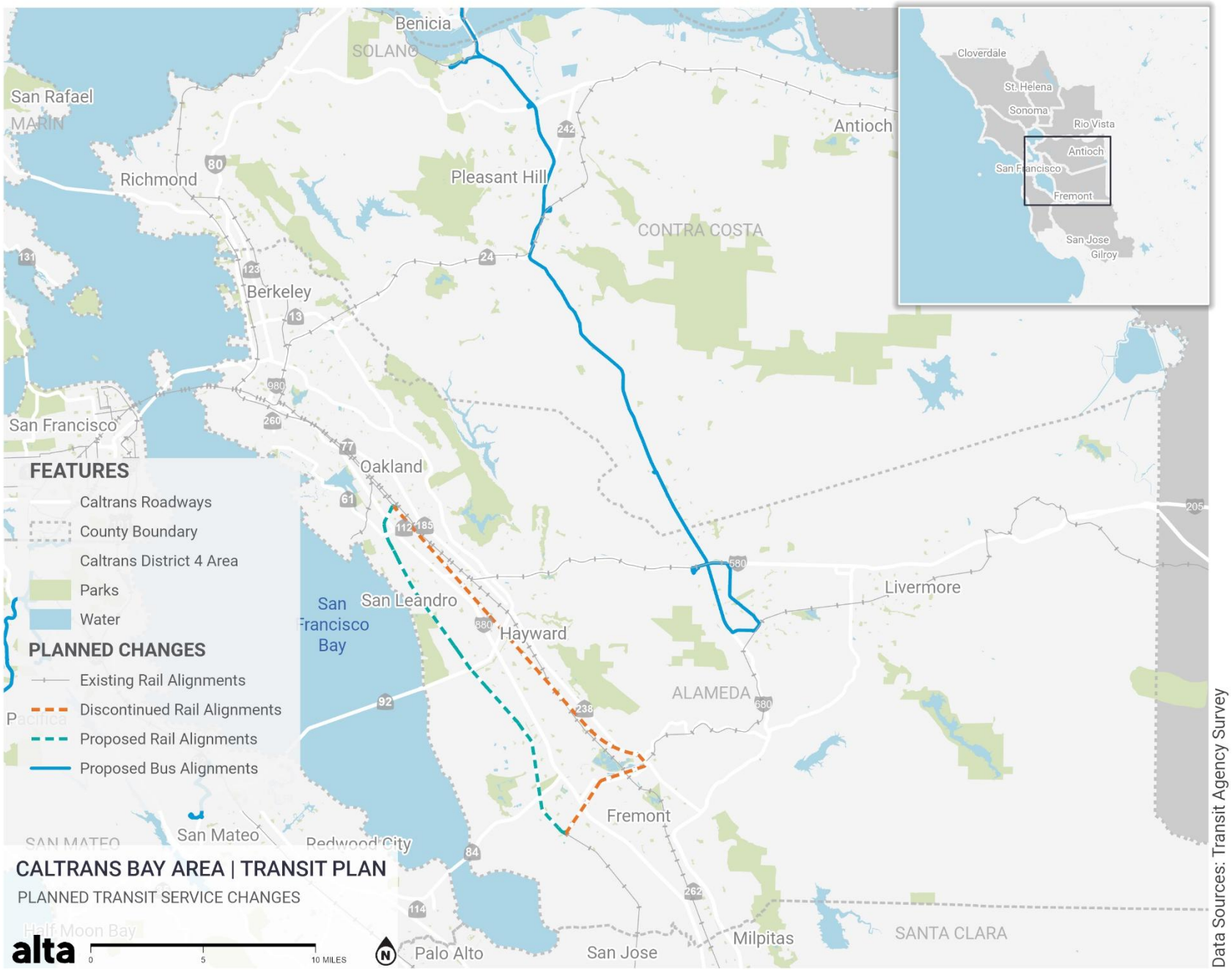


Figure 30: Planned transit service changes (EAST)

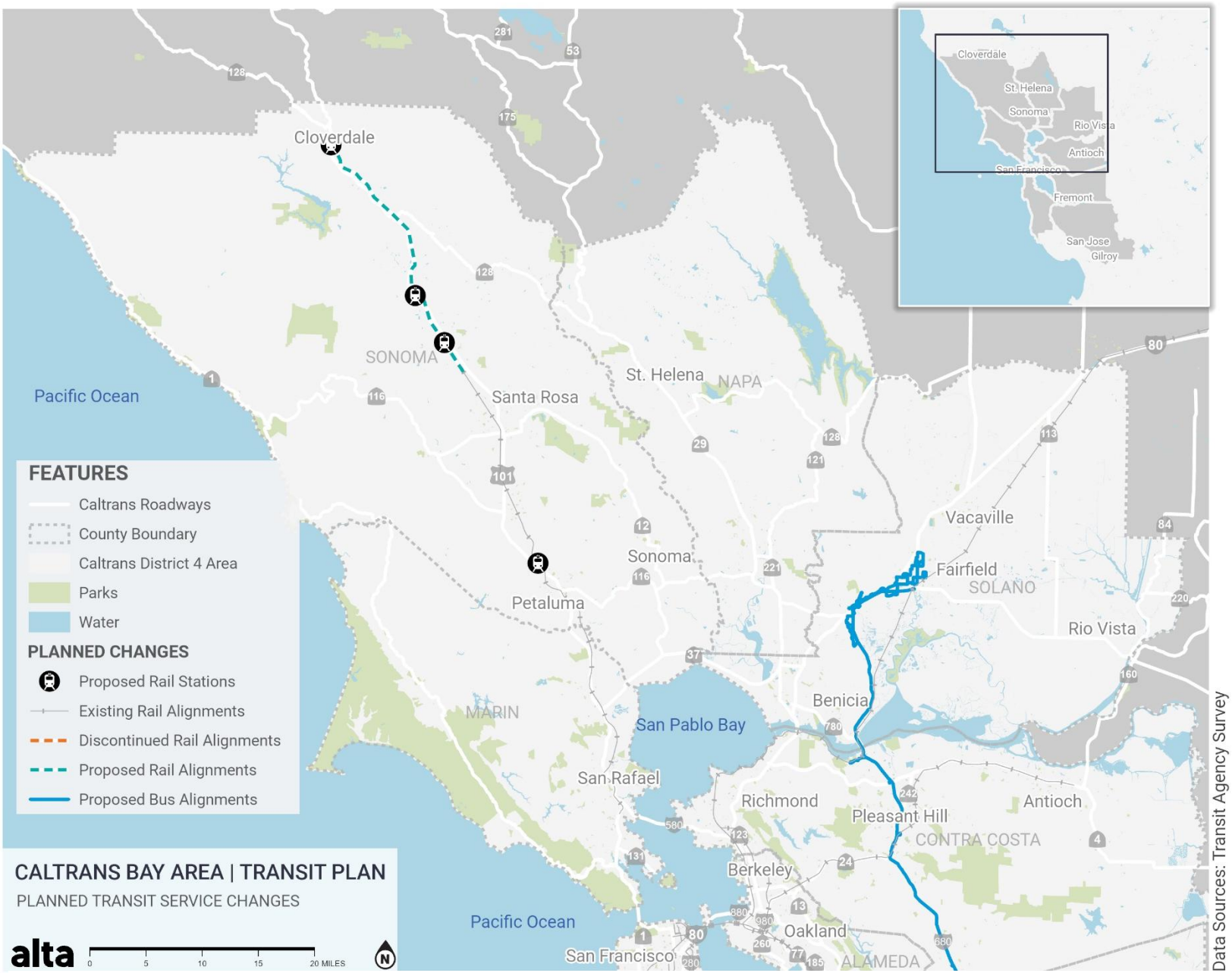


Figure 31: Planned transit service changes (NORTH)

Figure 32: Planned transit service changes (SOUTH)

Transit Frequency

Alta conducted a frequency analysis by transit stop using General Transit Feed Specification data, a standardized data format for transit schedule data. For each bus stop or train station, Alta used GIS tools to calculate transit frequency based on the average number of trips per hour serving that stop or station between the hours of 8:00 a.m. and 8:00 p.m. on weekdays. Finally, the top 50 bus stops and rail stations were selected and displayed on the map. Alta originally completed this analysis as a proxy for ridership when ridership data was not available. Alta since collected ridership data from the transit agency survey, and that analysis follows.

Rail station service frequency was analyzed at the station level. The 50 rail stations with the greatest service frequency were the urban area stations served by multiple lines of the Muni Metro and BART in San Francisco. Suburban BART corridors between Warm Springs/South Fremont Station and Richmond Station had high frequency with an average of 21 trains per hour, in either direction. Rural area stations are primarily served by Amtrak and SMART with frequencies greater than 30 minutes each hour.

Bus stop service frequency was evaluated within three different contexts: urban, suburban, and rural. To determine these typologies, Alta used definitions from the Bureau of Transportation Statistics that categorize census tracts based on population density.[27] **Figure 33** shows urban, rural, and suburban areas in the region based on this definition. **Figure 34** through **Figure 37** Figure 37: Top 50 bus stops by frequency (SOUTH)note that within both rural and urban areas, the 50 most frequent bus stops are primarily along SR-29 in Napa County, with small clusters on SR-116 in Guerneville and Petaluma. These stops have an average frequency of 1.9 trips per hour, equating to one bus about every 30 minutes.

Urban areas, primarily San Francisco, have the highest transit frequency due to a higher density of both population and destinations. Displayed in **Figure 38**, the 50 most frequent bus stops are primarily in the City/County of San Francisco along US-101 and SR-1, as well as a few along SR-123 in Berkeley (Alameda County). These bus stops have an average frequency of 11 trips per hour.

[27]USDOT. (2024). *Bureau of Transportation Statistics: Local Area Transportation Characteristics for Households Data*. https://www.bts.gov/latch/latch-data.

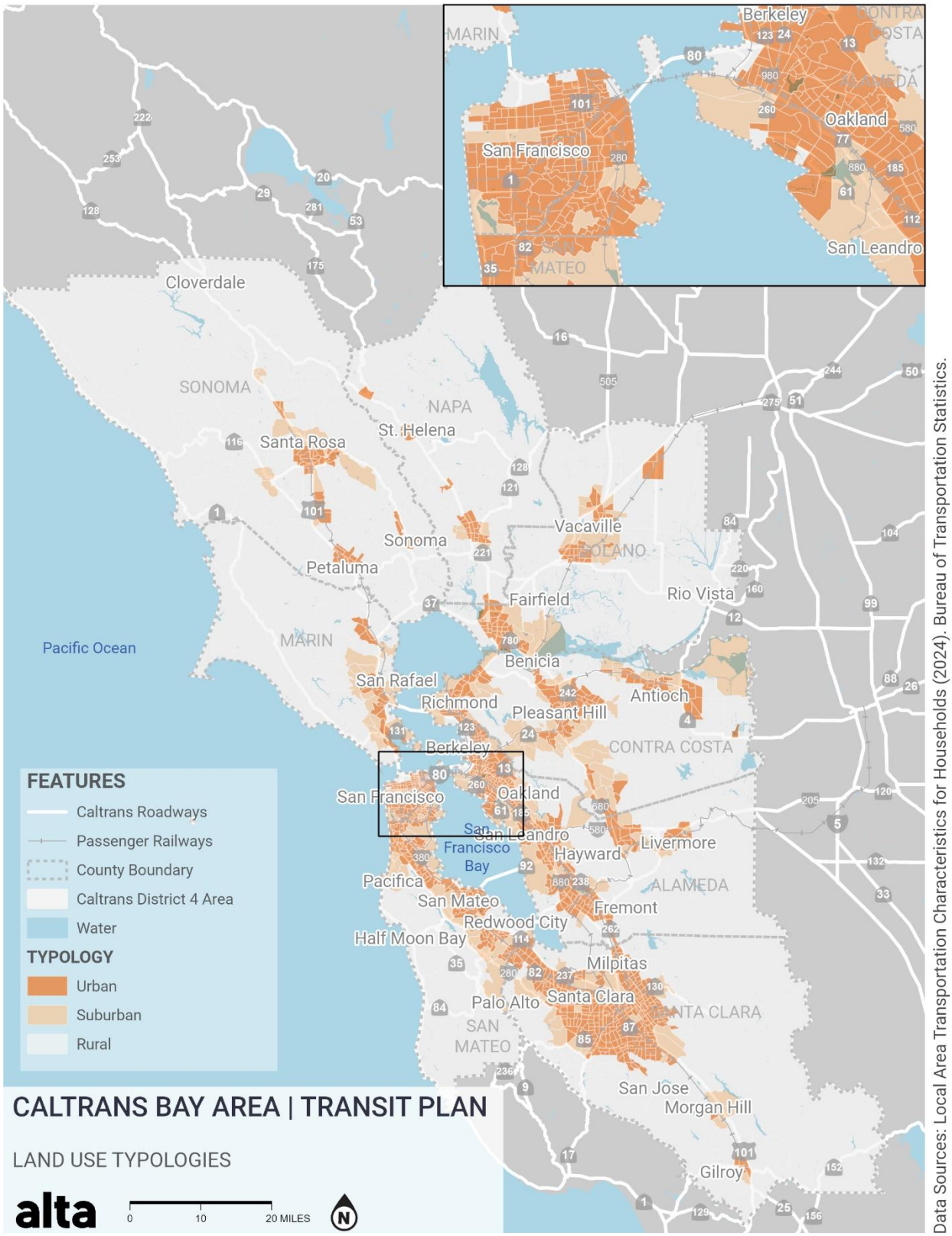


Figure 33: Typologies for urban, suburban, and rural areas

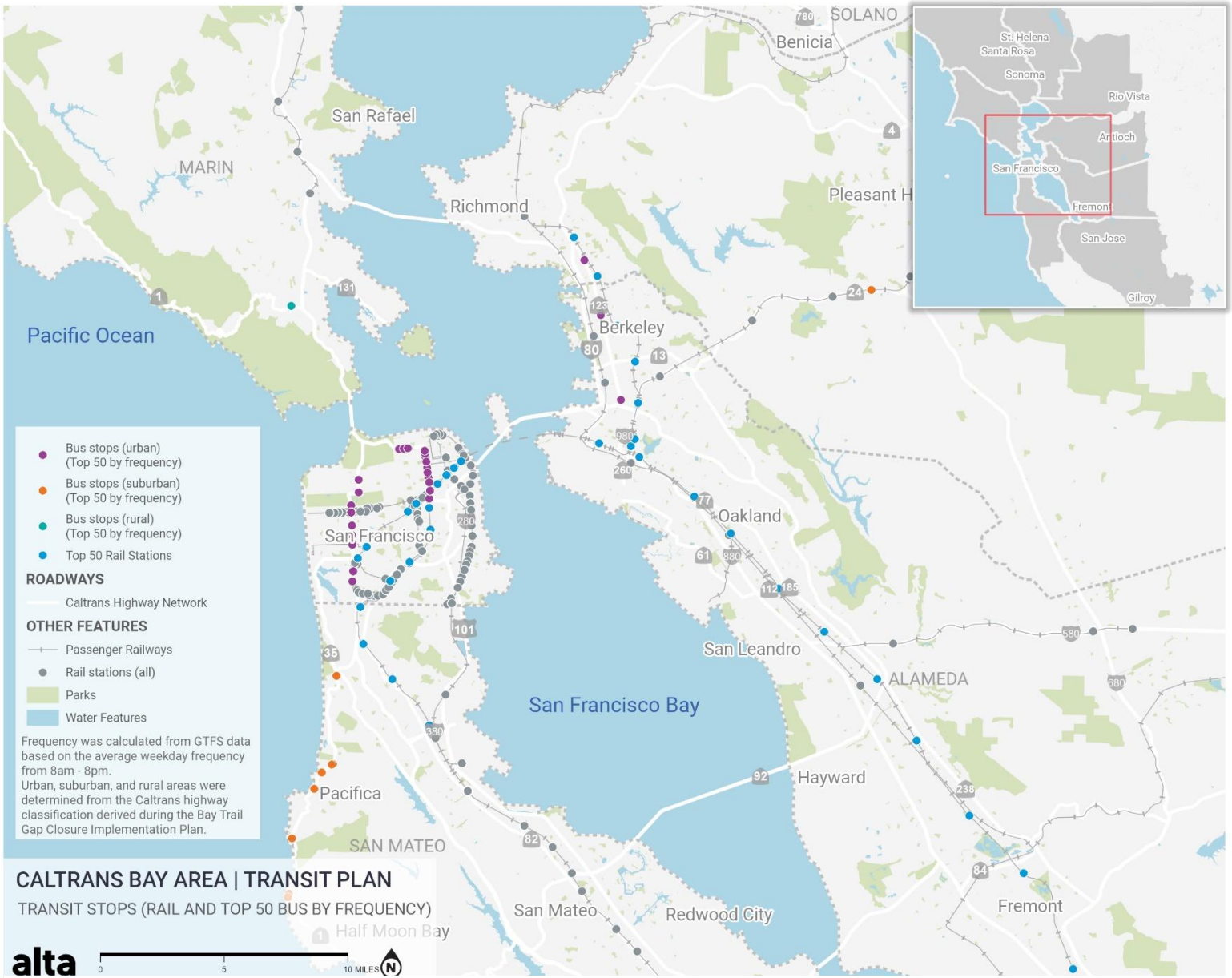


Figure 34: Top 50 bus stops by frequency (CORE)

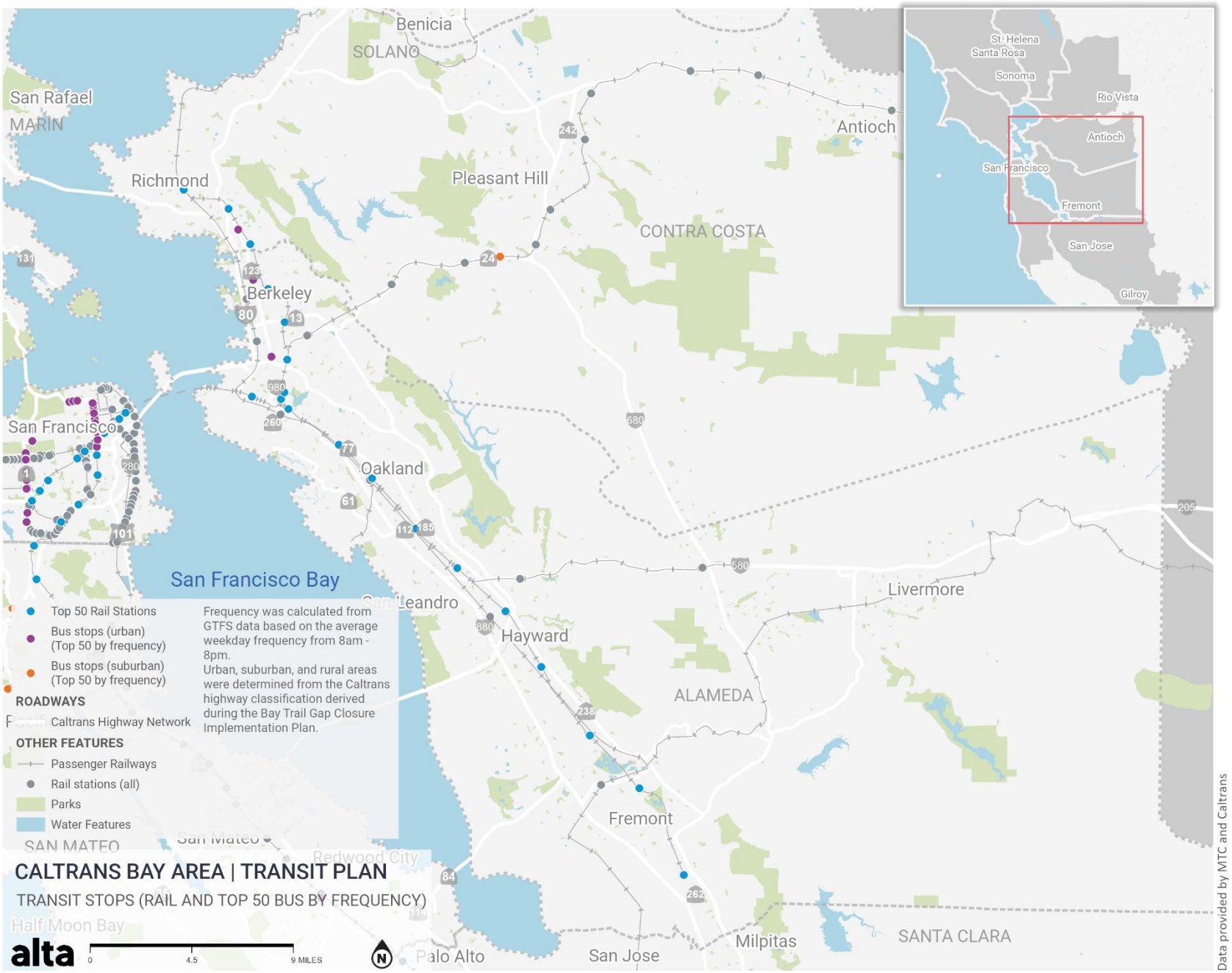


Figure 35: Top 50 bus stops by frequency (EAST)

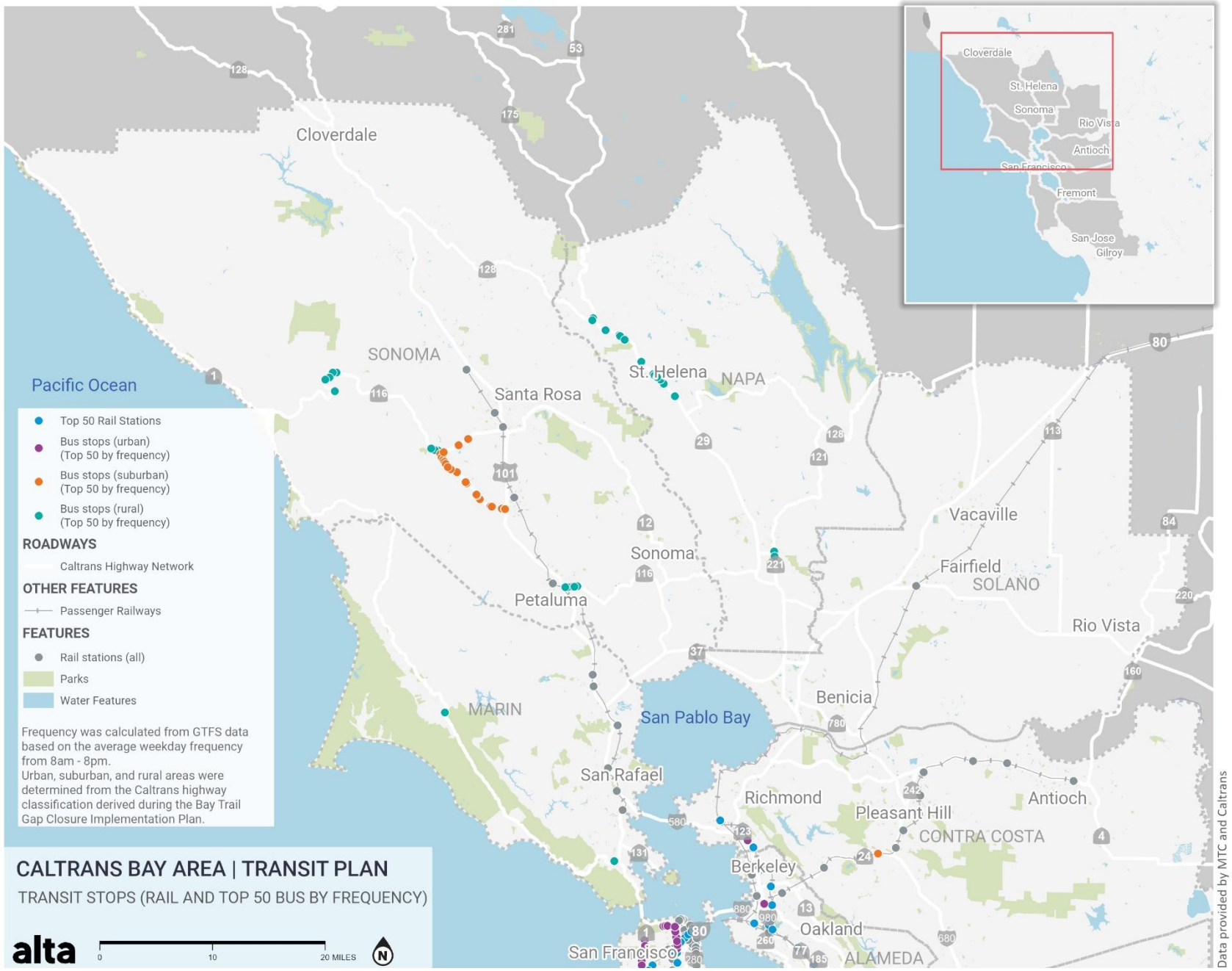


Figure 36: Top 50 bus stops by frequency (NORTH)

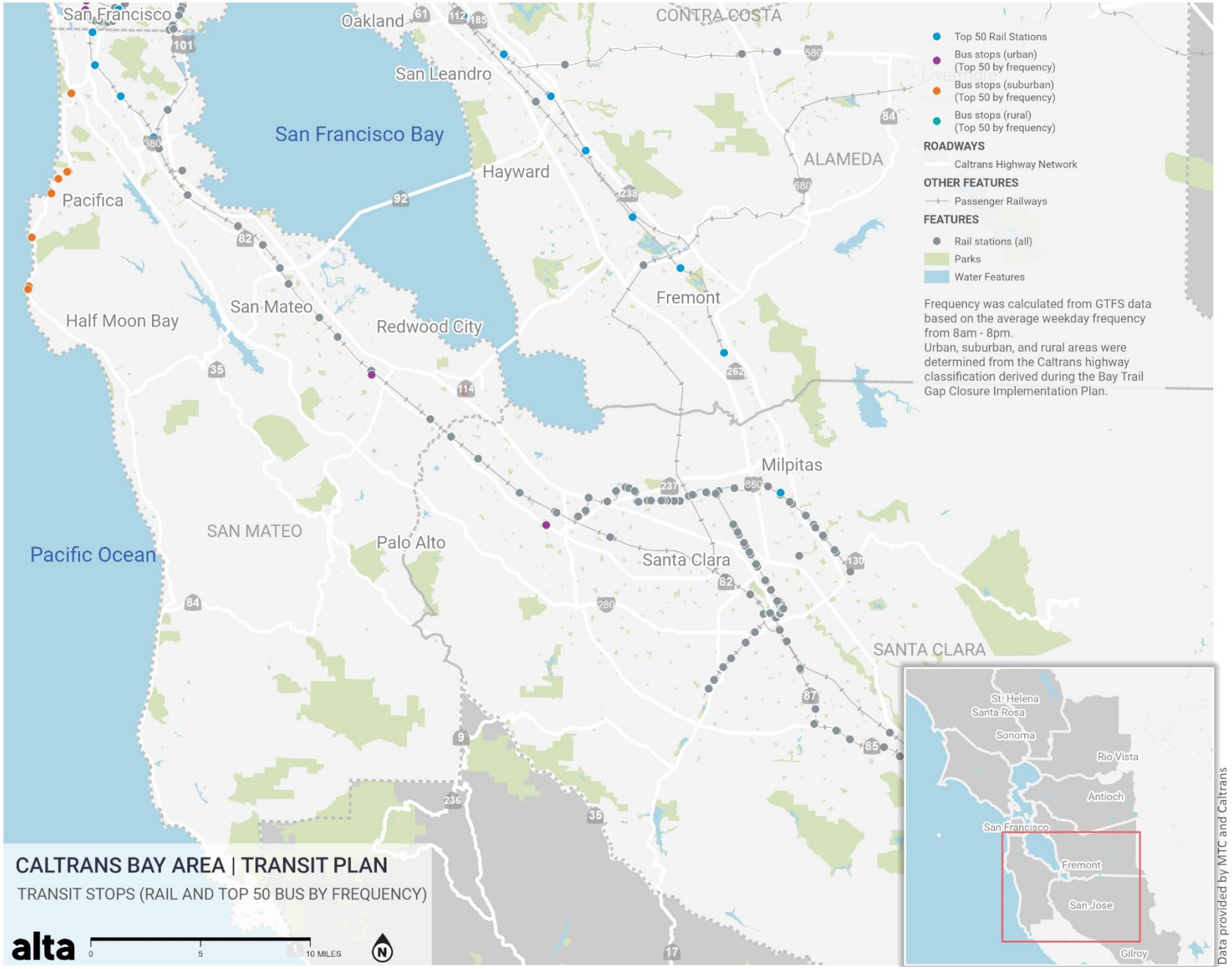


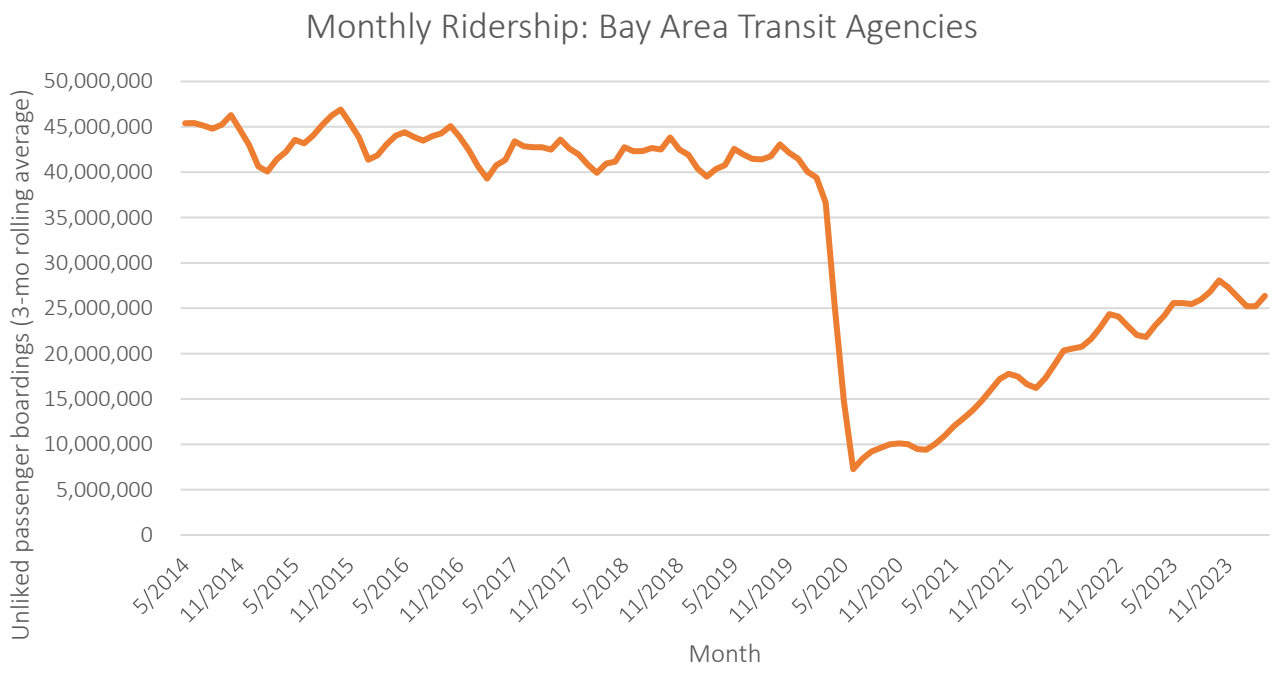
Figure 37: Top 50 bus stops by frequency (SOUTH)

Figure 38: Top 50 bus stops by frequency (URBAN SF)

Transit Ridership

Alta examined the last 10 years of agency-level monthly ridership data from the Bay Area transit agencies that report to the National Transit Database.[28,29] **Figure 39** shows the three-month rolling average monthly ridership, which includes both rail and bus ridership. The rolling average reduces the effect of seasonal variation in transit ridership while showing data as granularly as possible. As the graph shows, monthly ridership peaked in spring 2016 but was fairly steady in the two years before the COVID-19 pandemic. However, it dropped precipitously in early 2020: between March and April 2020, the monthly boardings declined 80%. While transit ridership has steadily increased since 2021, it remained well below pre-pandemic levels as of January 2024. There have been improvements in transit ridership since COVID-19 with some service improvements contributing significantly to ridership recovery. Services that have seen ridership growth include Van Ness BRT, AC Transbay Service Line F, and SMART.

Figure 39. Monthly transit boardings, showing a 12-month rolling average



[28] Reporting agencies were Bay Area Rapid Transit, SamTrans, Santa Clara Valley Transportation Authority, Alameda-Contra Costa Transit District, San Francisco Muni, Golden Gate Transit, Santa Rosa CityBus, County Connection, The Vine, Sonoma County Transit, City of Fairfield (FAST), Metropolitan Transportation Commission, CalTrain, Wheels Bus (LAVTA), Vacaville City Coach, WestCAT, Union City Transit, Tri Delta Transit, Merced Transit Authority, Petaluma Transit, San Francisco Bay Ferry, SolTrans, Marin Transit, and Sonoma-Marin Area Rail Transit.

[29] USDOT. (2024). *Federal Transit Administration: Complete Monthly Ridership (with adjustments and estimates)*. https://www.transit.dot.gov/ntd/data-product/monthly-module-adjusted-data-release.

Top Ridership Stops

Alta obtained stop- or station-level ridership data from 16 agencies via the transit agency survey for the most recent time period available (primarily fall 2023). Three agencies did not have stop-level data available but did have route-level data: , Altamont Corridor Express, Wheels Bus (LAVTA), and WestCAT. For these agencies, Alta distributed route-level ridership among all stops served by each route to infer stop-level ridership. No ridership data of any kind was shared by BART, Sonoma County Transit, or Union City Transit. Results are displayed in Figure 40 through Figure 42.

The analysis showed that the highest ridership transit stops in the Caltrans service area are located along Van Ness Avenue in San Francisco, where three stops exceed 1,000 average daily boardings: South Van Ness and Market Street, Van Ness and O'Farrell Street, and Van Ness and Sutter Street. Other stops with at least 250 average weekday boardings are along 19th Avenue/SR-1 in San Francisco, and San Pablo Avenue in Berkeley. Many of the rail stations have very high ridership.

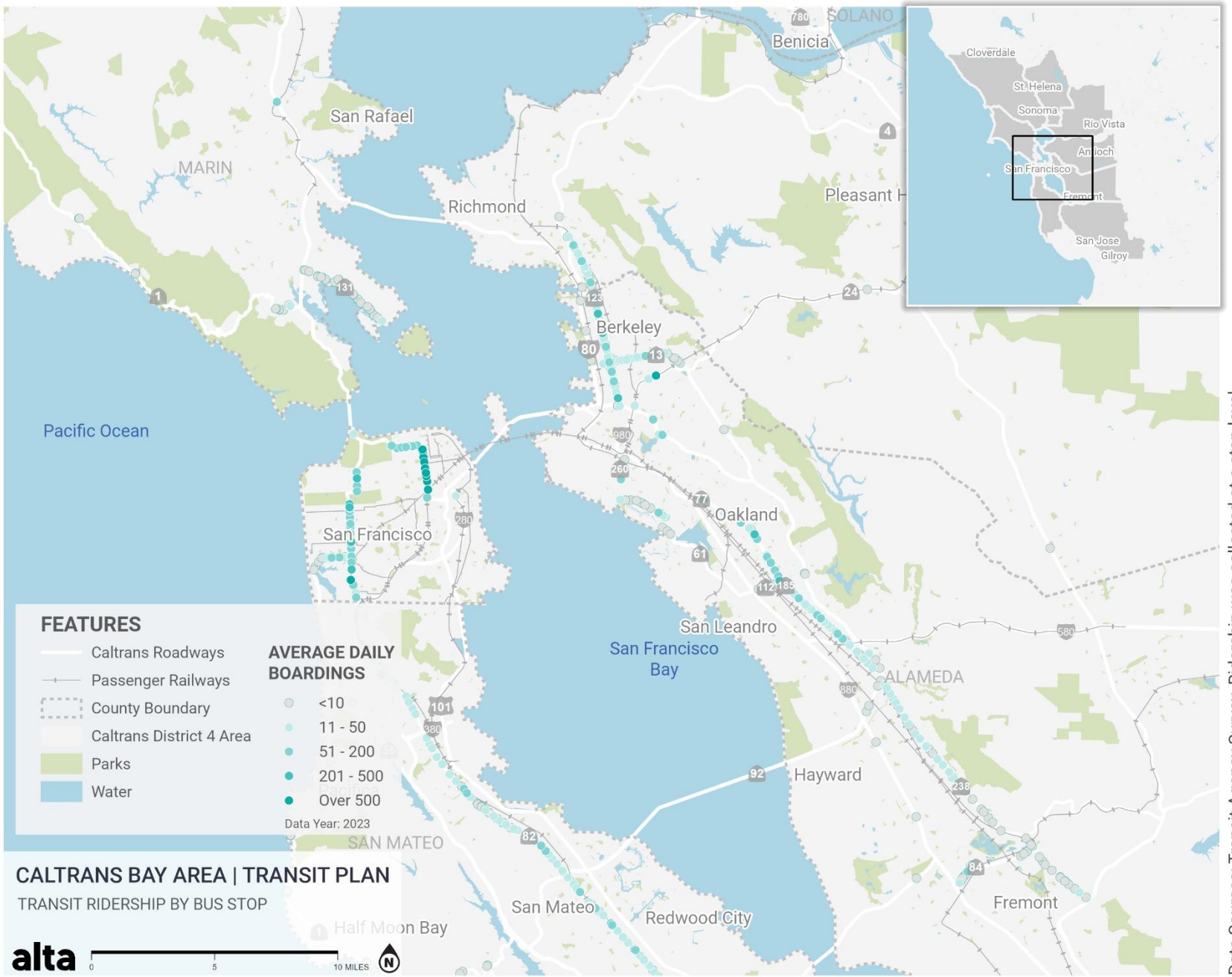


Figure 40: Transit ridership by stop (CORE)

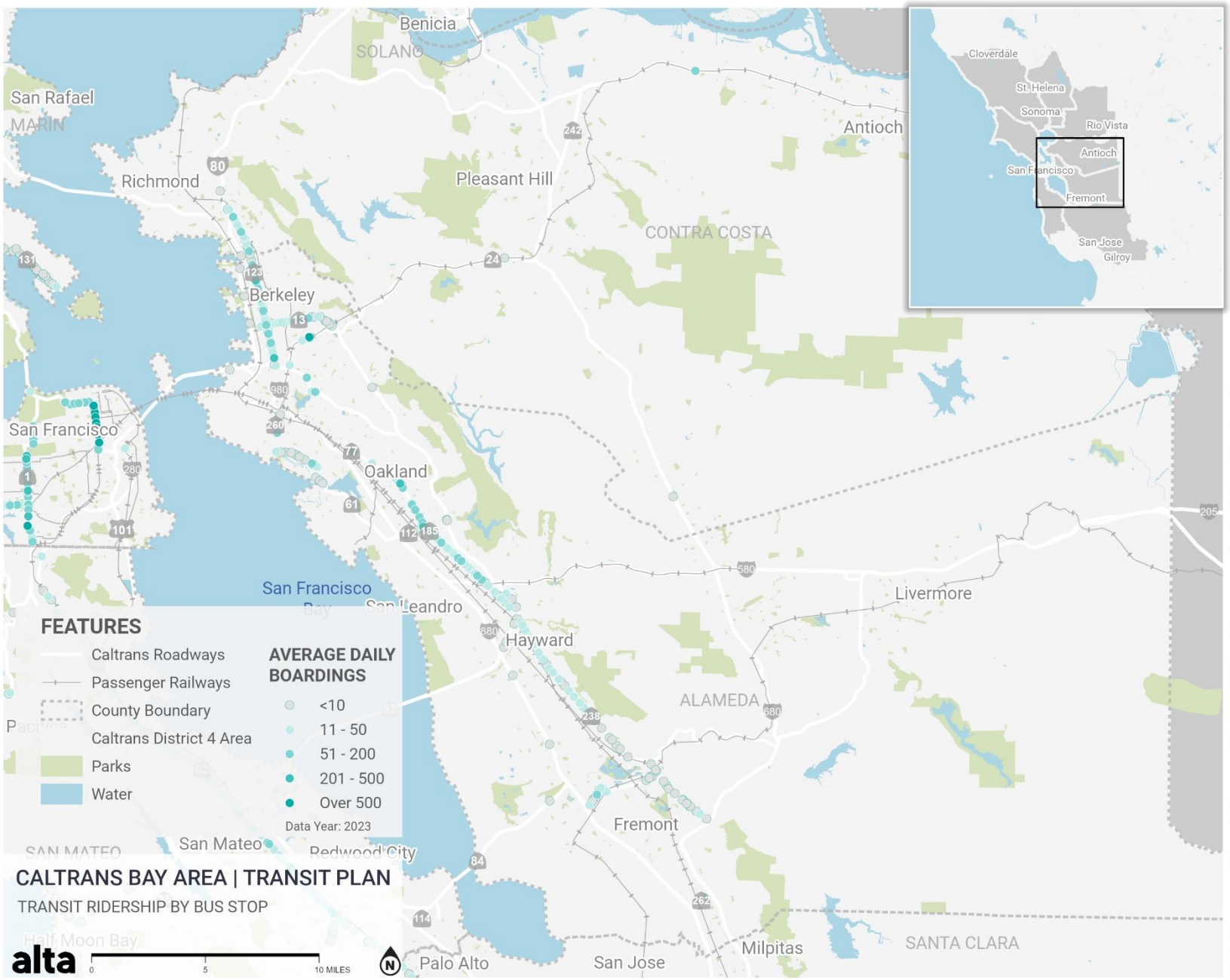


Figure 41: Transit ridership by stop (EAST)

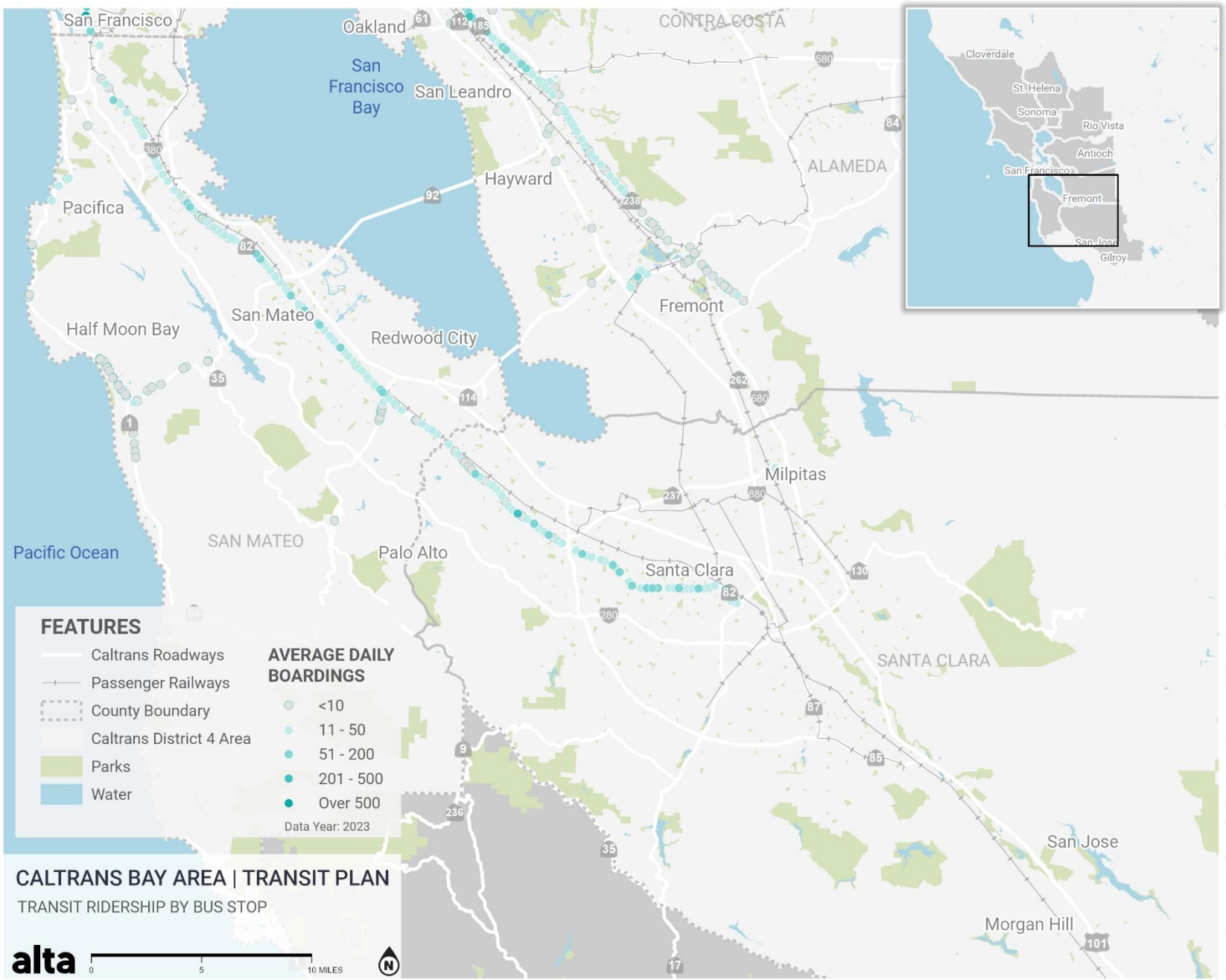


Figure 42: Transit ridership by stop (SOUTH)

Transit Priority Infrastructure

Transit priority infrastructure is an important part of improving the reliability and speed of transit, which helps to retain and attract new ridership. Alta received information on TPI from seven agencies: AC Transit, County Connection, Wheels Bus, San Francisco Muni, SamTrans, Sonoma County Transit, and Santa Clara Valley Transportation Authority. Most of the agencies who did not provide data reported that they do not use any TPI. In the Bay Area, this infrastructure includes:

- Intersections with TSP, which adjusts signal timing to reduce the time that buses spend at red lights
- Intersections with queue jumps that allow buses to get ahead of traffic at intersections
- Bus-only lanes
- HOV or tolled express lanes that are available to buses as well as eligible private vehicles to reduce delays due to congestion
- HOV bypass lanes on freeway on-ramps

Results are shown in Figure 43 through Figure 46. Local agencies have installed TSP on several notable corridors in EPCs or CDCs,[30] including International Boulevard/SR-185 in Oakland, Mission Boulevard/Highway 238 in Hayward and Union City, and San Pablo Avenue/SR-123 in Albany, El Cerrito, Berkeley, Emeryville, and Oakland. Other corridors with high, SR-85, and Van Ness Avenue/US-101 in San Francisco.

Transit routes on many highways benefit from HOV or express lanes throughout District 4. Buses gain reliability improvements from using these lanes; however, the extent of the time savings depends on how many private vehicles are using the lanes and whether bus stops and exits are accessible from these lanes.

Dedicated bus-only lanes are much less common. Only AC Transit and SFMTA reported bus-only lanes in their districts. Most of the bus lanes in the AC Transit district are on International Boulevard or San Pablo Avenue providing service to EPCs. Parts of San Francisco, such as the Tenderloin and Union Square, are also EPCs that benefit from bus-only lanes on US-101.

Among the corridors that do not have TPI, those with the highest ridership include:

- Ashby Avenue, Berkeley (Alameda)
- East 14th Street/Mission Boulevard, San Leandro/Hayward (Alameda)
- Sloat Boulevard, San Francisco (San Francisco)
- Thornton Avenue, Fremont (Alameda)

Given the relatively high number of transit riders using services along these corridors, TPI improvements may provide the greatest cost efficiency.

[30] Defined by CalEPA for the purpose of SB 535 (2012) as the 25% highest scoring census tracts in CalEnviroScreen 4.0, census tracts previously identified in the top 25% in CalEnviroScreen 3.0, census tracts with high amounts of pollution and low populations, and federally recognized tribal areas as identified by the census in the 2021 American Indian Areas Related National Geodatabase.

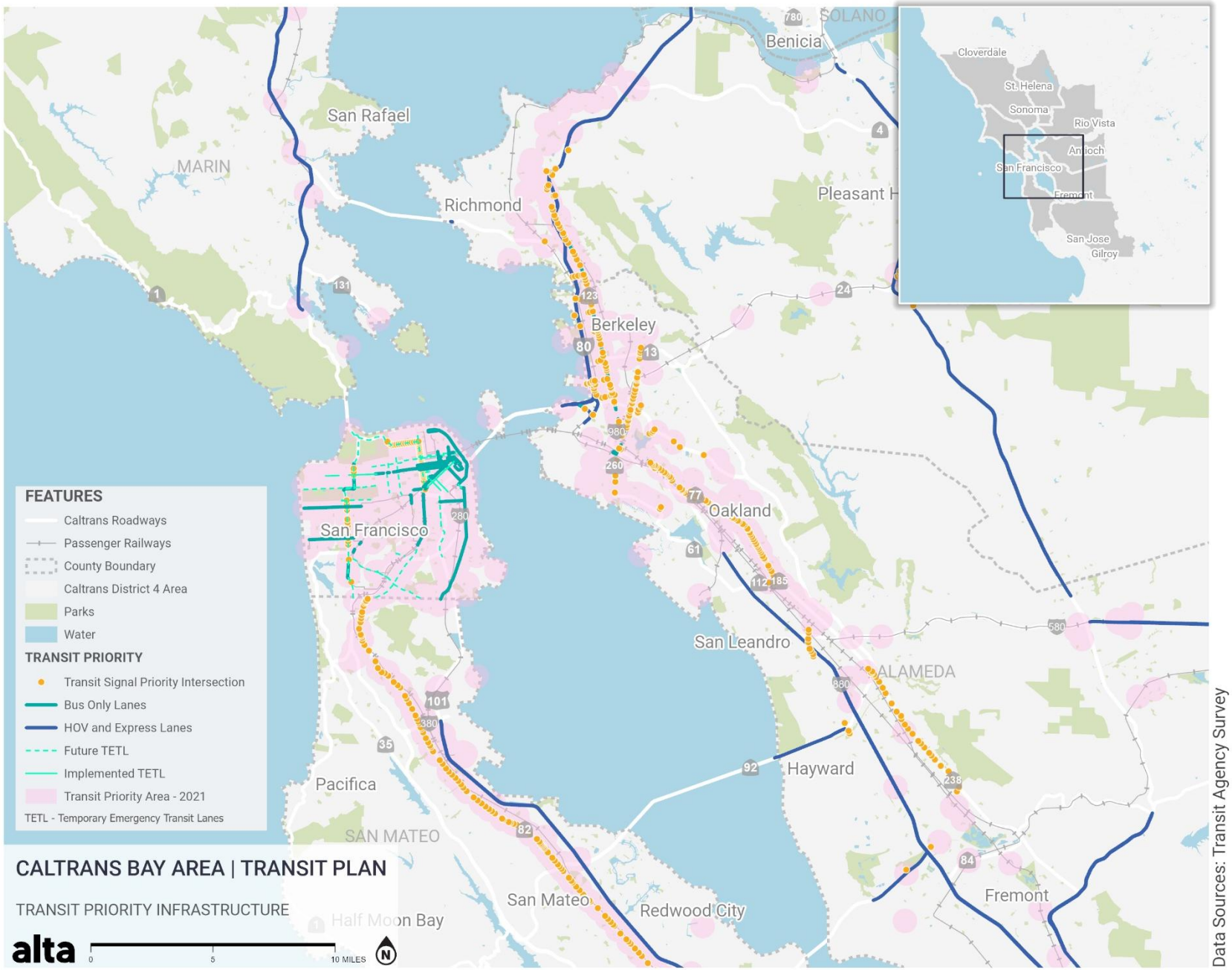


Figure 43: Transit priority infrastructure (CORE)

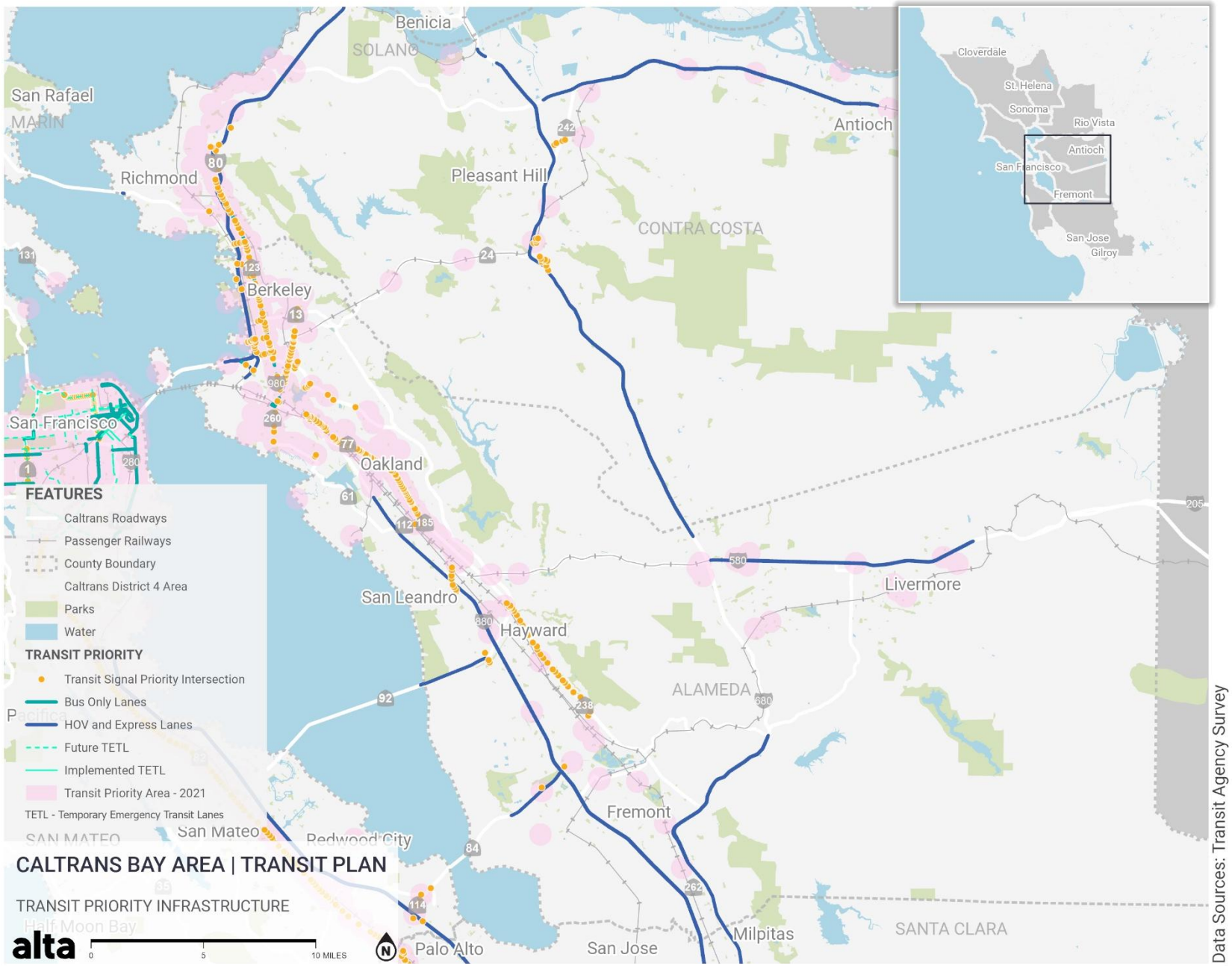


Figure 44: Transit priority infrastructure (EAST)

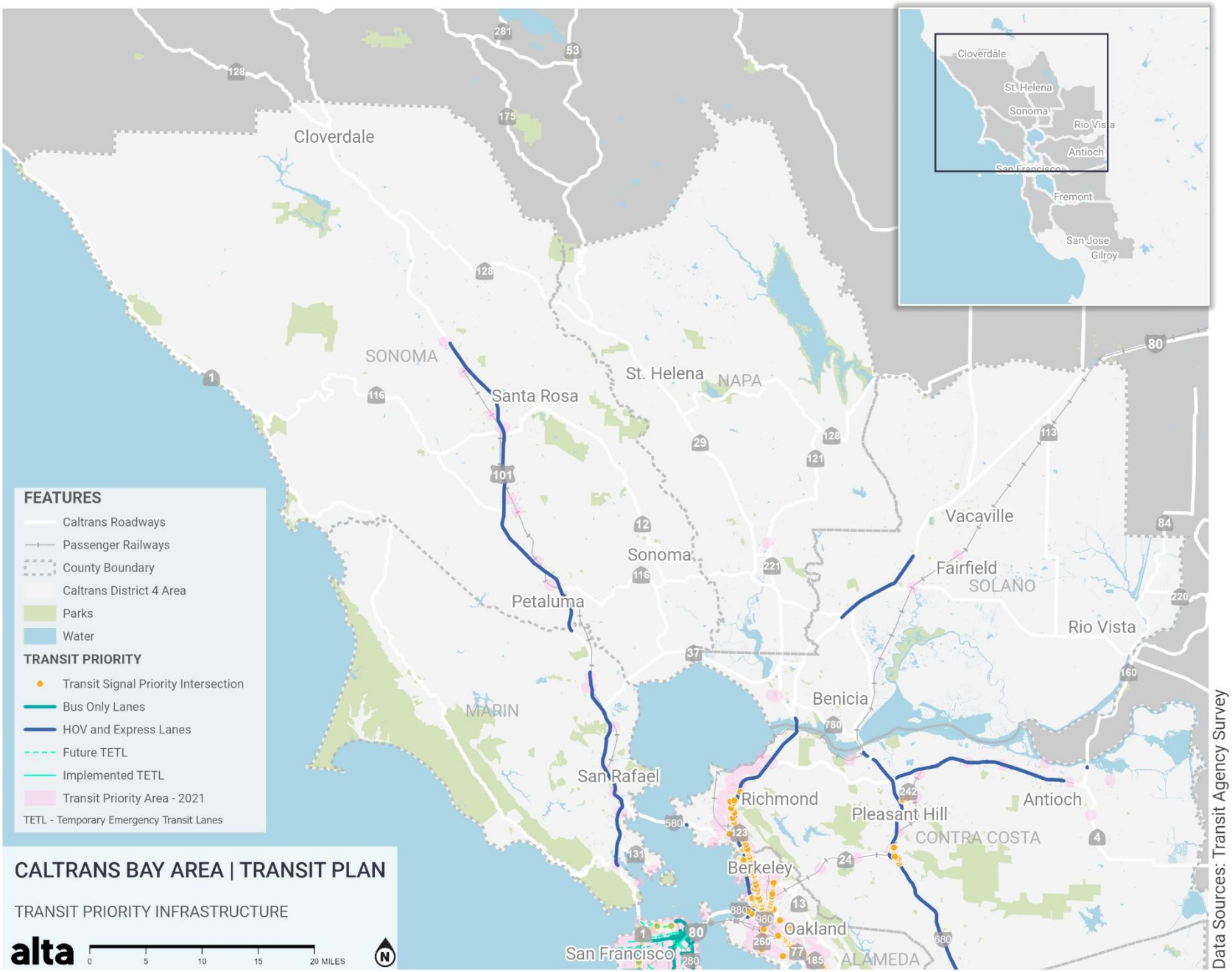


Figure 45: Transit priority infrastructure (NORTH)

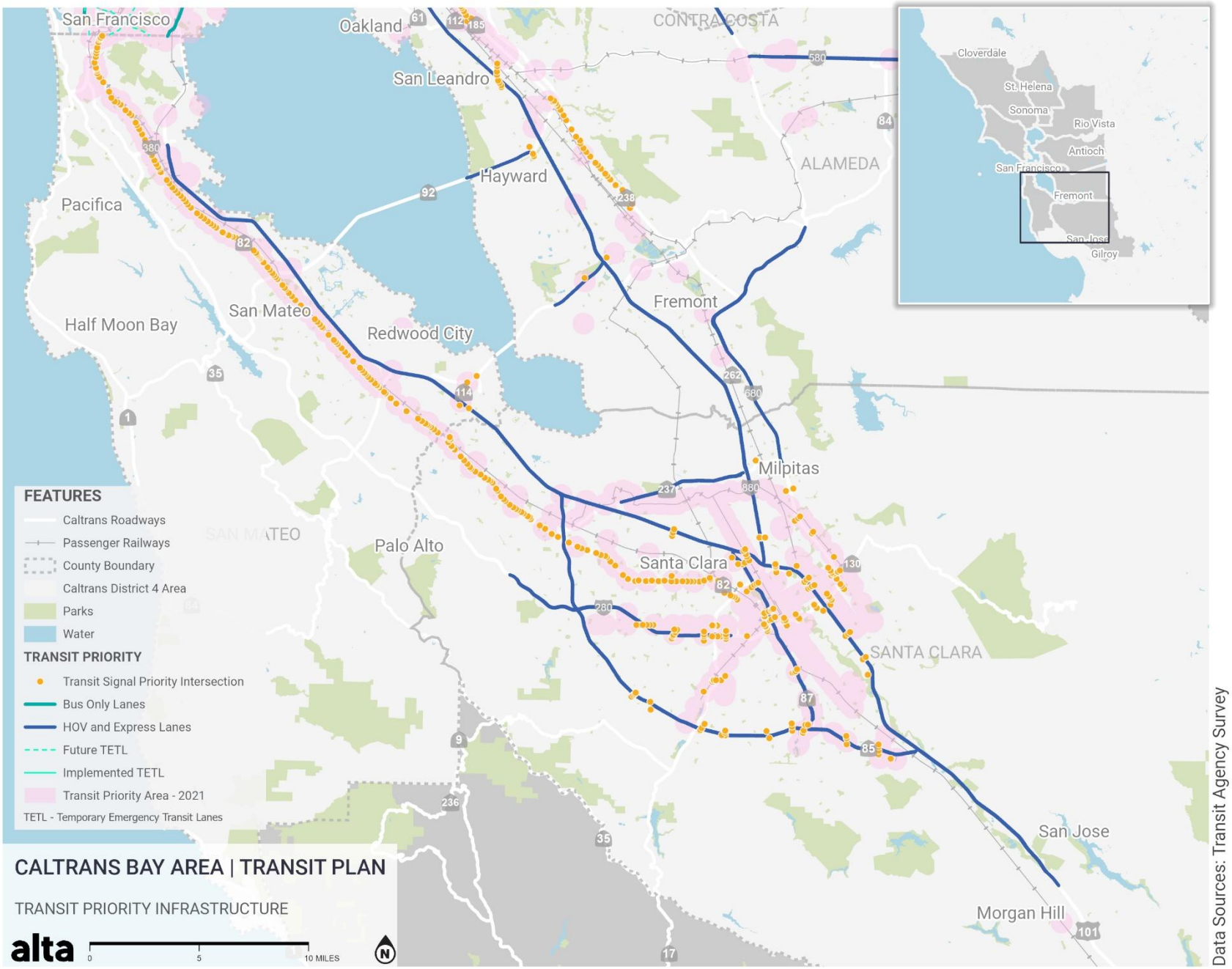


Figure 46: Transit priority infrastructure (SOUTH)

Common Bottlenecks

Alta also collected data from the transit agency survey on known bottlenecks, or points of persistent delay as stated by transit agencies. Bottlenecks may indicate areas that could benefit from TPI, or areas where existing infrastructure is not meeting its goals. Data collected was limited: Alta received information from agencies in the counties of Alameda (two agencies), Contra Costa (three agencies), Marin (two agencies), San Francisco (one agency), San Mateo (one agency), Santa Clara (one agency), Sonoma (three agencies), and Solano (two agencies).

Figure 47 through Figure 50 show bottlenecks as reported by transit agencies throughout District 4. SamTrans reports bottlenecks in many short segments along El Camino Real, despite a high prevalence of TSP there. Highway 4 in Bay Point, I-80 in Berkeley, and I-680 through Contra Costa County are three corridors with bottlenecks reported, where HOV or express lanes are already in use. However, many reported bottlenecks are in areas with little or no TPI. These include the Richmond-San Rafael Bridge, the Bay Bridge, and US-101 and I-280 in San Francisco.

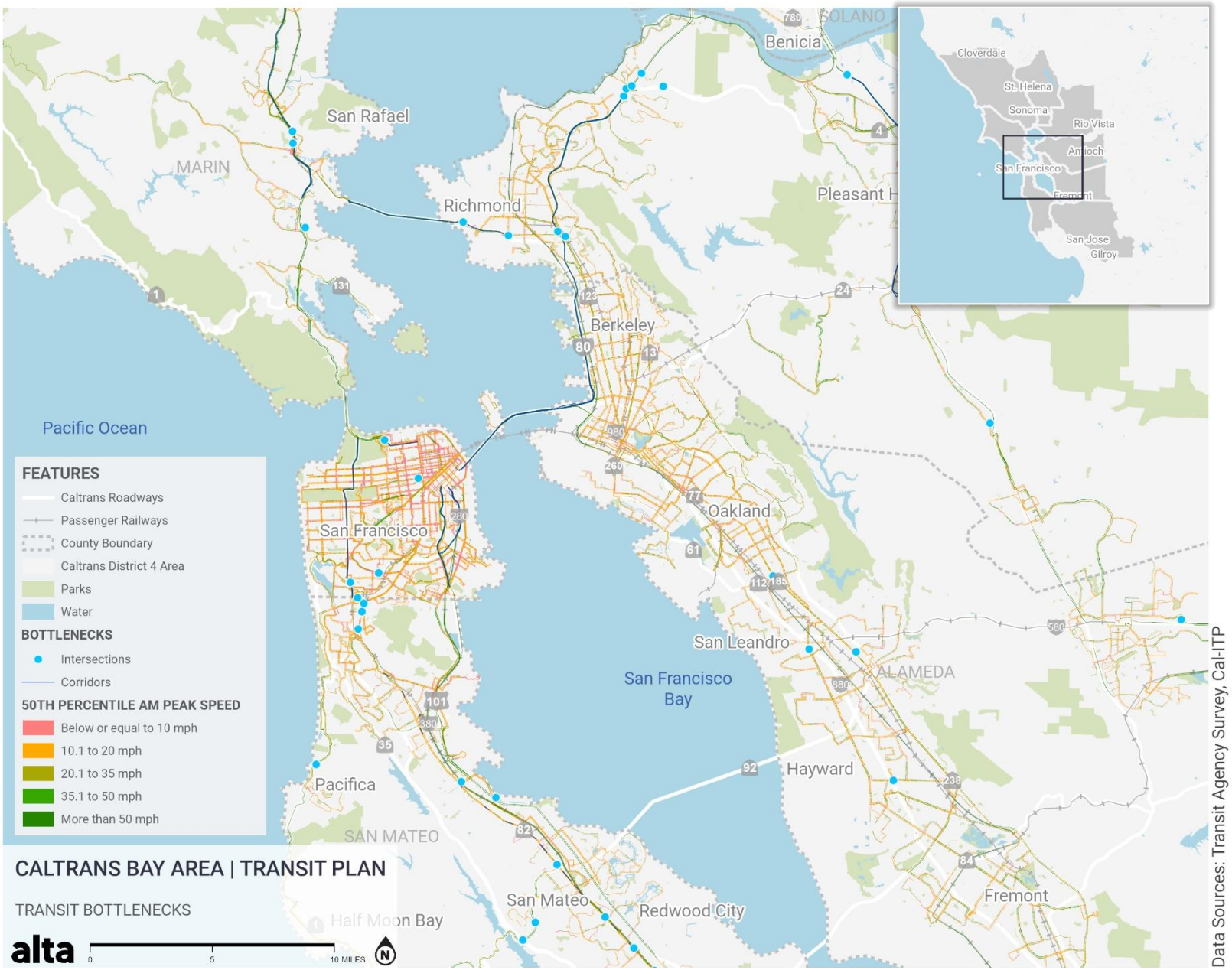


Figure 47: Transit bottlenecks (CORE)

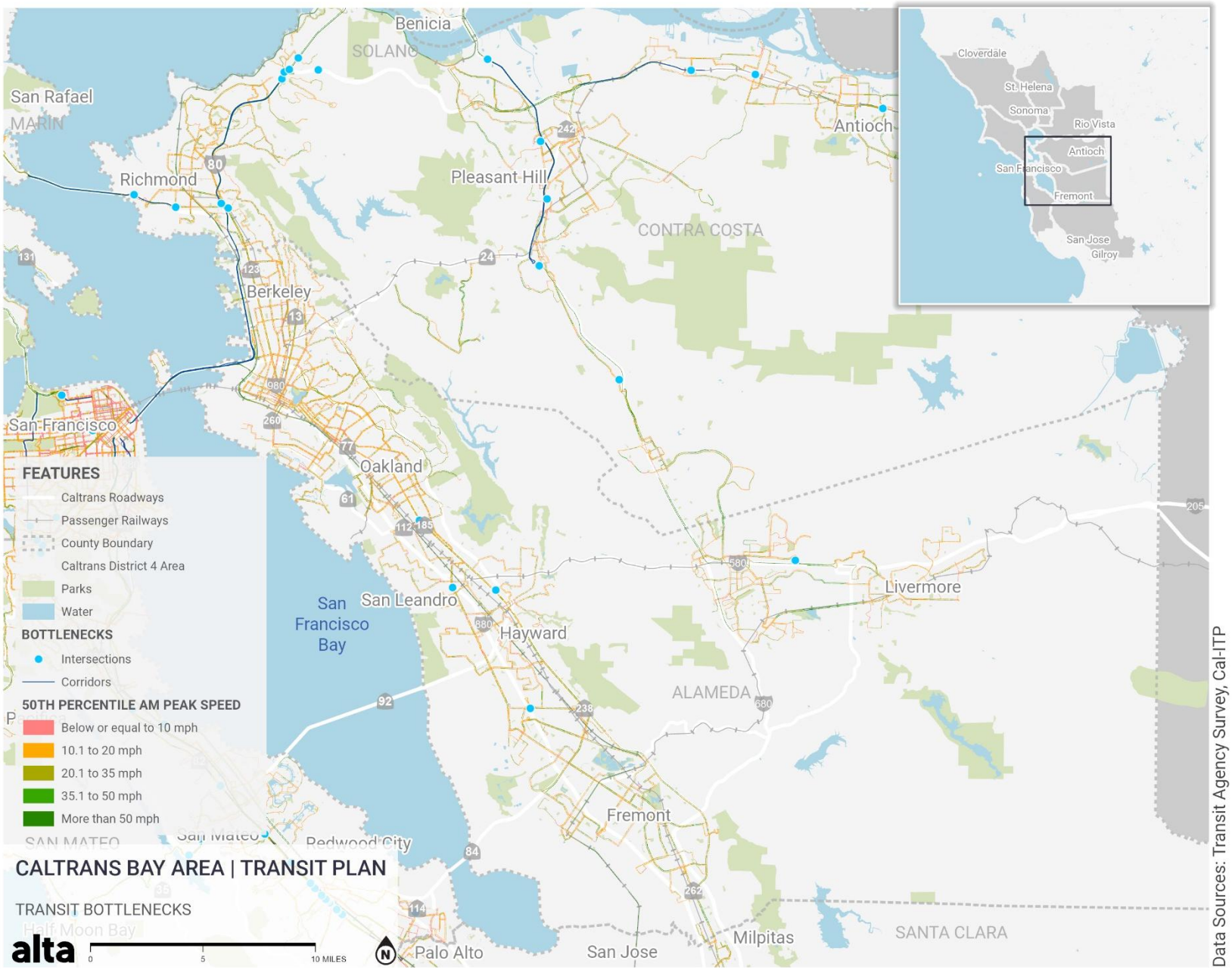


Figure 48: Transit bottlenecks (EAST)

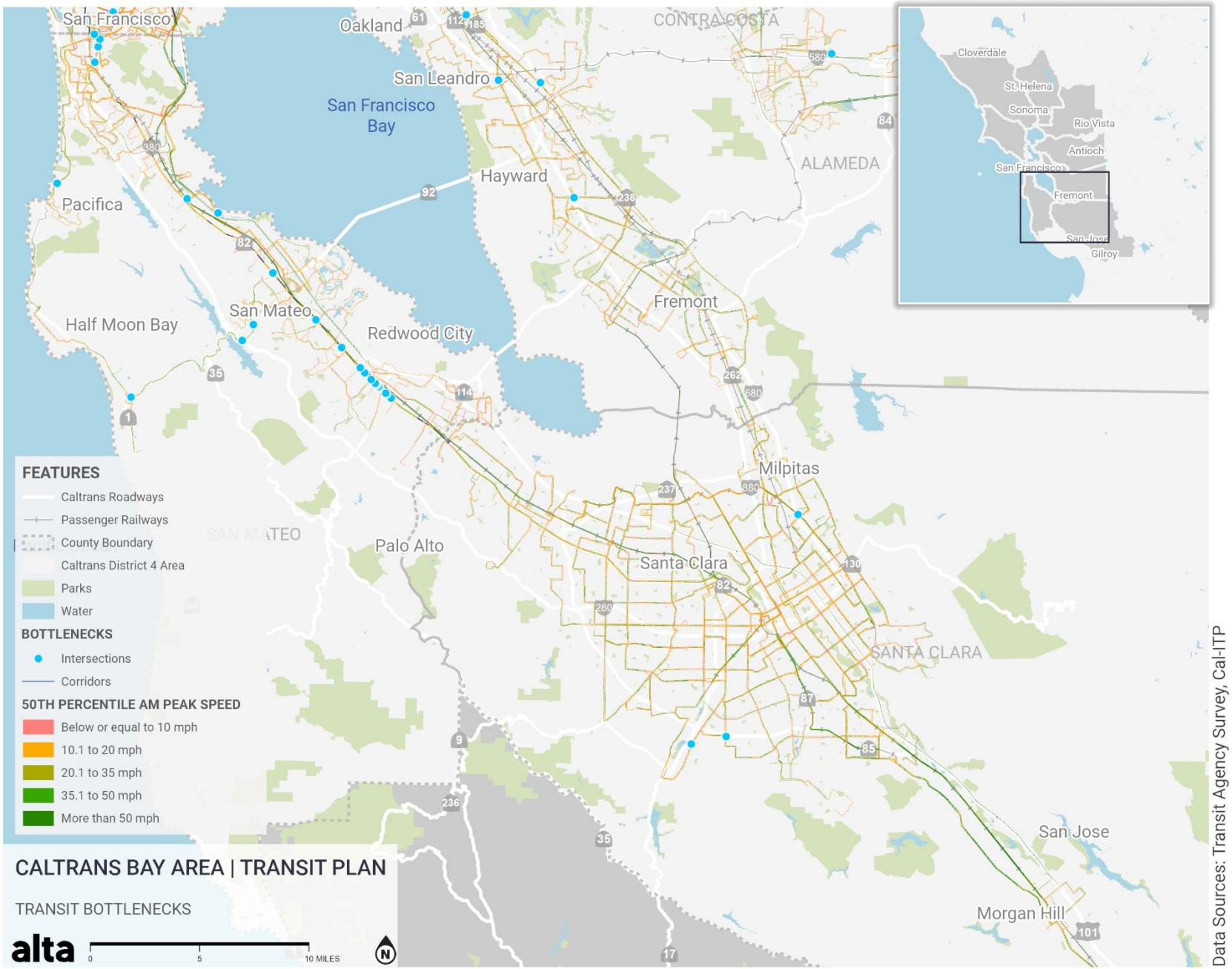


Figure 49: Transit bottlenecks (SOUTH)

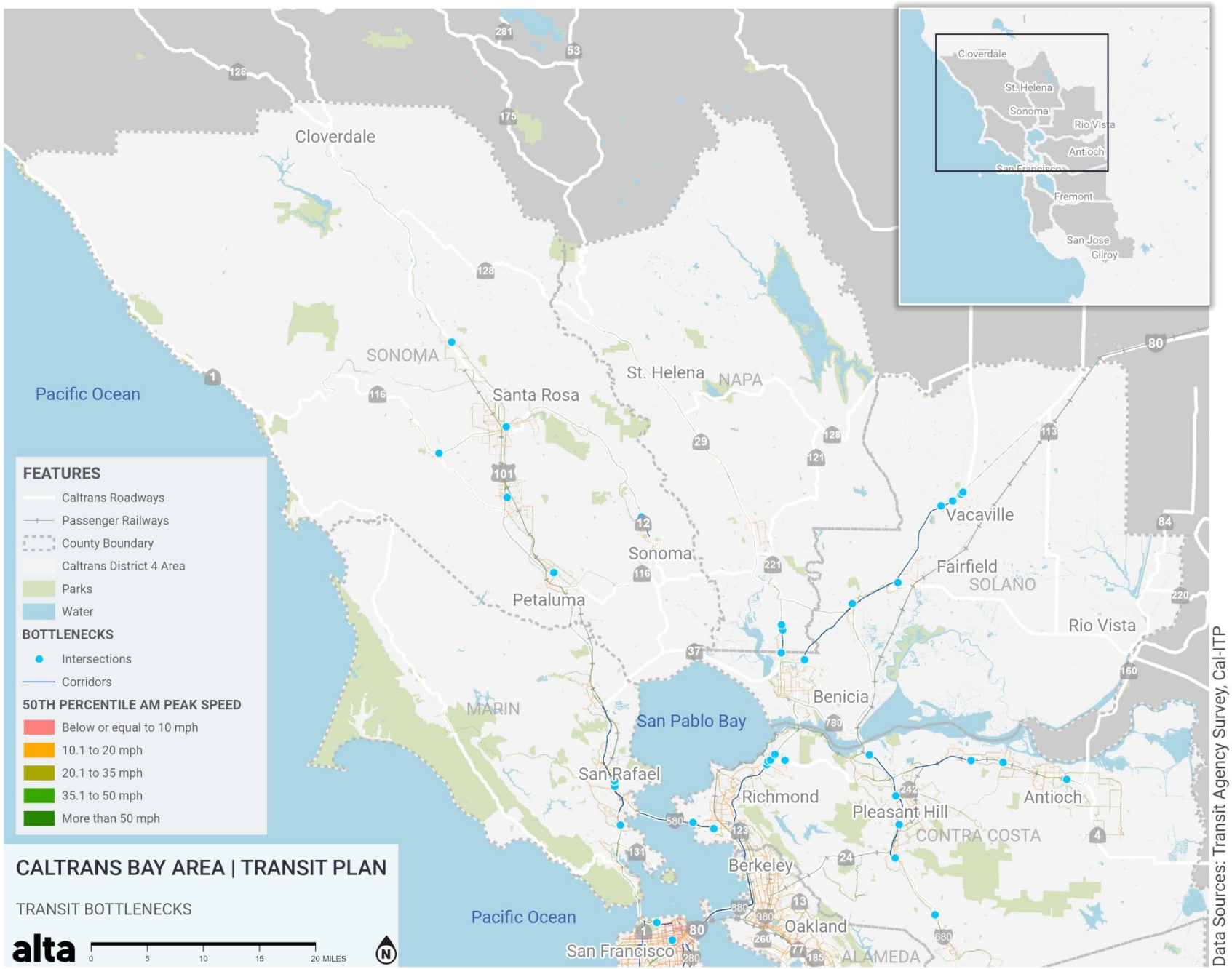


Figure 50: Transit bottlenecks (NORTH)

Transit Access Infrastructure

Alta assessed TAI in the Caltrans service area using data shared by transit agencies and MTC. Transit Access Infrastructure include pedestrian and bicycle facilities, on-demand transit/microtransit, stop amenities, and safety improvements that help riders reach fixed-route transit. The ability to access transit is crucial to being able to use it. The inability to travel the first- or last-mile of a journey, perceived safety concerns and uncomfortable experiences while waiting and transferring may prevent people from using transit altogether.

To evaluate areas ripe for improved TAI, Alta identified major transfer points, planned mobility hub locations, bus stop amenities, bikeshare stations, on-demand transit zones (i.e., microtransit service), existing pedestrian and bicycle facilities along the STN, and corridors including transit stops with the highest number of bicycle and pedestrian-involved collisions within ¼ mile of the STN.[31] By identifying clusters of current TAI infrastructure that currently exists, we can identify opportunities to fill gaps to enhance comfort and safe access to transit stops in the Bay Area.

It is important to note that complete data sets were not received for every agency, therefore the data presented is not an exhaustive representation/analysis of TAI within the service area.

General Findings

Given the robust transit network in the Bay Area region, there are many locations throughout the region where transfers are available between five or more buses or trains[32]. BART stations, other rail stations (e.g., Caltrain), and transit centers offer the greatest potential for impact due to the number of transit routes (rail and bus) serving these locations. MTC is also planning mobility hubs within the Caltrans service area in San Francisco and along the Caltrain alignment. Mobility hubs are defined as areas/locations that connect different modes of transportation to facilitate travel without a private vehicle. They are often built around frequent, high-capacity transit and may include connections to local transit, micromobility, car share, or carpooling. Park-and-ride locations in Marin, San Mateo, and Sonoma counties offer additional transfer locations that Caltrans may prioritize for upgrading to mobility hubs with enhanced TAI.

The most common bus stop amenities reported included benches, garbage cans, transit shelters, lighting, bike racks, and bike lockers. Bikeshare stations offer a major amenity for multimodal travel. The Bay Wheels bikeshare system operates in the City/County of San Francisco, Oakland/Berkeley/Emeryville (Alameda), and San José (Santa Clara), offering the opportunity to improve first- and last-mile connections to transit.

Besides fixed-route transit service, on-demand microtransit service is available in several counties, including Alameda, Napa, Solano, San Mateo, Santa Clara, and Sonoma counties. Microtransit zones primarily serve areas without fixed-route service and may benefit from improved TAI to optimize these trips around virtual stops. Sidewalks and curb ramps along major corridors in these zones may provide the greatest benefit, enabling microtransit vehicles to pick up and drop off passengers at intersections rather than individual destinations. Shelters or other weather protection may be warranted at major destinations served by these microtransit services.

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[31] University of California Berkeley Safe Transportation Research and Education Center. (2023). *Transportation Injury Mapping System (TIMS), 2018 - 2022*. https://tims.berkeley.edu.

[32] Having access to five or more transit routes allows users to access many locations throughout the region and are locations that have a high number of transfers which is why five routes is defined as a major transfer point.

The Caltrans service area is well served by pedestrian and bicycle infrastructure. The Bay Trail and SMART trail serve as notable regional assets located near Caltrans roads and connecting to many transit stations. Most transit stops along the STN are proximate to some level of bicycle and pedestrian infrastructure. However, the STN does not properly accommodate pedestrian and bicycle safety to connect to many high-ridership stops. Alta identified 52 stops with more than 10 collisions in their vicinity clustered in 10 areas, all of which fall in the East Bay (Alameda and Contra Costa counties) and the San Francisco Peninsula areas (San Francisco, San Mateo, and Santa Clara counties). Caltrans could prioritize transit access investments around these stops to improve bicycle and pedestrian safety. It is important to note that certain bicycle and pedestrian treatments may impede ADA access to a curb for accessing transit vehicles. That being said a balance between bicycle and pedestrian access along with ADA access is important for transit access and one does not have to preclude the other.

Data Analysis

Transfer Points

Bus stops and train stations served by five or more routes may benefit the most from additional investment in the customer experience. These locations are often transfer points that facilitate multi-leg journeys. **Figure 51** through **Figure 54** show all stops and stations in the service are that serve more than one route. The stops that serve the highest number of transit routes within a ¼ mile of the STN are shown in **Table 2**.

Table 2: Top 10 Transfer Points by Number of Routes Served (within ¼ mile of the STN)

Station Name	Transit Typology	City	County	# Transit Routes Served (Bus/Rail)
Transbay Transit Center	Bus	San Francisco	San Francisco	30
Palo Alto Transit Center	Rail/Bus	Palo Alto	Santa Clara	25
Santa Rosa Transit Mall	Bus	Santa Rosa	Sonoma	24
8th Street and Market Street	Rail/Bus	San Francisco	San Francisco	21
Daly City BART Station	Rail	Daly City	San Mateo	19
Fruitvale BART Station	Rail	Oakland	Alameda	18
11th Street and Market Street, San Francisco	Rail/Bus	San Francisco	San Francisco	18
El Cerrito del Norte BART Station	Rail	El Cerrito	Contra Costa	18
Van Ness Muni Station	Rail	San Francisco	San Francisco	17
San Rafael Transit Center	Bus/Rail	San Rafael	Marin	17

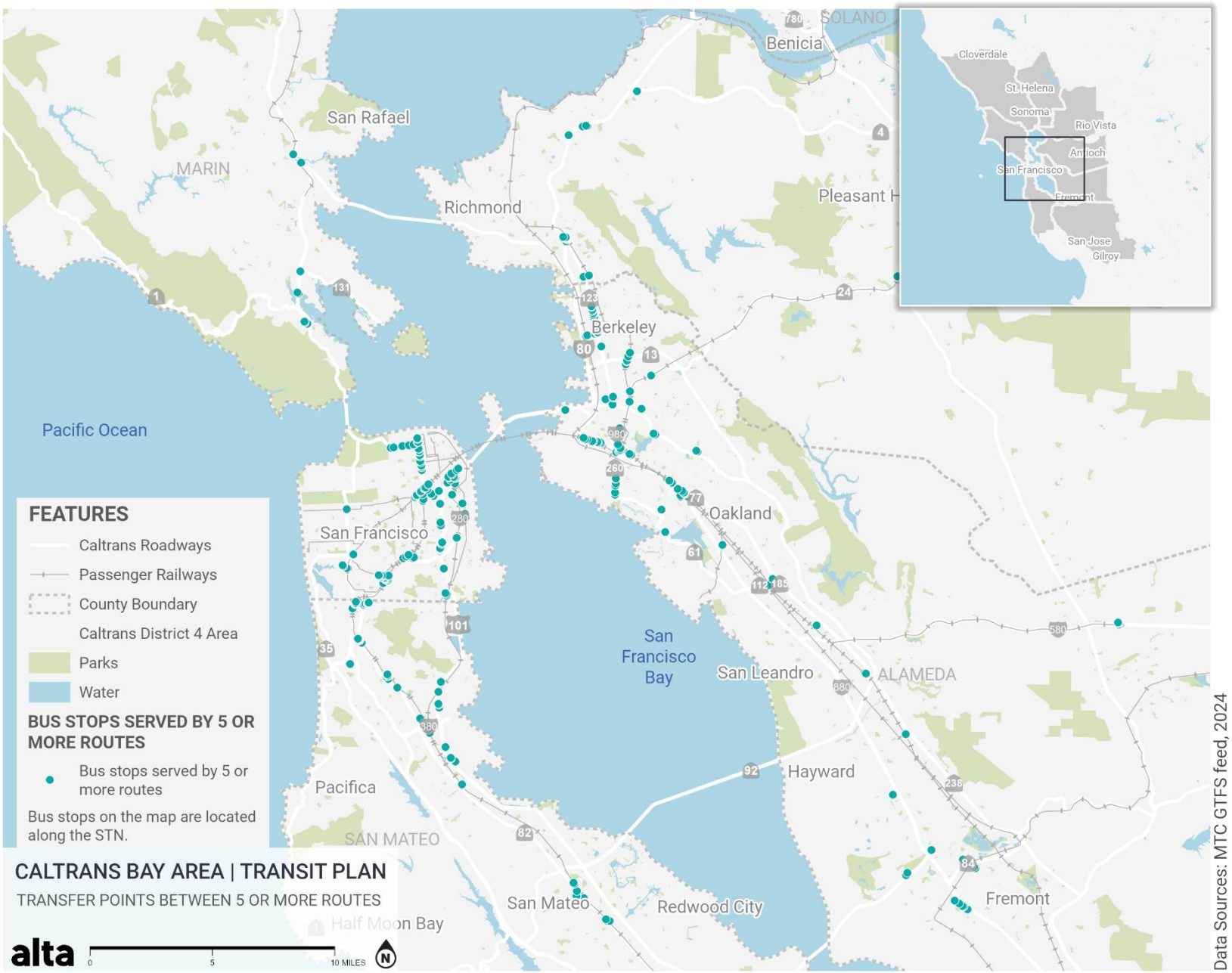

Figure 51: Transfer points (CORE)

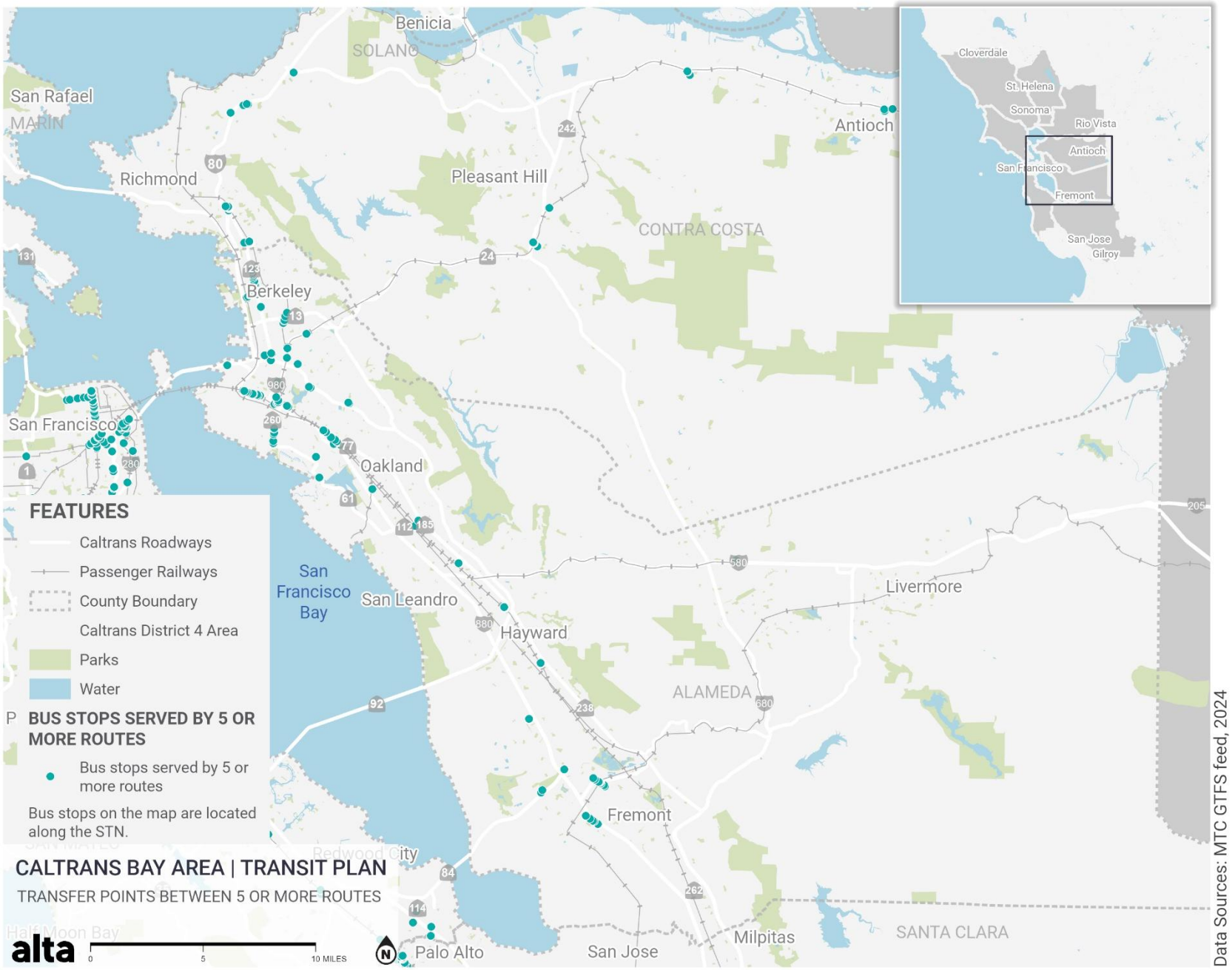

Figure 52: Transfer points (EAST)

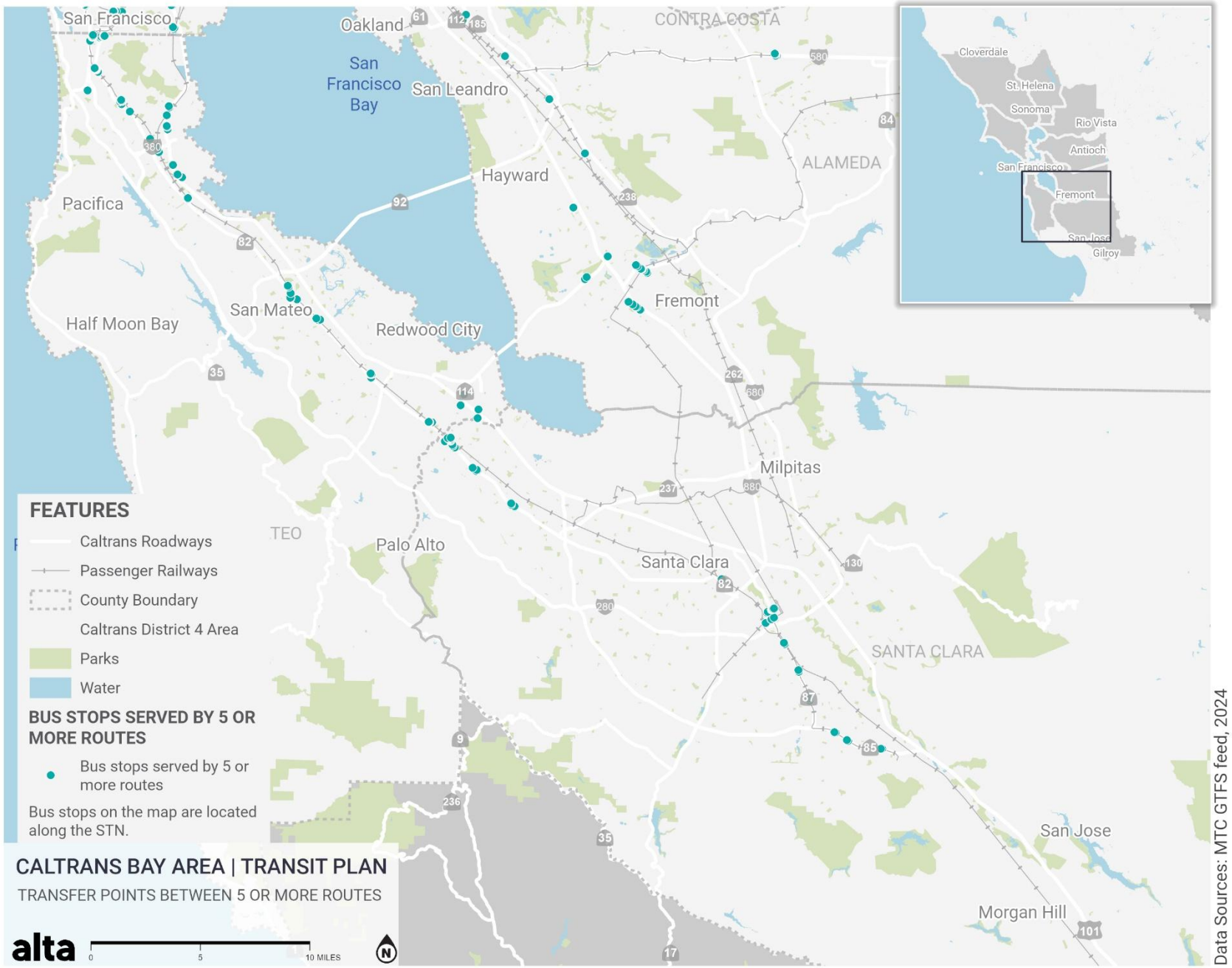

Figure 53: Transfer points (SOUTH)

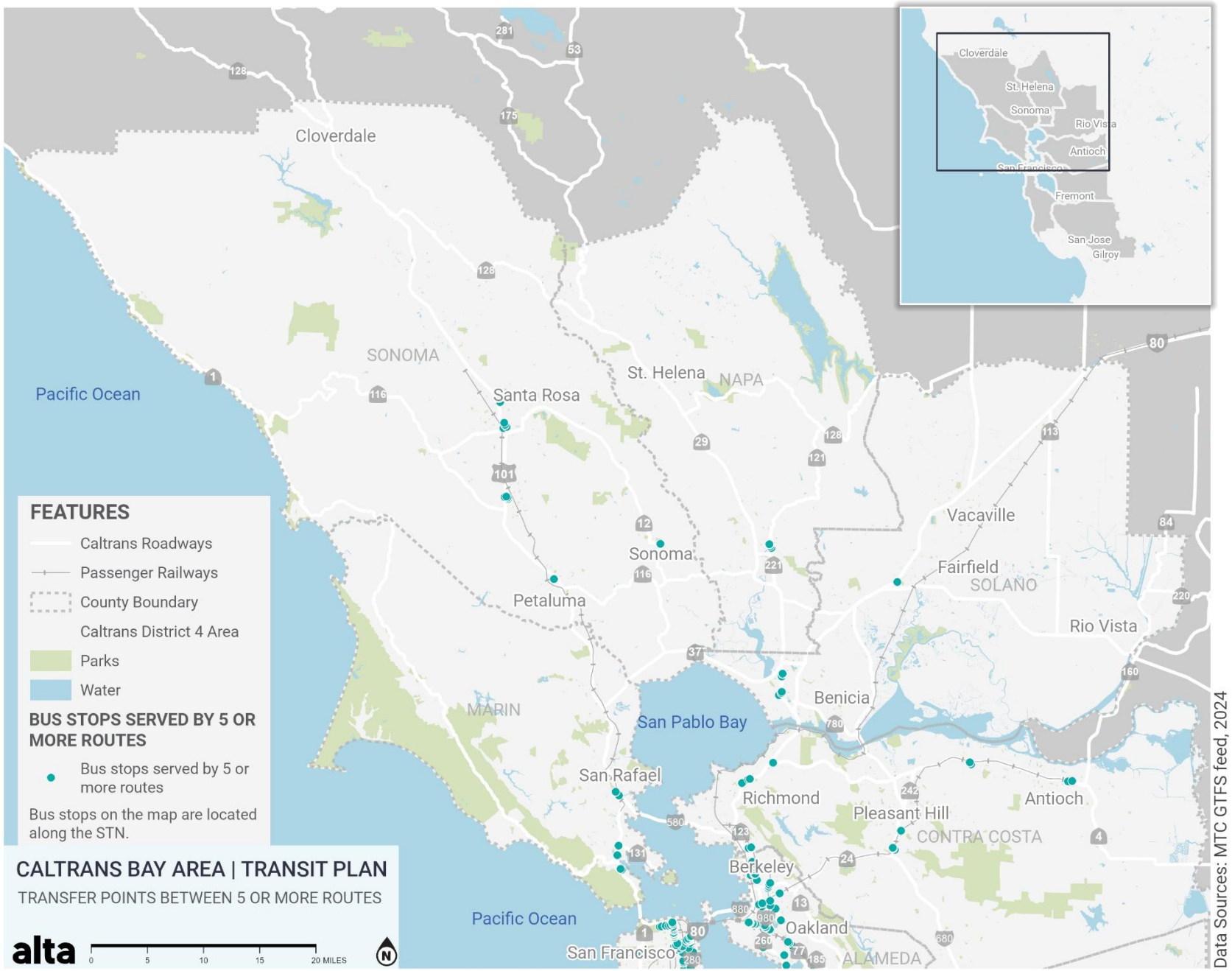

Figure 54: Transfer points (NORTH)

Bus Stop Amenities

Amenities may play a role in helping passengers feel safe and comfortable while waiting for transit or, in the case of bike lockers, that their bikes will be secure. These amenities are displayed in Figure 55 through Figure 64. However, Alta received very limited data on bus stop amenities from transit agencies. Data was received only from Marin County Transit District, SamTrans, Wheels Bus, (Livermore-Amador Valley Transit Authority), Santa Clara Valley Transportation Authority, Sonoma County Transit, and Soltrans; in many cases, this data was incomplete. Alta's data displays that information that was received, but it is likely that many existing amenities are not represented here. For example, many bus stops have lighting, but the only data collected about bus stop lighting was in San Mateo County.

Mobility Hub Locations

Mobility hubs are places where multiple modes of transportation come together, such as public transit, bikeshare, or car share, which allow for mobility without the need for a private vehicle. Figure 65 through Figure 68 show the locations of the mobility hubs in the Caltrans service area that were identified as top 100 hubs by MTC. These hubs are primarily in San Francisco and along the Caltrain alignment, with some in the San José, Oakland, and Berkeley areas as well.

Figure 65 through Figure 68 also show park-and-ride facilities, which are critical for transit access in suburban areas. These facilities are scattered throughout the region with an especially strong presence in Marin, Sonoma, and San Mateo counties. Facilities outside of the Caltrans service area are shown in gray. Proposed mobility hub locations were not available.

Bike Share Stations

Bike share can play a key role in providing first- and last-mile connections to transit. Bay Wheels bike share operates fixed stations, which are currently placed in three separate areas: San Francisco, Oakland/Berkeley/Emeryville, and San José, as shown in Figures 69 and 70.

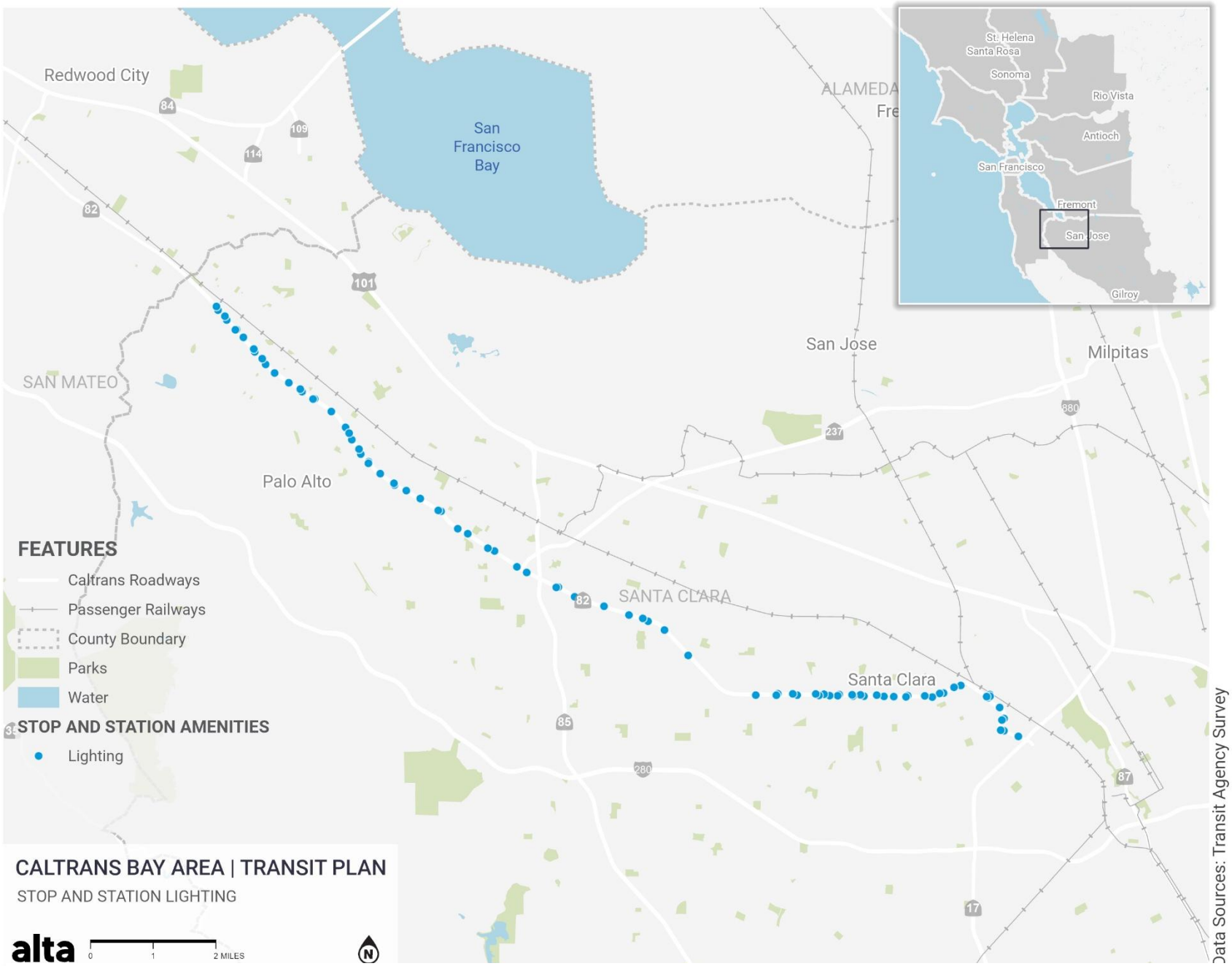

Figure 55: Lighting

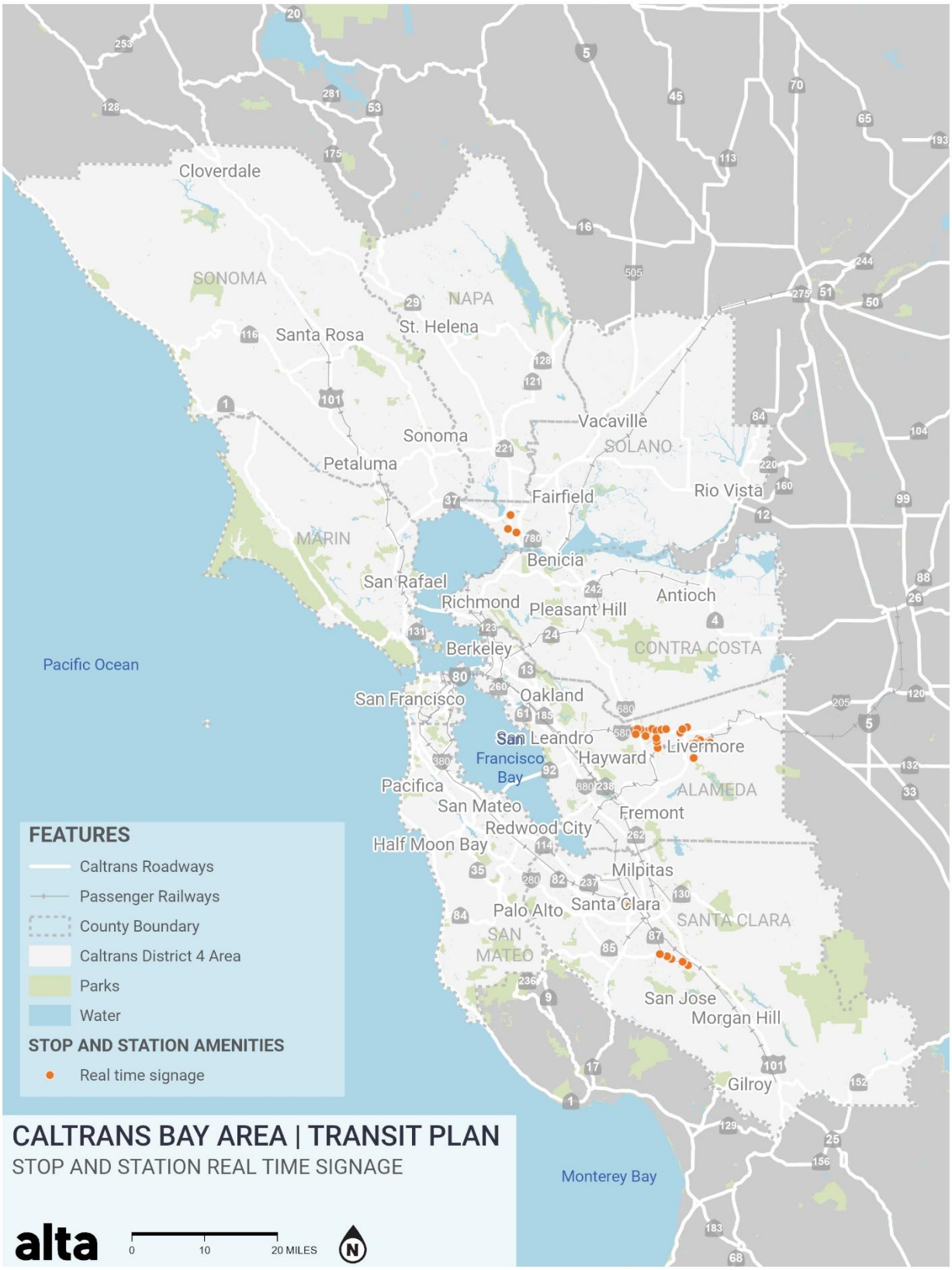

Figure 56: Real-time signage

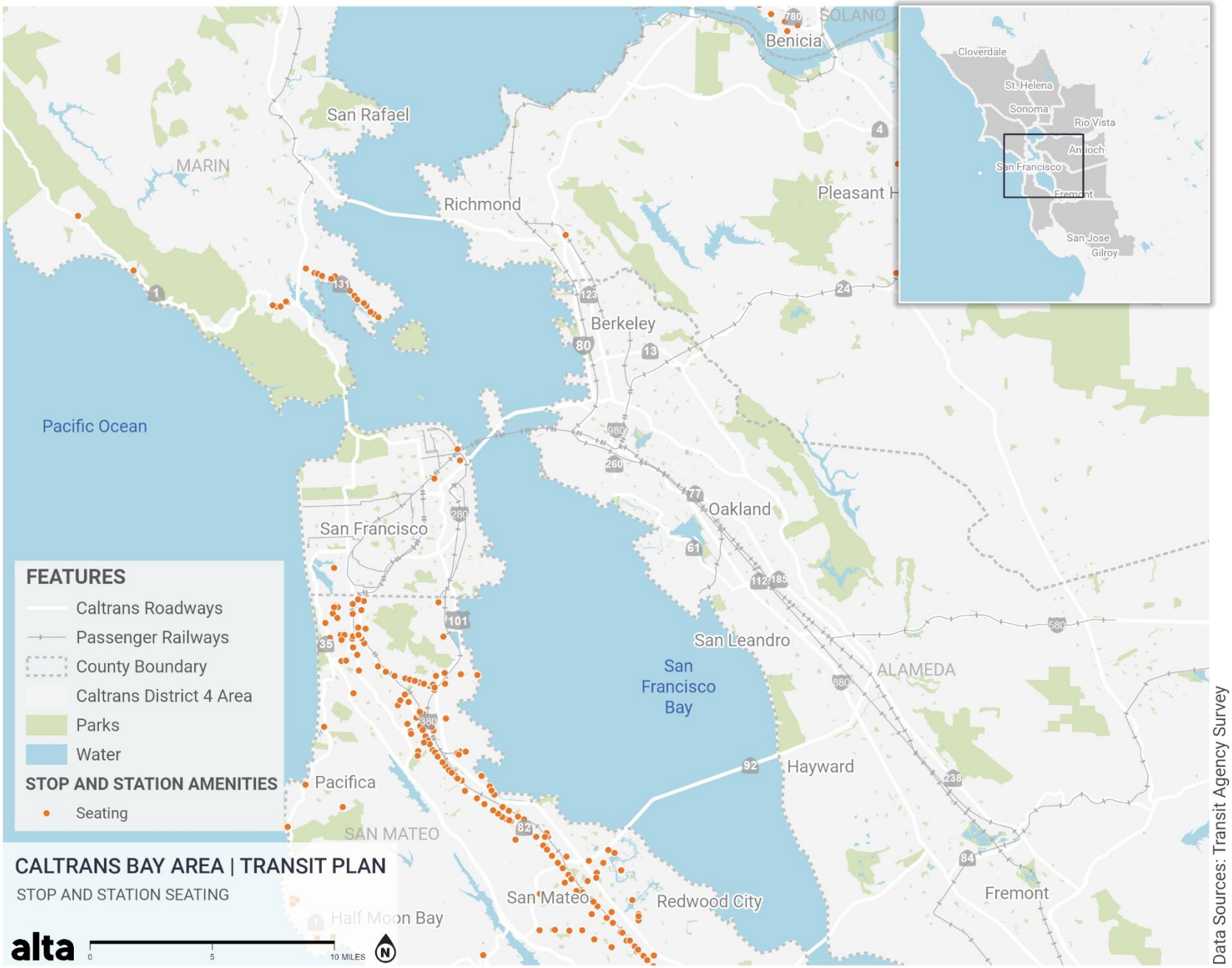

Figure 57: Stops and stations with seating (CORE)

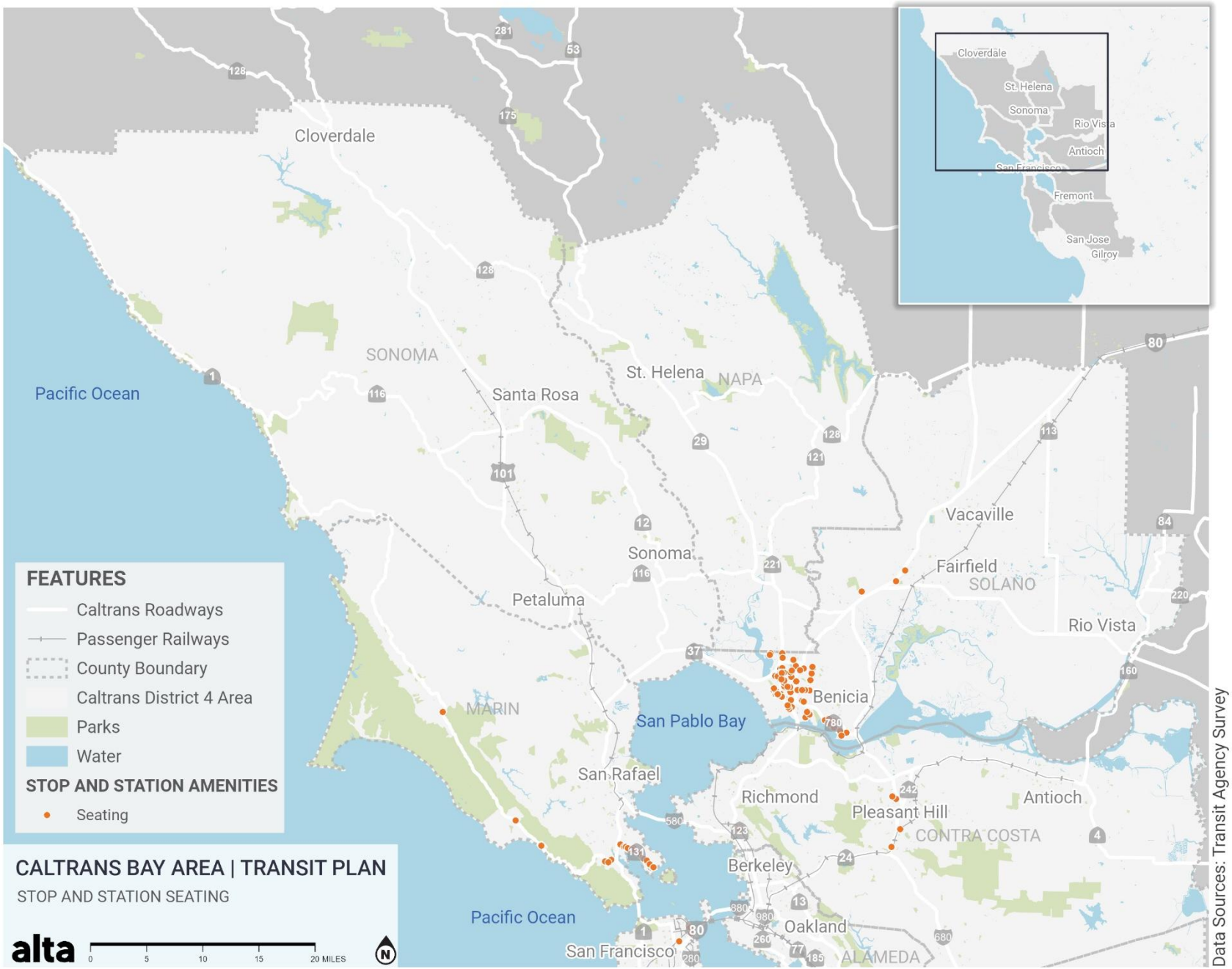

Figure 58: Stops and stations with seating (NORTH)

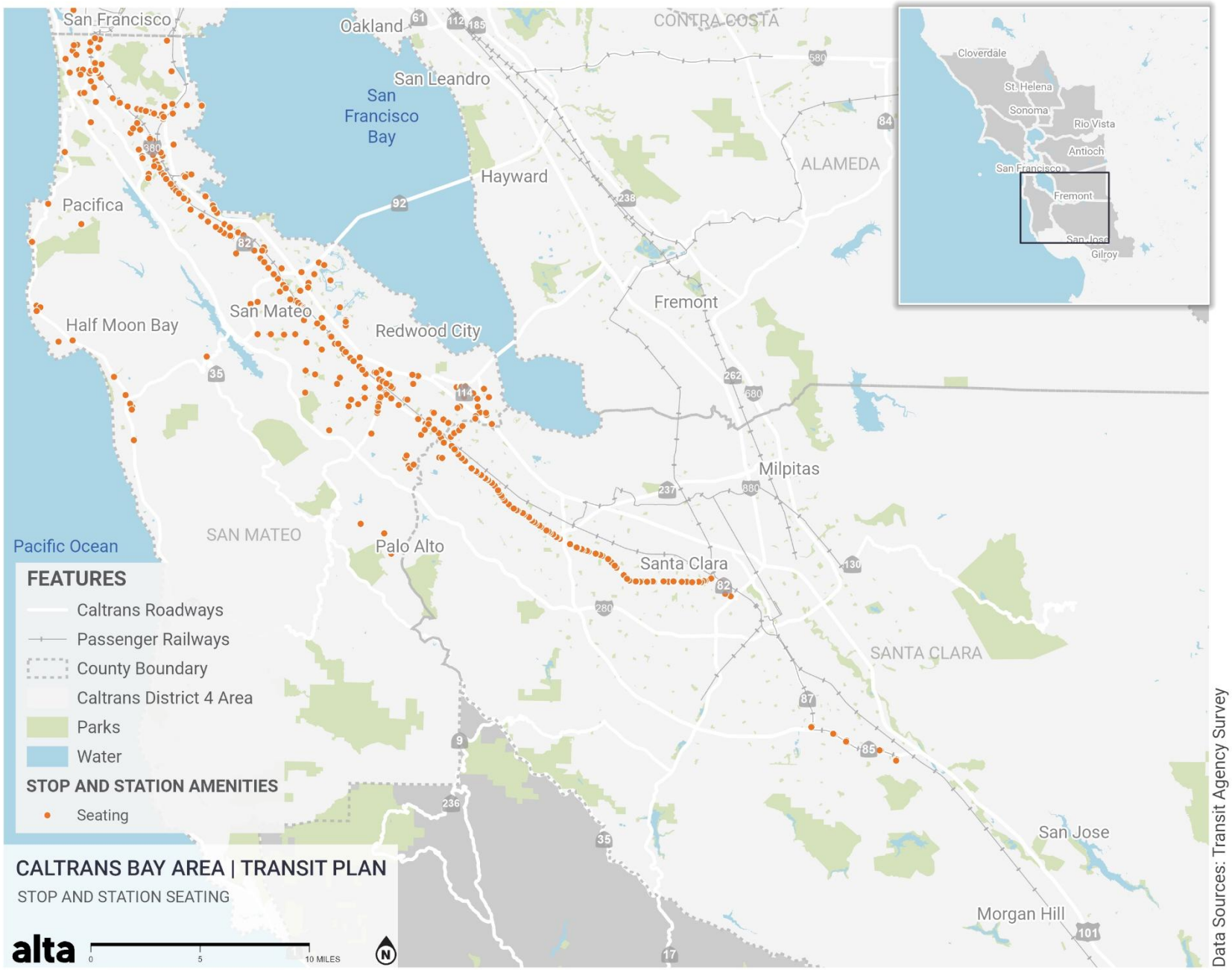

Figure 59: Stops and stations with seating (SOUTH)

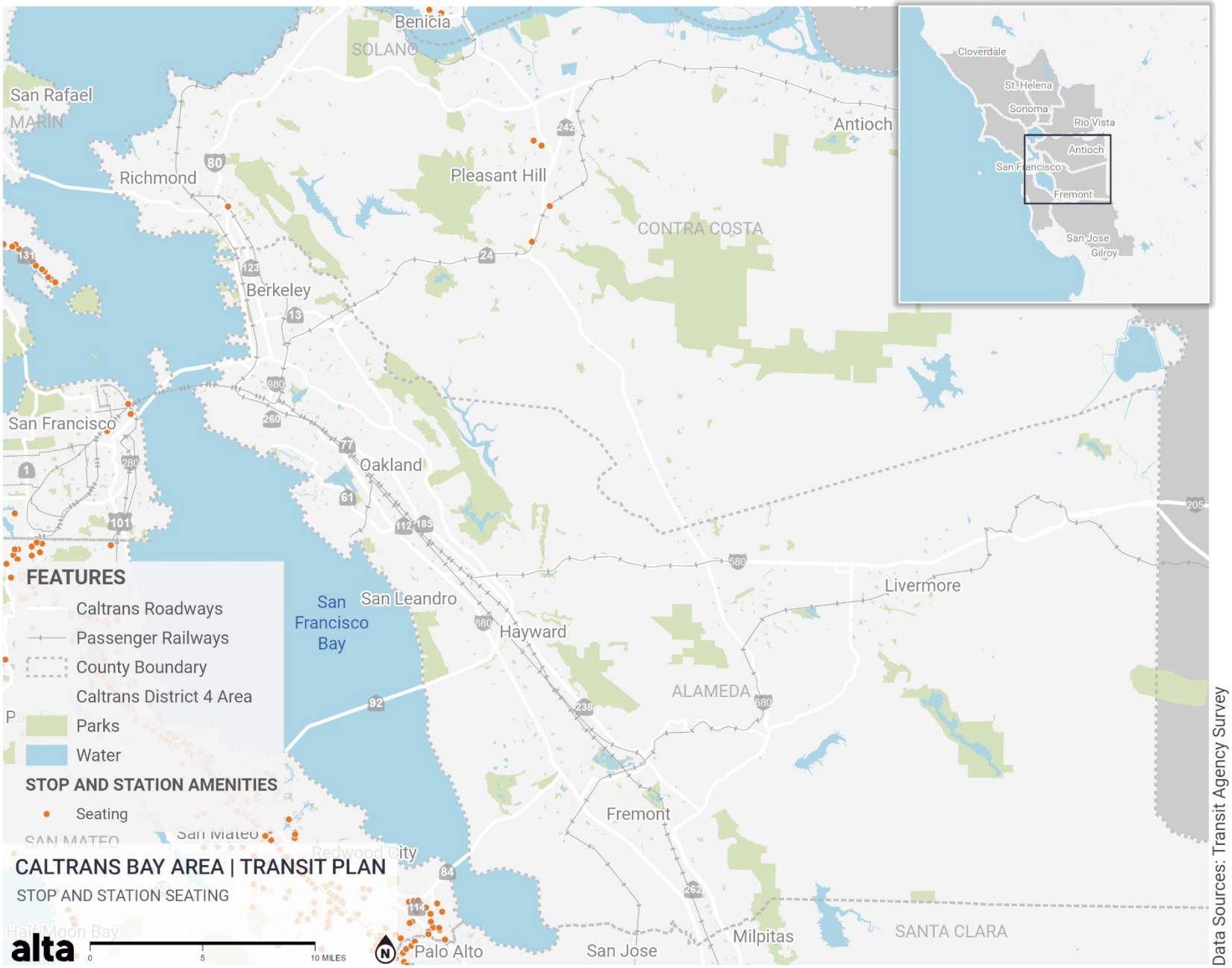

Figure 60: Stops and stations with seating (EAST)

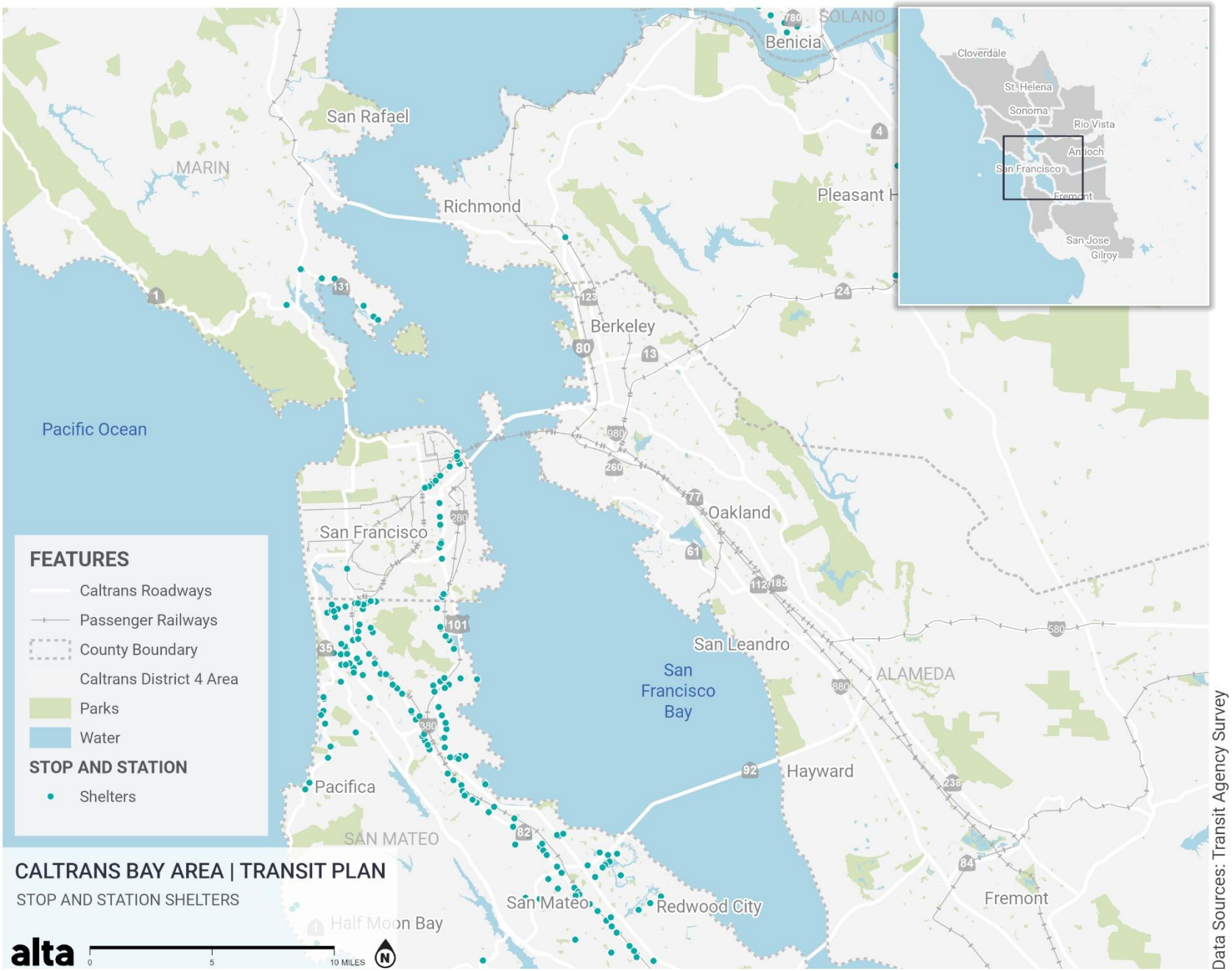

Figure 61: Stops and stations with shelters (CORE)

Figure 62: Stops and stations with shelters (NORTH)

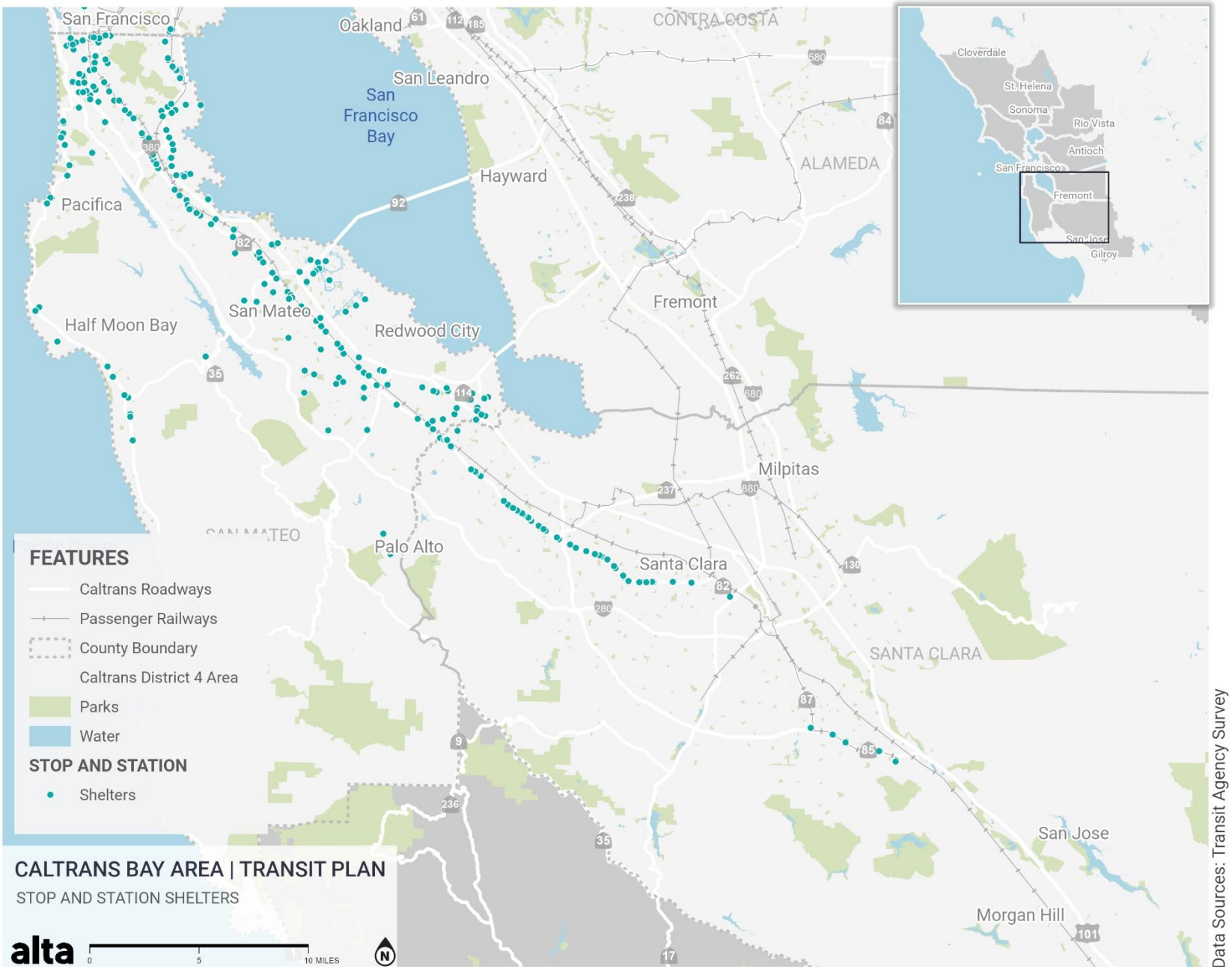

Figure 63: Stops and stations with shelters (SOUTH)

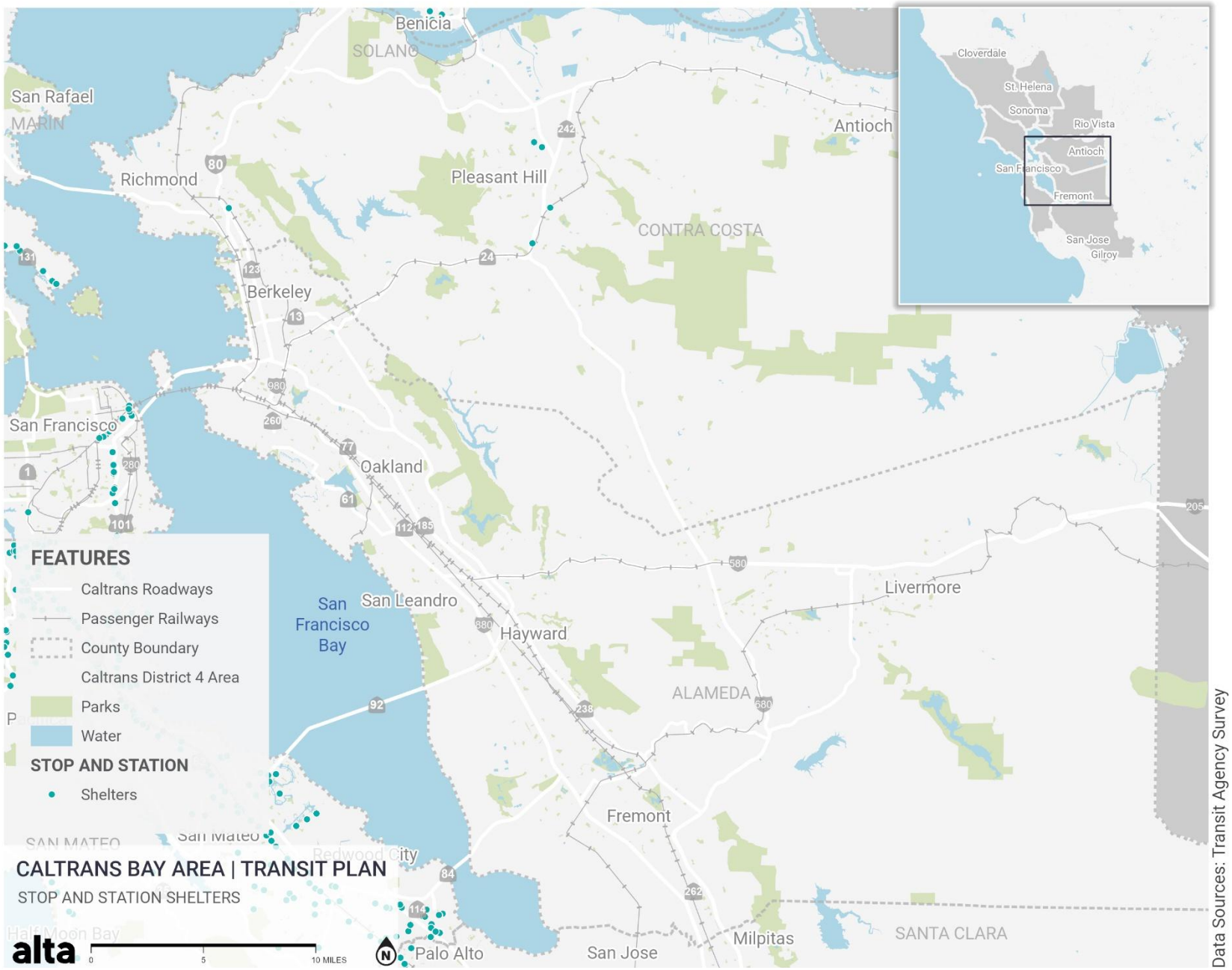

Figure 64: Stops and stations with shelters (EAST)

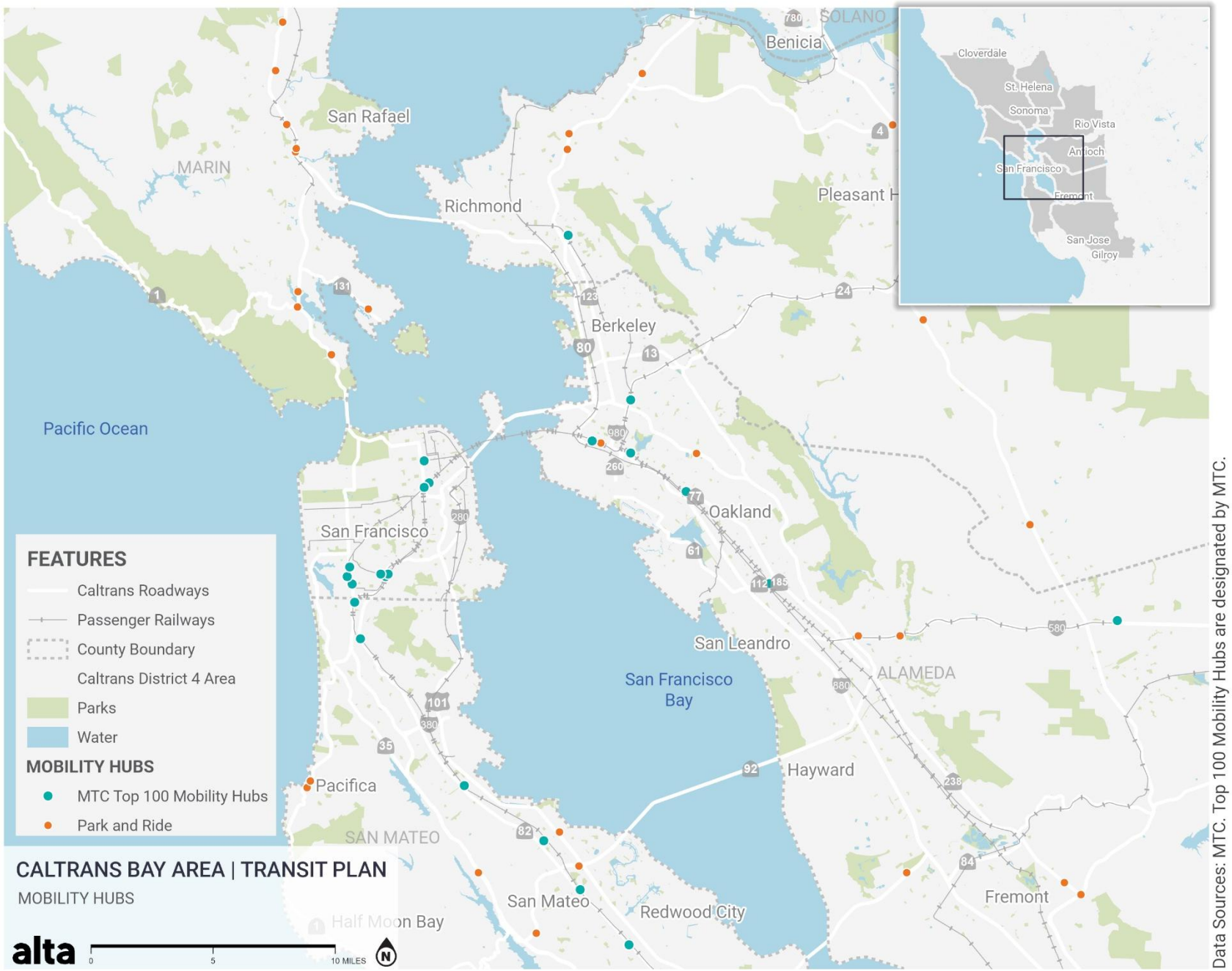

Figure 65: Mobility hubs and park and rides (CORE)

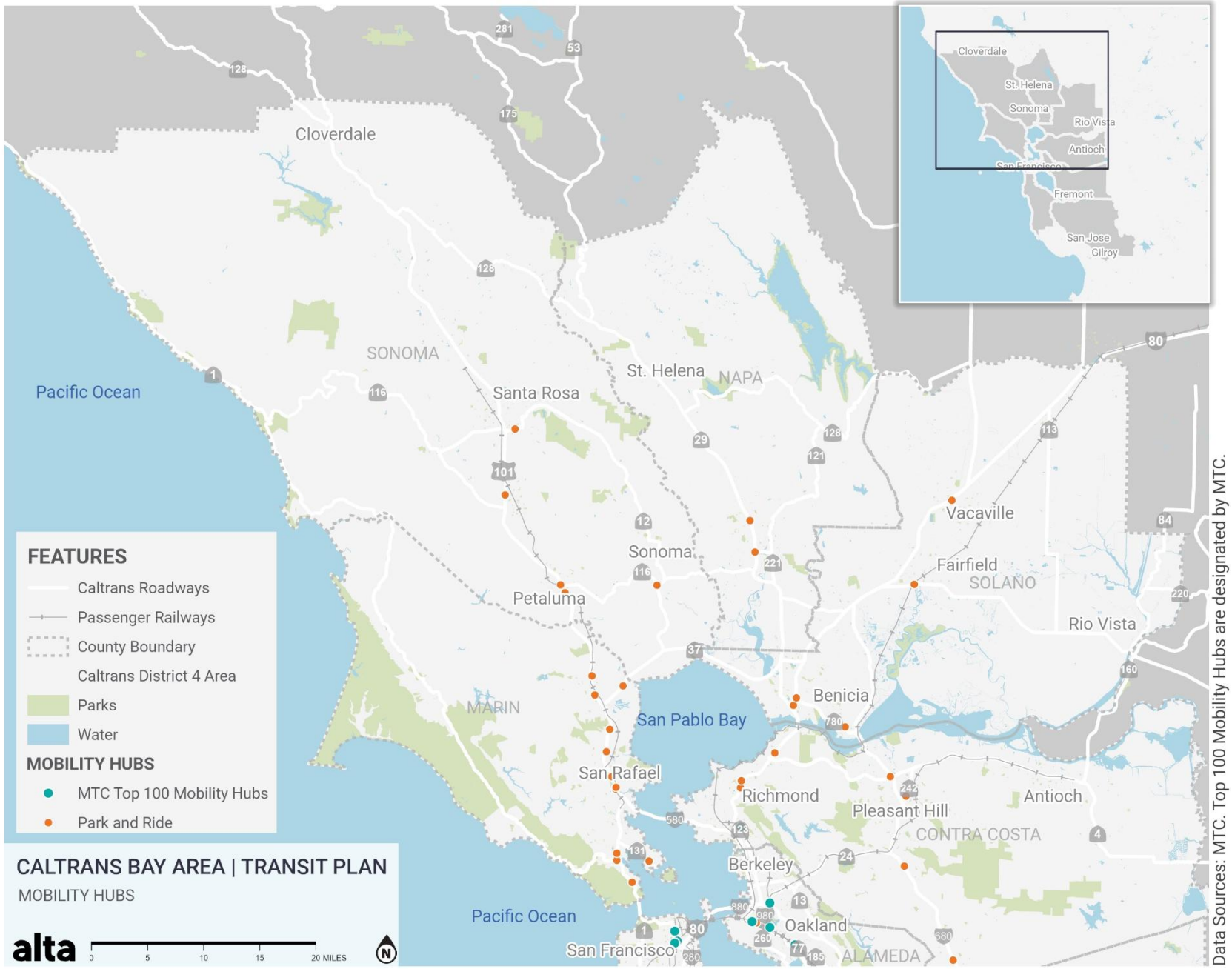

Figure 66: Mobility hubs and park and rides (NORTH)

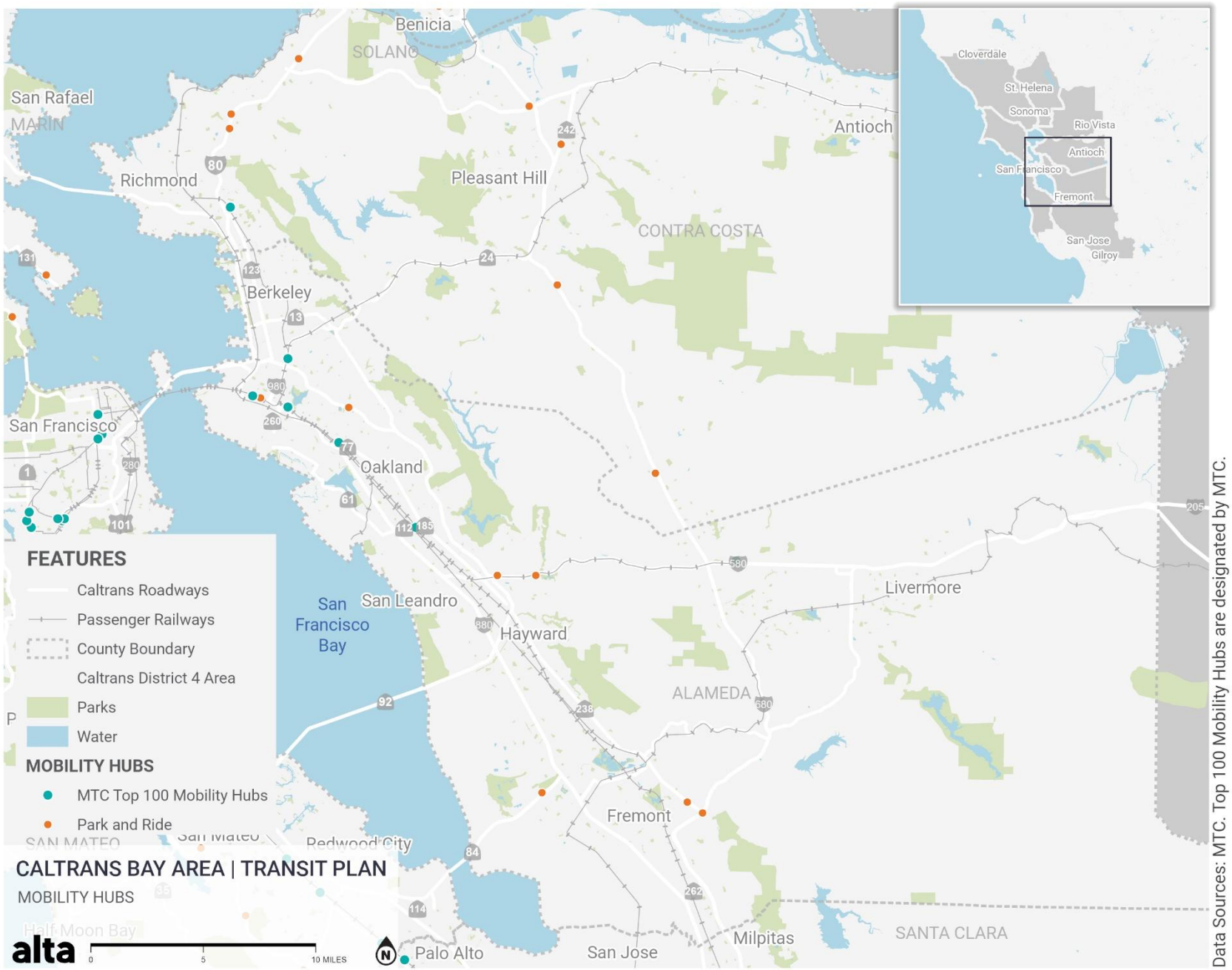

Figure 67: Mobility hubs and park and rides (EAST)

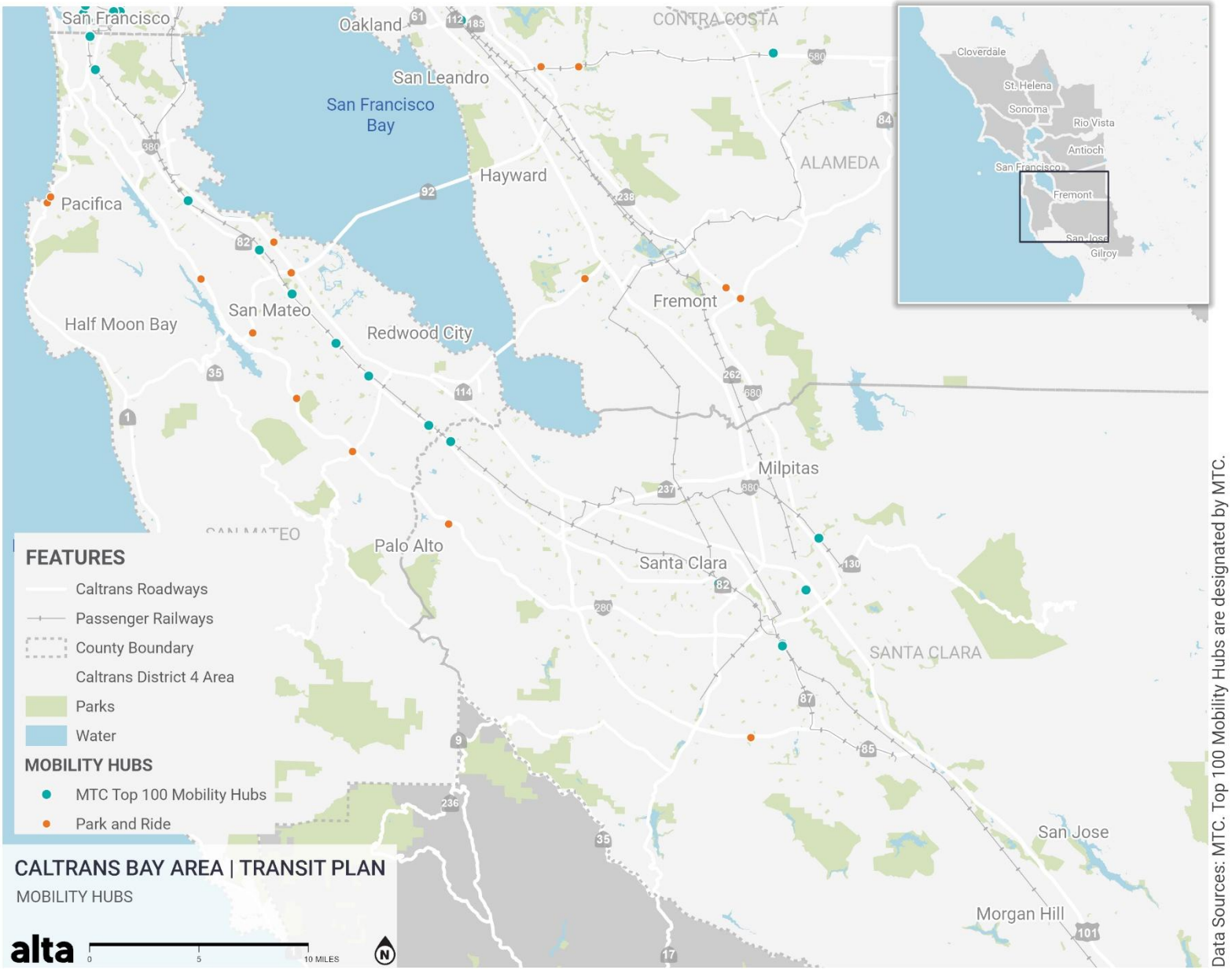

Figure 68: Mobility hubs and park and rides (SOUTH)

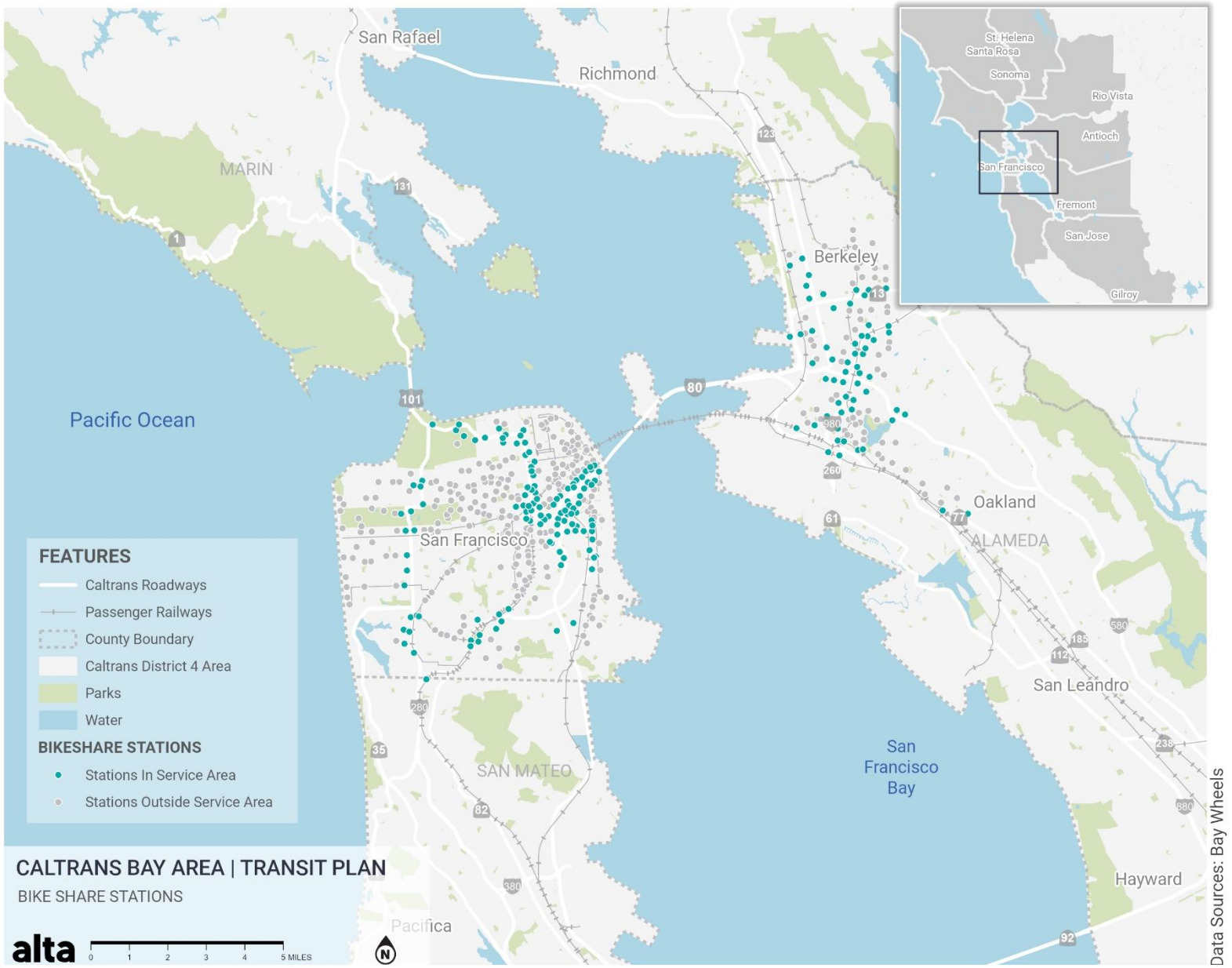

Figure 69: Bikeshare (Central)

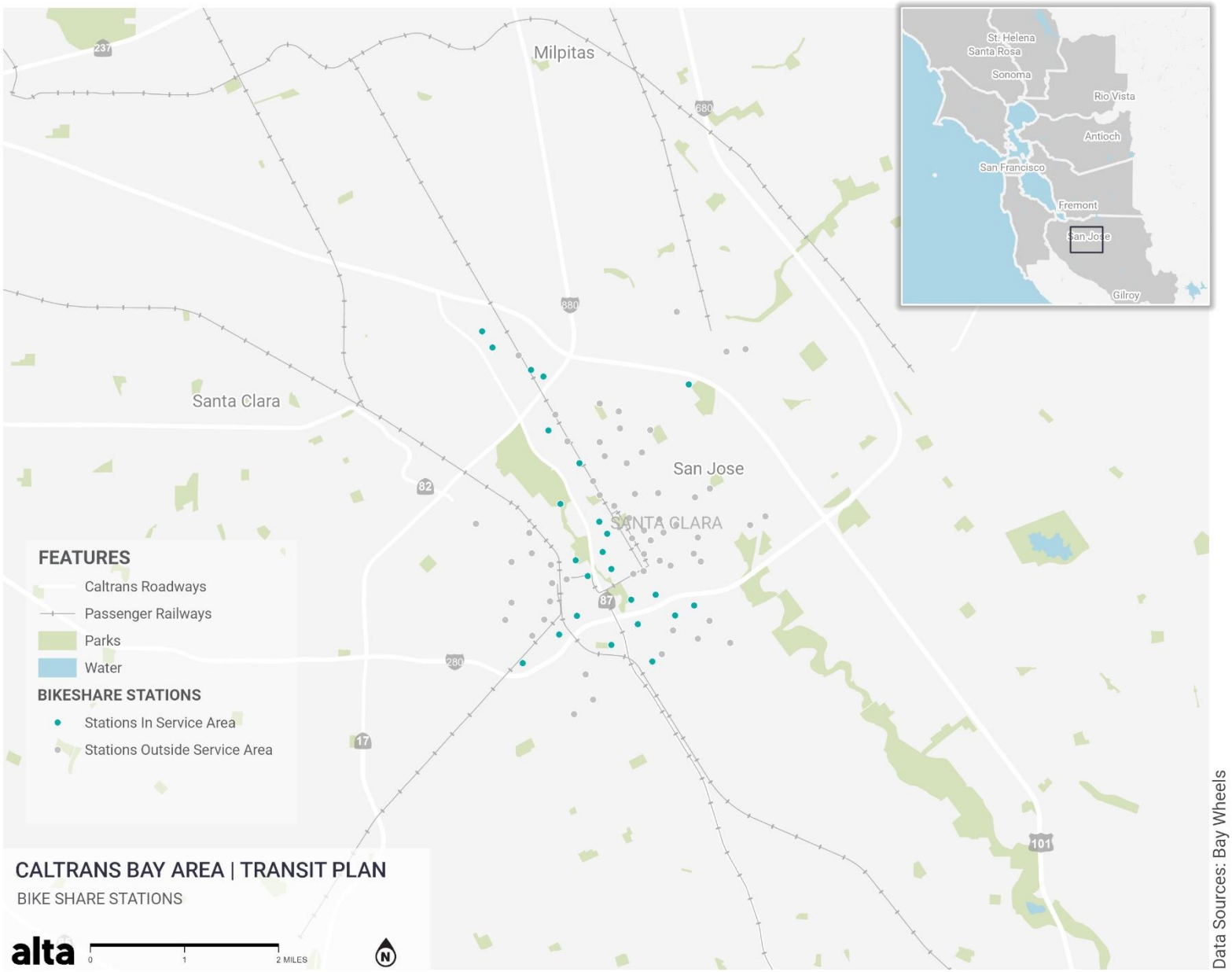

Figure 70: Bikeshare (San Jose)

On-Demand Transit Zones

On-demand transit, or microtransit, may also play a key role in first- and last-mile transit access; in some cases, it also replaces fixed-route transit. These services do not operate on fixed routes and schedules; rather, riders can call or request a ride via an app and be taken to any part of a designated service area. Some services offer door-to-door service, while others may offer service only to and from designated hubs or to nearby street corners to streamline operations. Microtransit in the Bay Area operates in relatively small, distinct zones, often where fixed-route transit is limited. Figure 71 shows current microtransit and on-demand transit zones, excluding paratransit. Alta did not collect data on future or planned microtransit service areas.

Pedestrian and Bicycle Infrastructure

Figure 72 through Figure 75 show pedestrian and bicycle infrastructure in the Caltrans service area.

Data on pedestrian facilities was incomplete and did not include many smaller streets with sidewalks, which may provide access across Caltrans roadways. Most stops are proximate to some level of bicycle and pedestrian infrastructure; however, the condition of these facilities or their connectivity to the wider network was not assessed.

Alta compared the locations of major infrastructure gaps with the location of Equity Priority Communities (EPCs), but was not able to identify any gaps in EPCs.

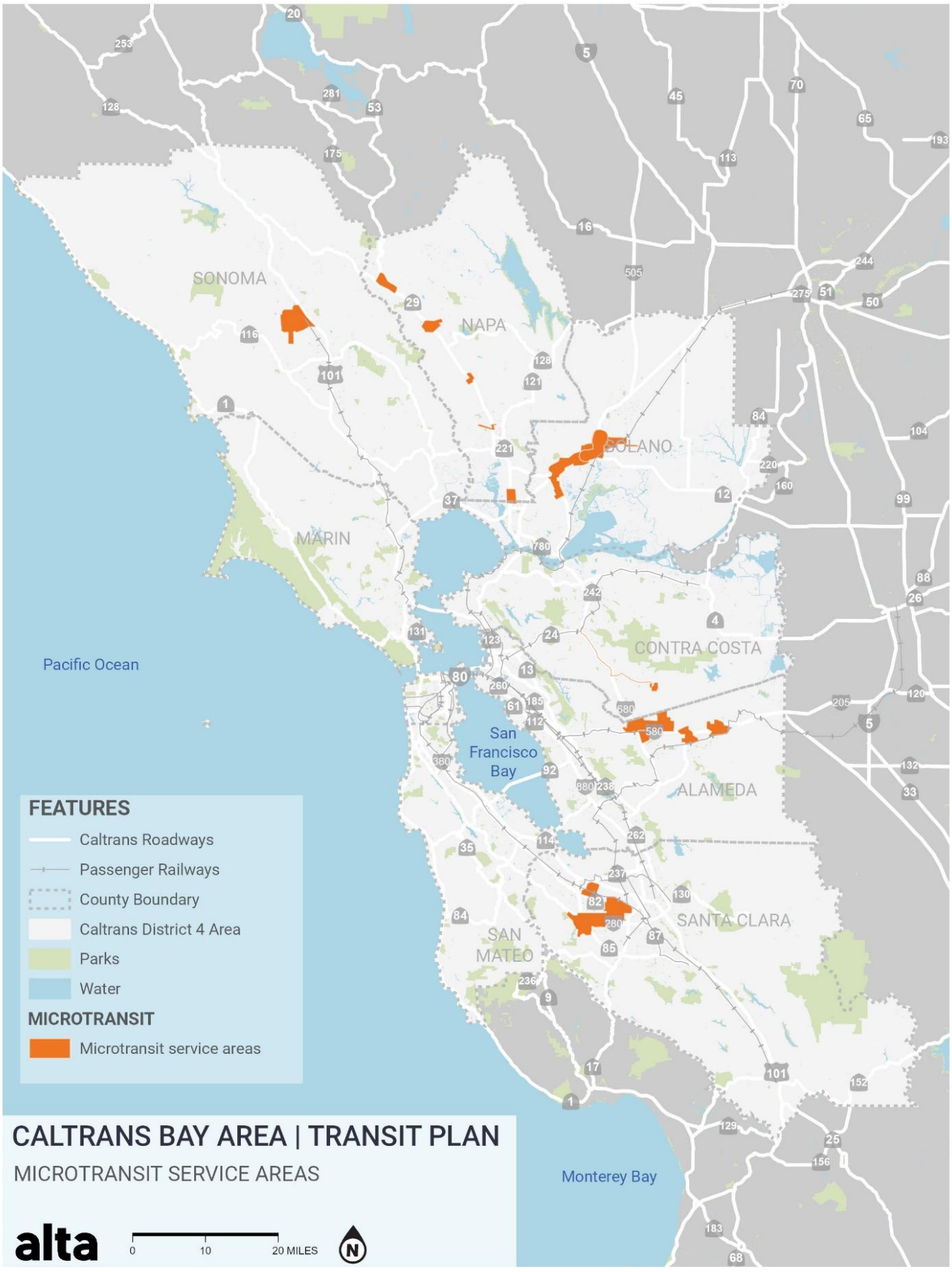

Figure 71: Microtransit service areas

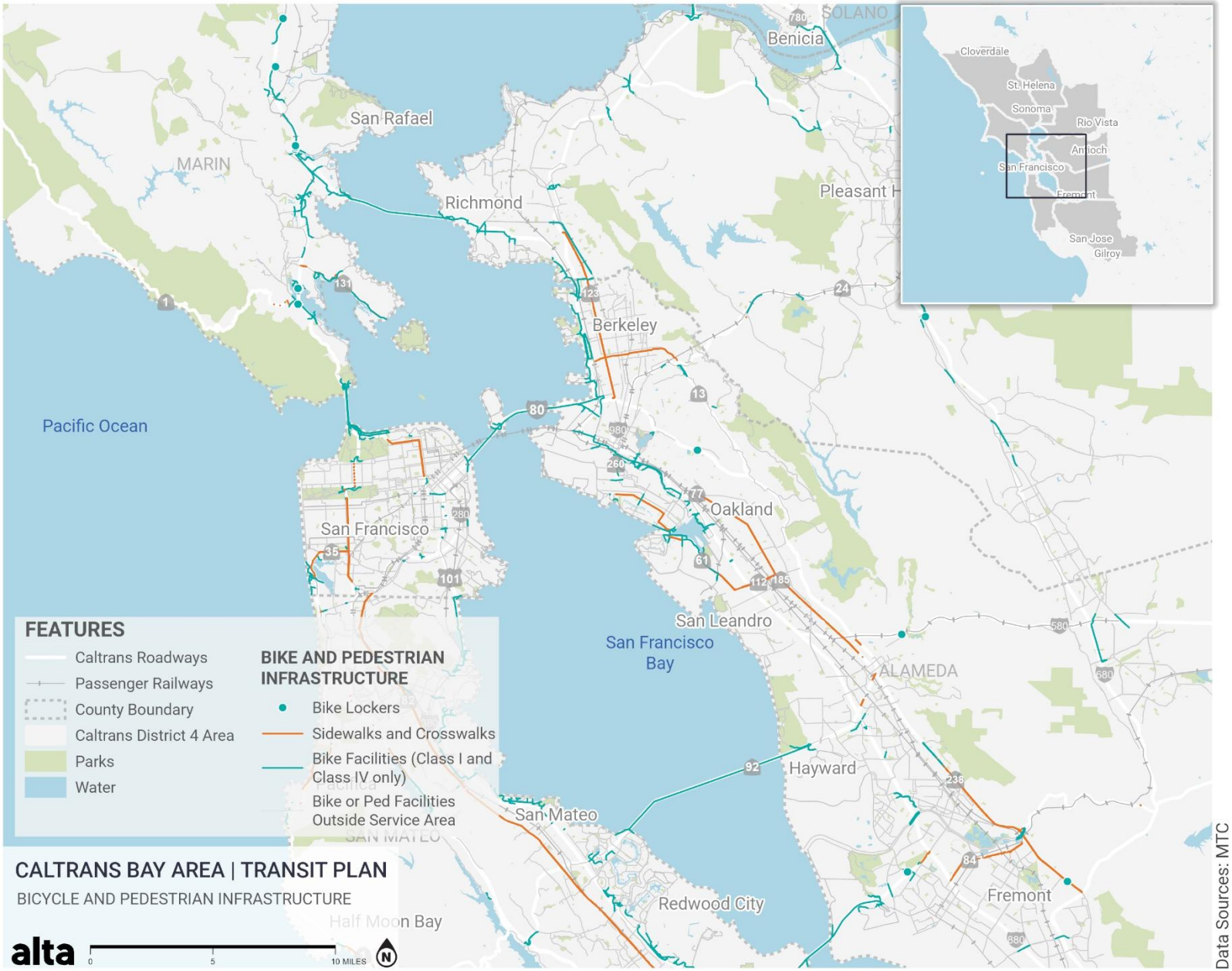

Figure 72: Bicycle and pedestrian infrastructure (CORE)

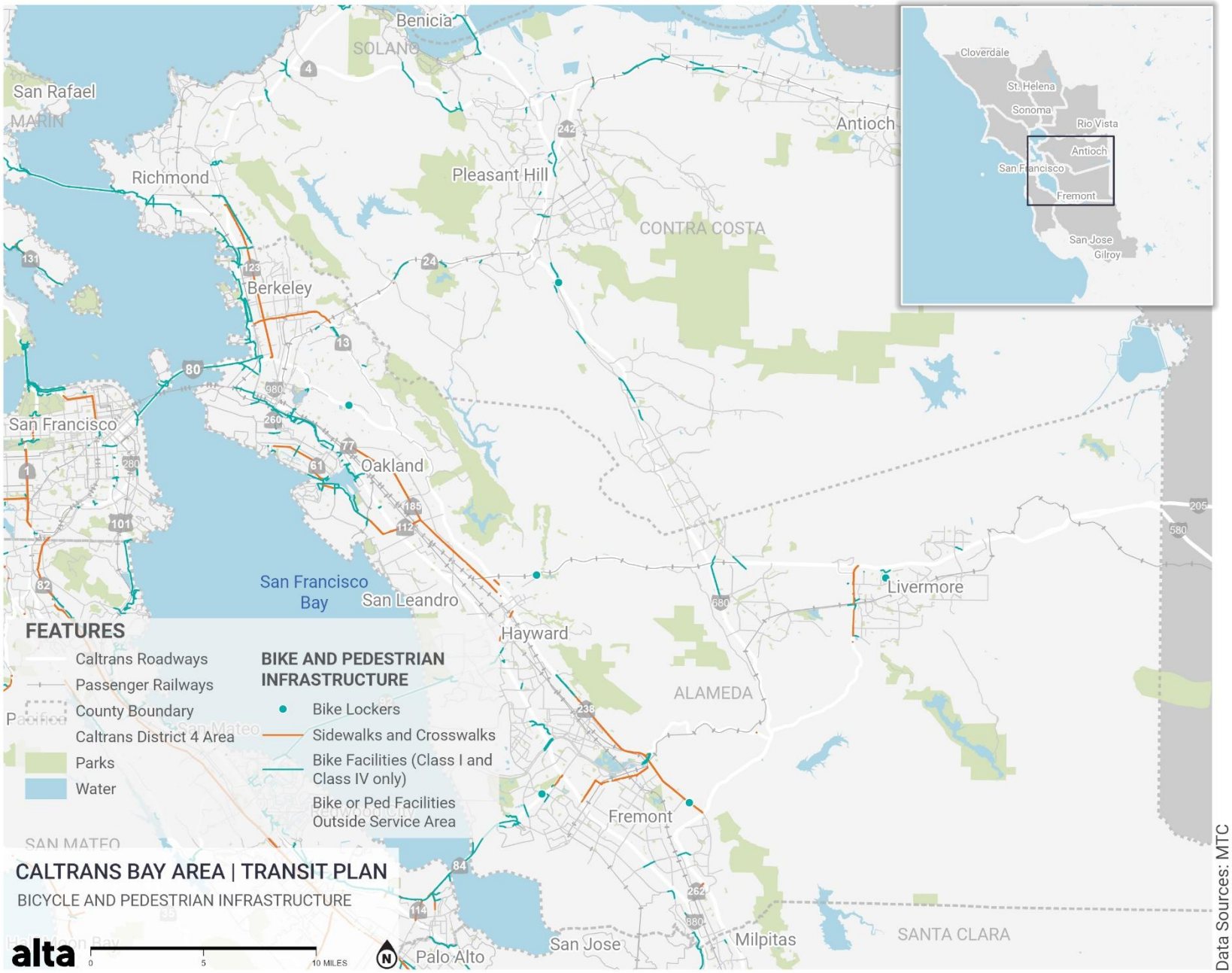

Figure 73: Bicycle and pedestrian infrastructure (EAST)

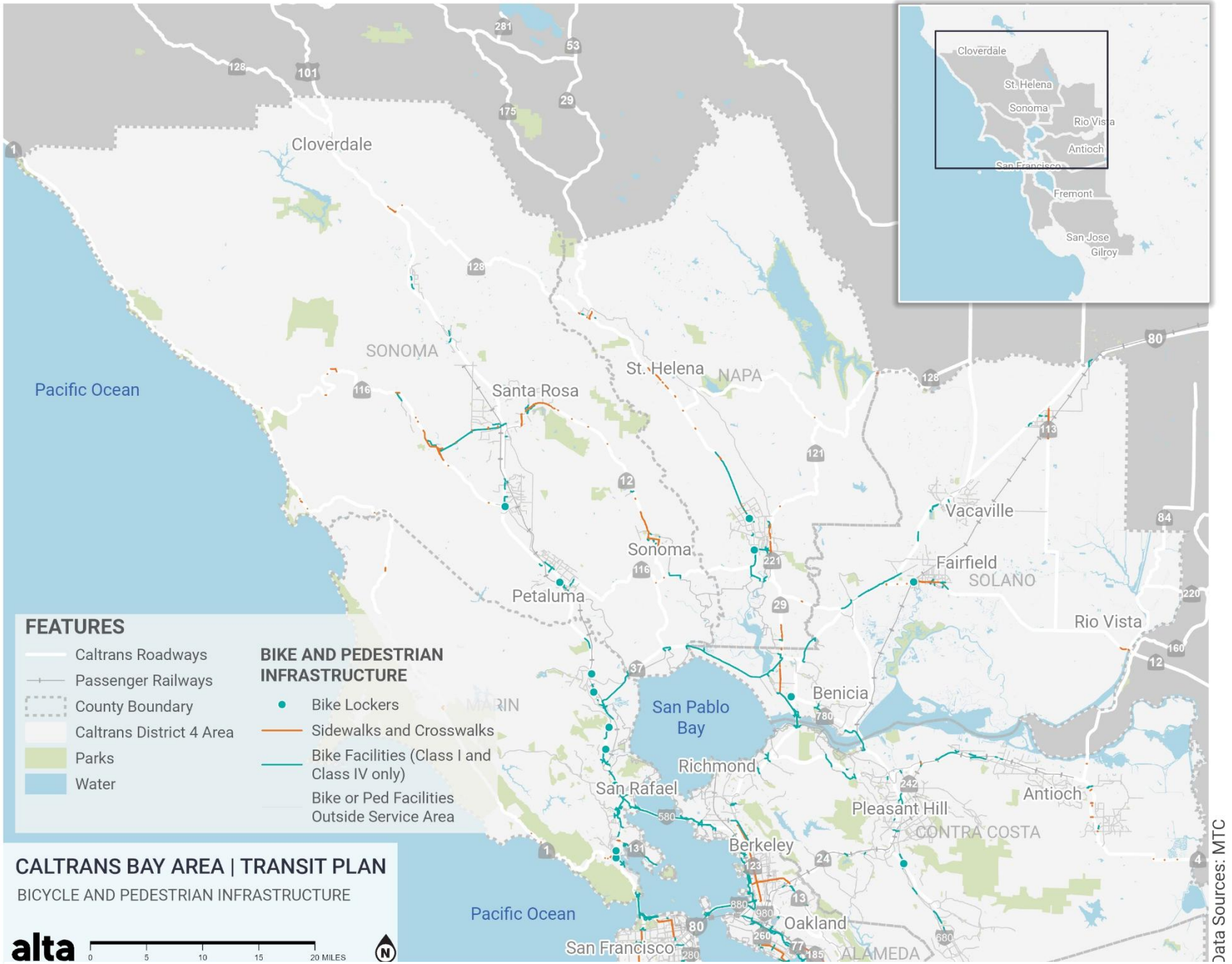

Figure 74: Bicycle and pedestrian infrastructure (NORTH)

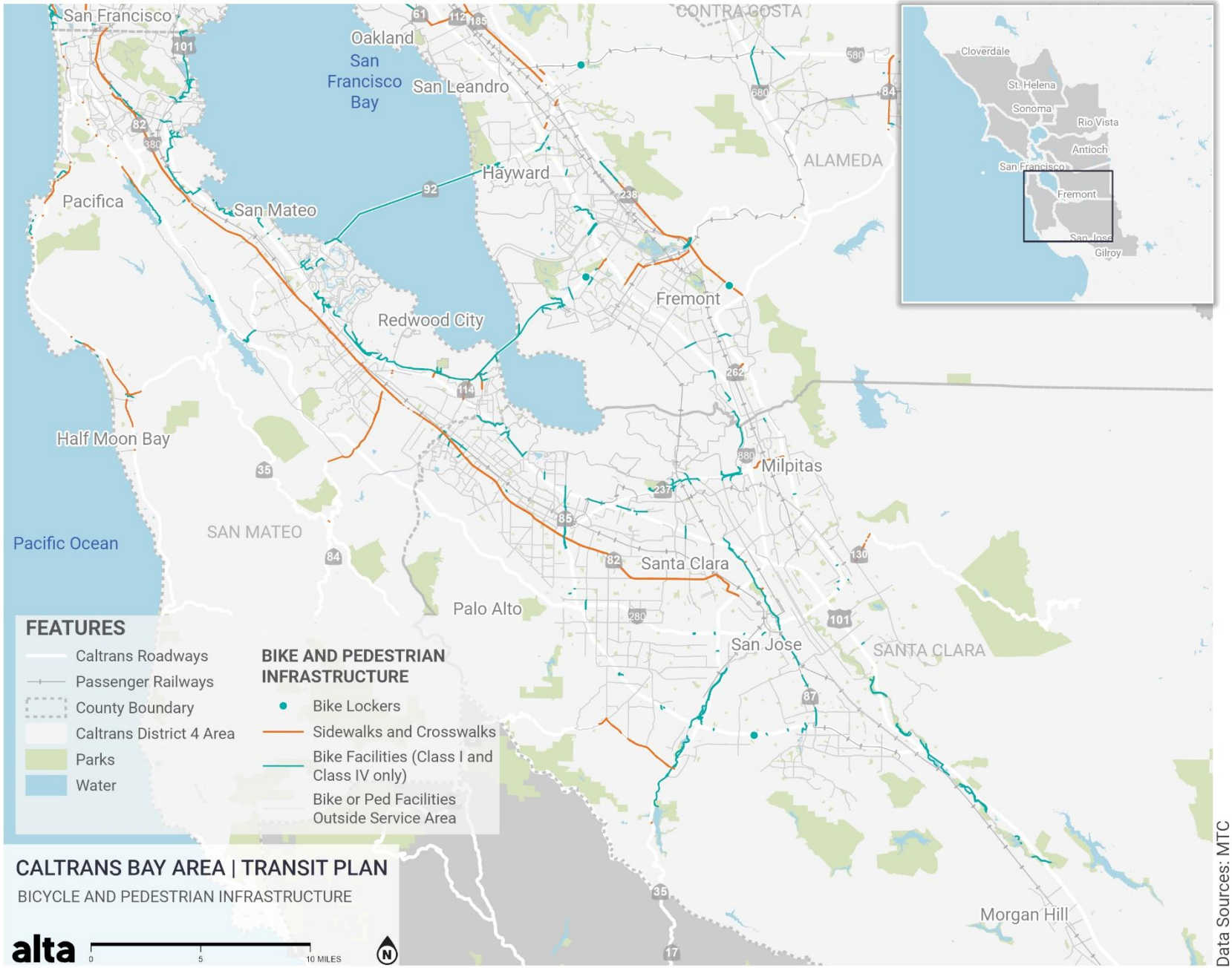

Figure 75: Bicycle and pedestrian infrastructure (SOUTH)

Safety Analysis

Safety is an important consideration for transit access. The perception of safety may affect a person's willingness to use transit as well as walk or bike to a particular transit stop. To understand which transit locations were most impacted by pedestrian and bicycle collisions, Alta analyzed the past five years of data (2018 to 2022) regarding injury-causing collisions involving a bicyclist or pedestrian in the service area. Data was accessed from the Transportation Injury Mapping System (TIMS) managed by the University of California Berkeley Safe Transportation Research and Education Center. Figure 76 through Figure 82 show crashes where someone was killed or severely injured (KSI) are shown in. All locations where collisions occurred during this time period along the STN are shown in Figure 83 through Figure 86. Pedestrian-involved collisions are much more common than bicyclist-involved collisions. Areas where bicycle crashes predominate include along SR-9 in Santa Clara County and SR-35 in San Mateo County.

KSI crashes follow similar spatial patterns as all injury crashes overall. These locations tend to indicate areas of both high pedestrian or bicyclist activity as well as the potential for infrastructure improvements.

High Collision Occurrences near Transit Stations

Alta also identified the bus stops and stations with the highest number of bicycle and pedestrian-involved crashes within ¼ mile of the stop. It should be noted that the analysis considered total collisions rather than collision rates. Fifty-two stops, found in San Mateo, Santa Clara, Alameda, Solano, and San Francisco counties, registered more than 10 collisions in close proximity of the stop, highlighting the need for the implementation of safety improvements there. Figure 87 through Figure 90 provide more details on the exact locations.

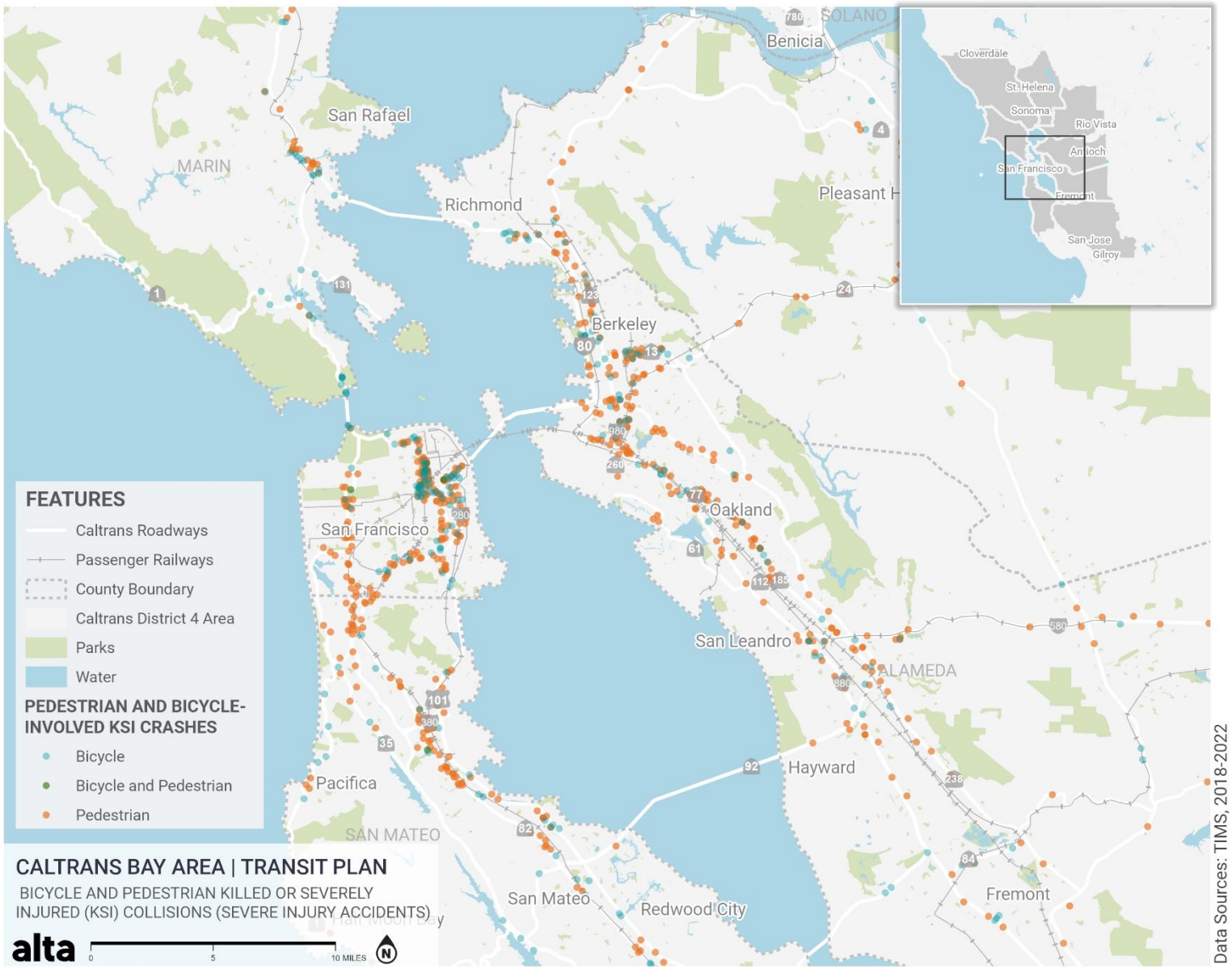

Figure 76: Bicycle and pedestrian KSI collisions (CORE)

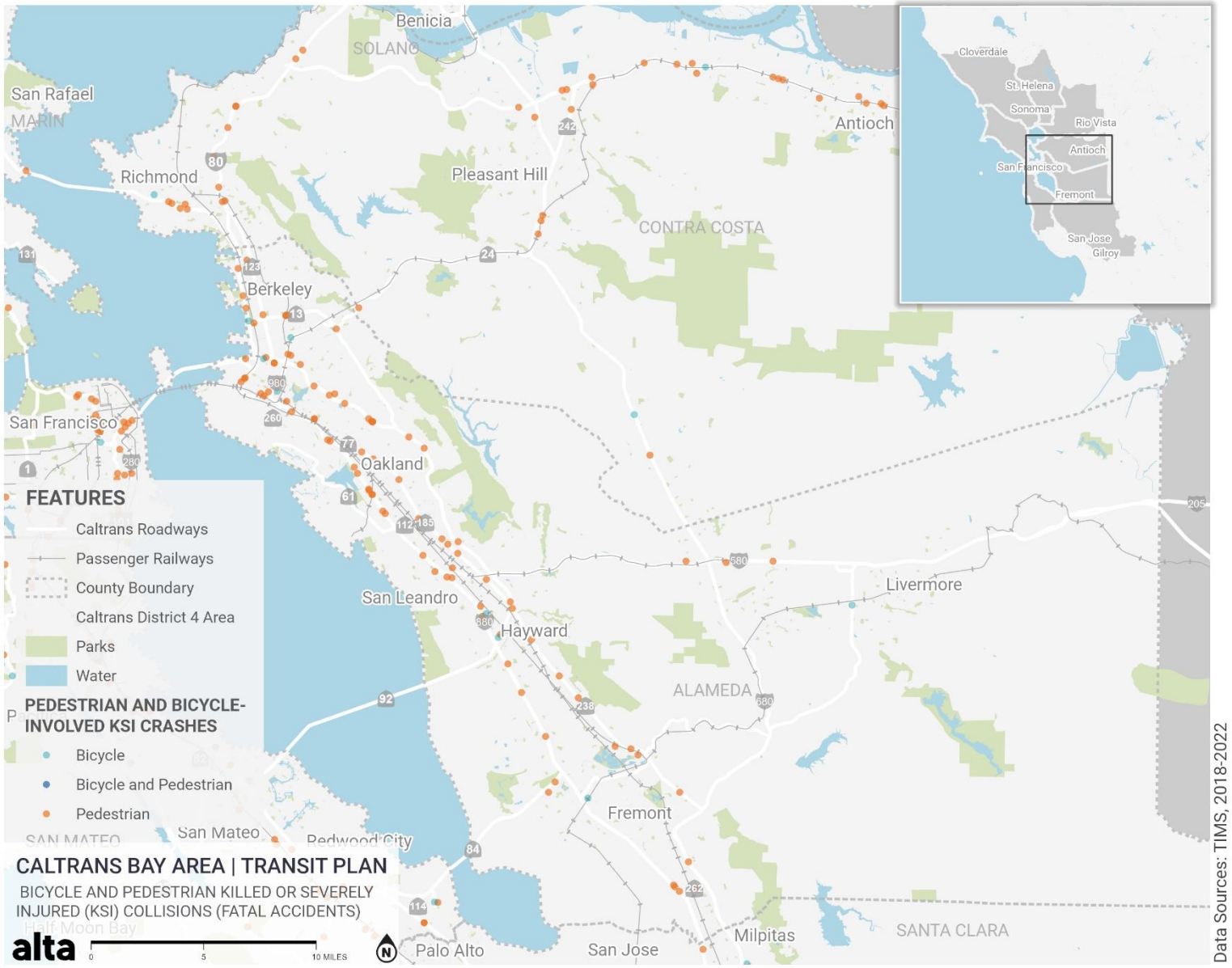

Figure 77: Bicycle and pedestrian KSI collisions (EAST)

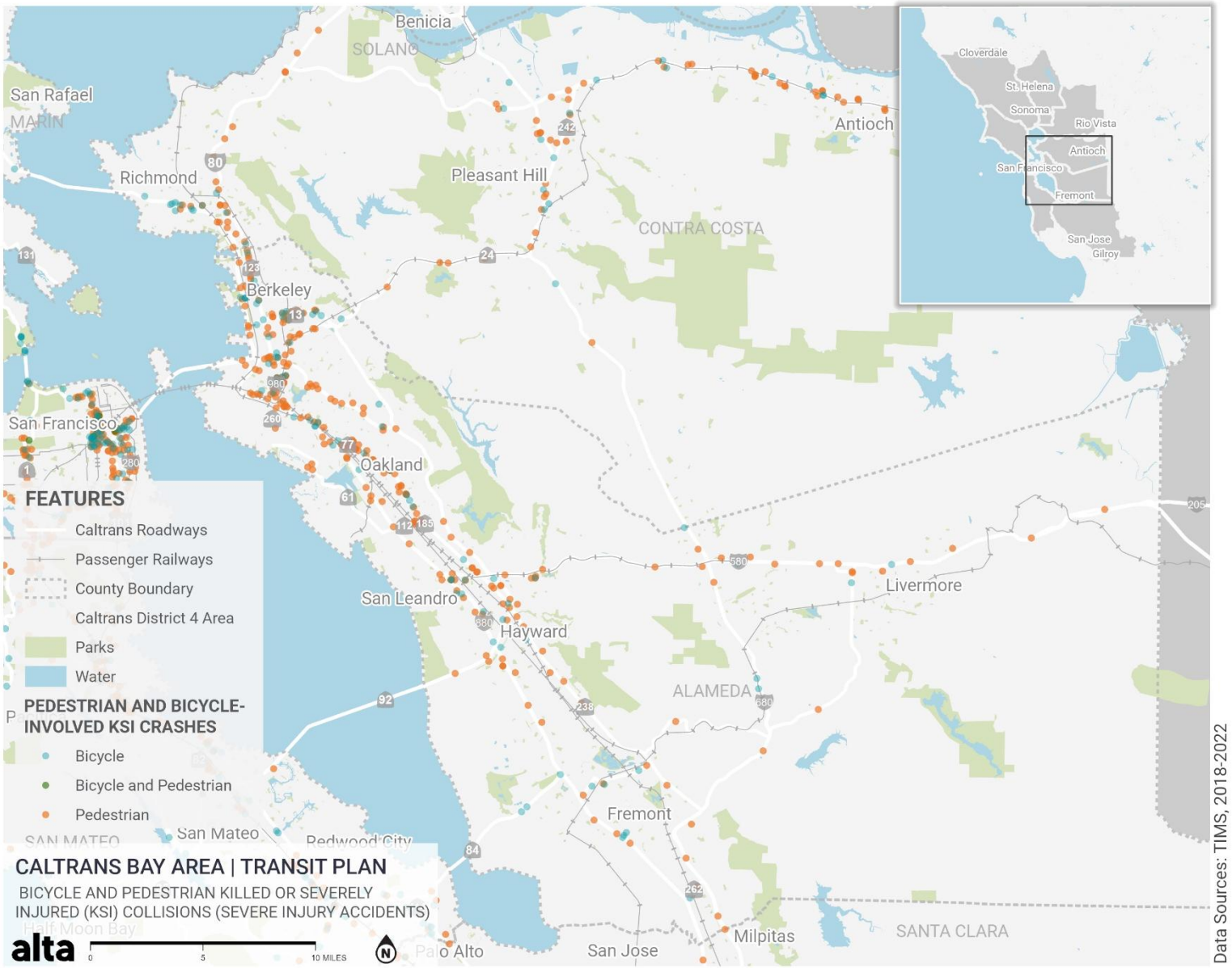

Figure 78: Bicycle and pedestrian KSI collisions (EAST)

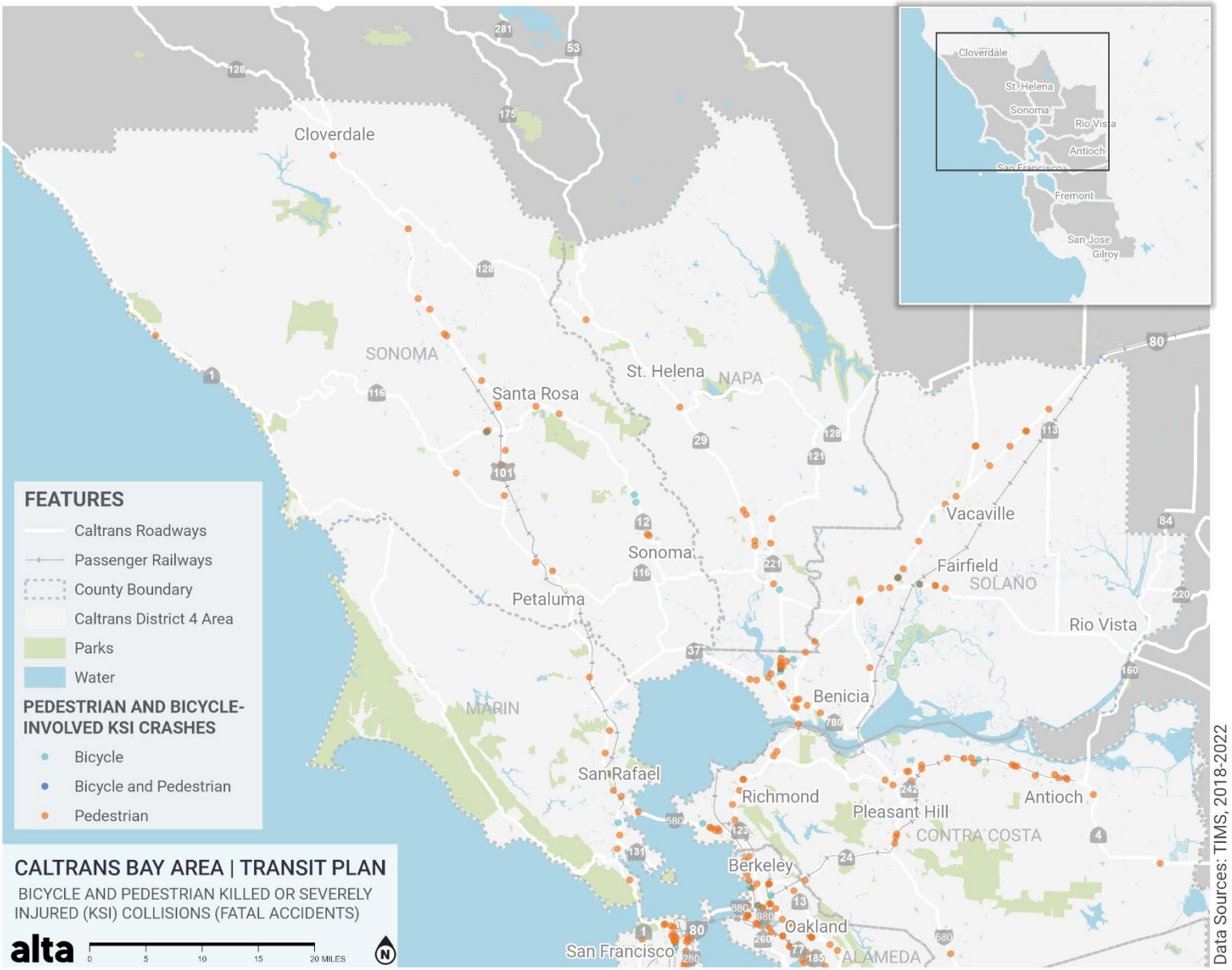

Figure 79: Bicycle and pedestrian KSI collisions (NORTH)

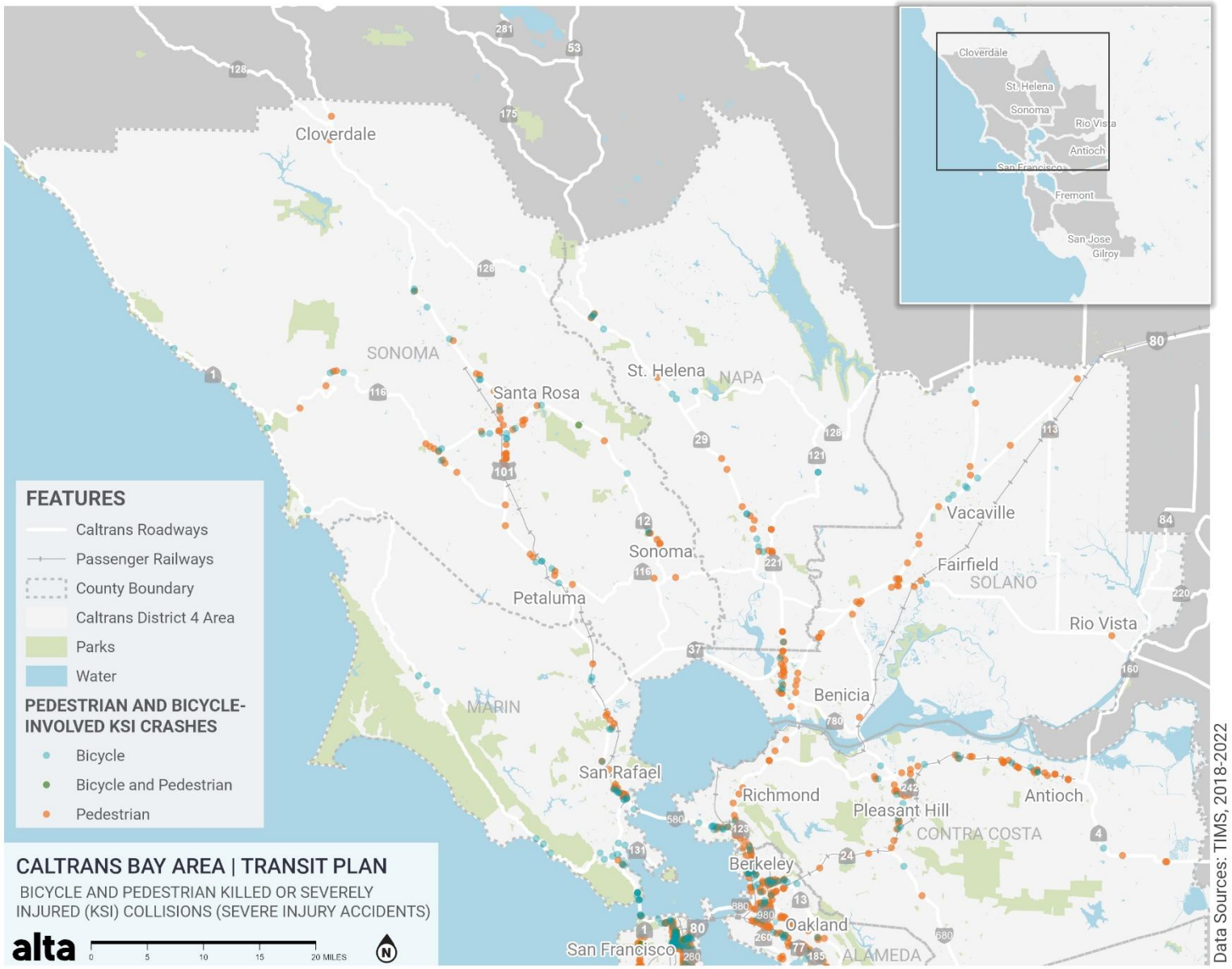

Figure 80: Bicycle and pedestrian KSI collisions (NORTH)

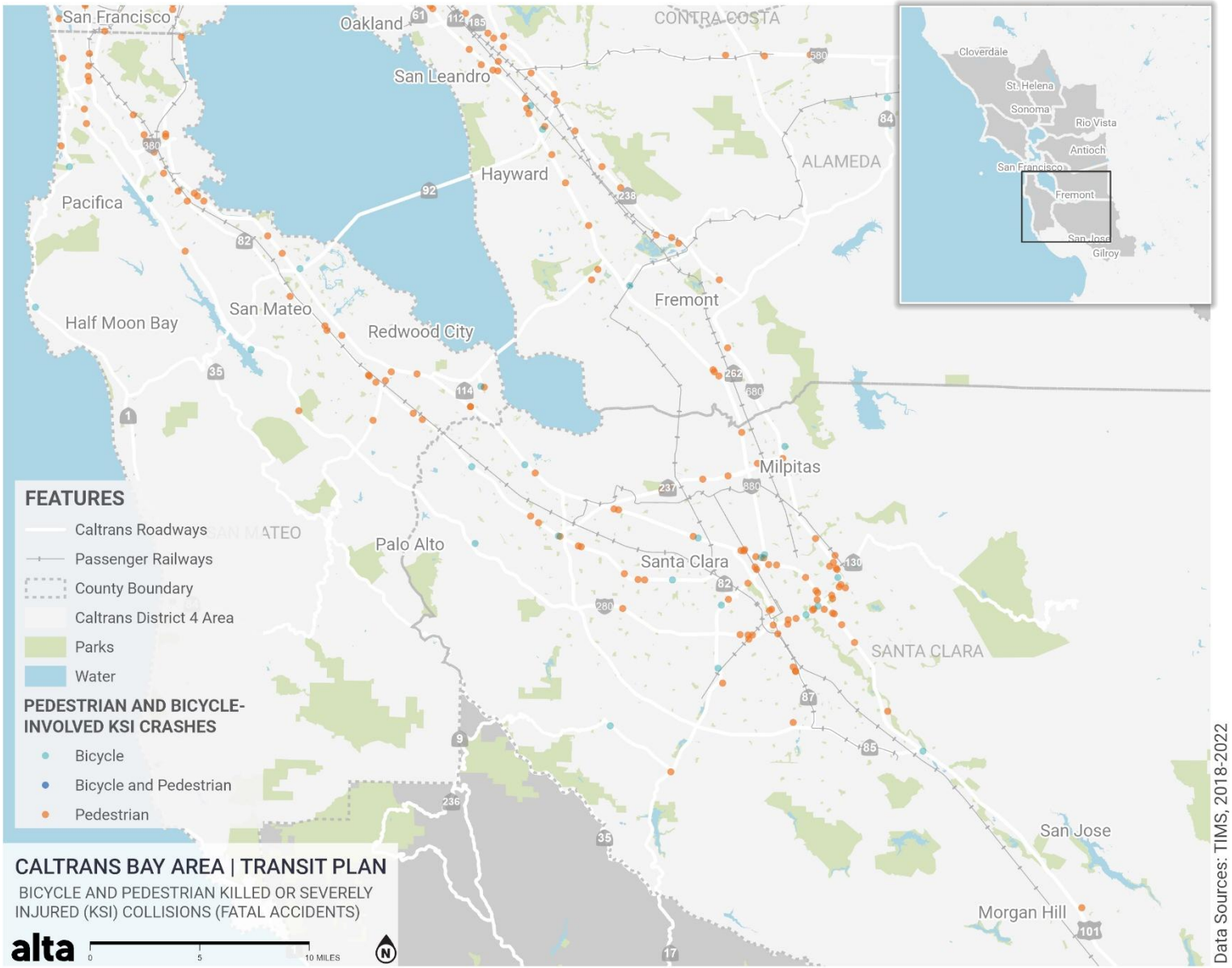

Figure 81: Bicycle and pedestrian KSI collisions (SOUTH)

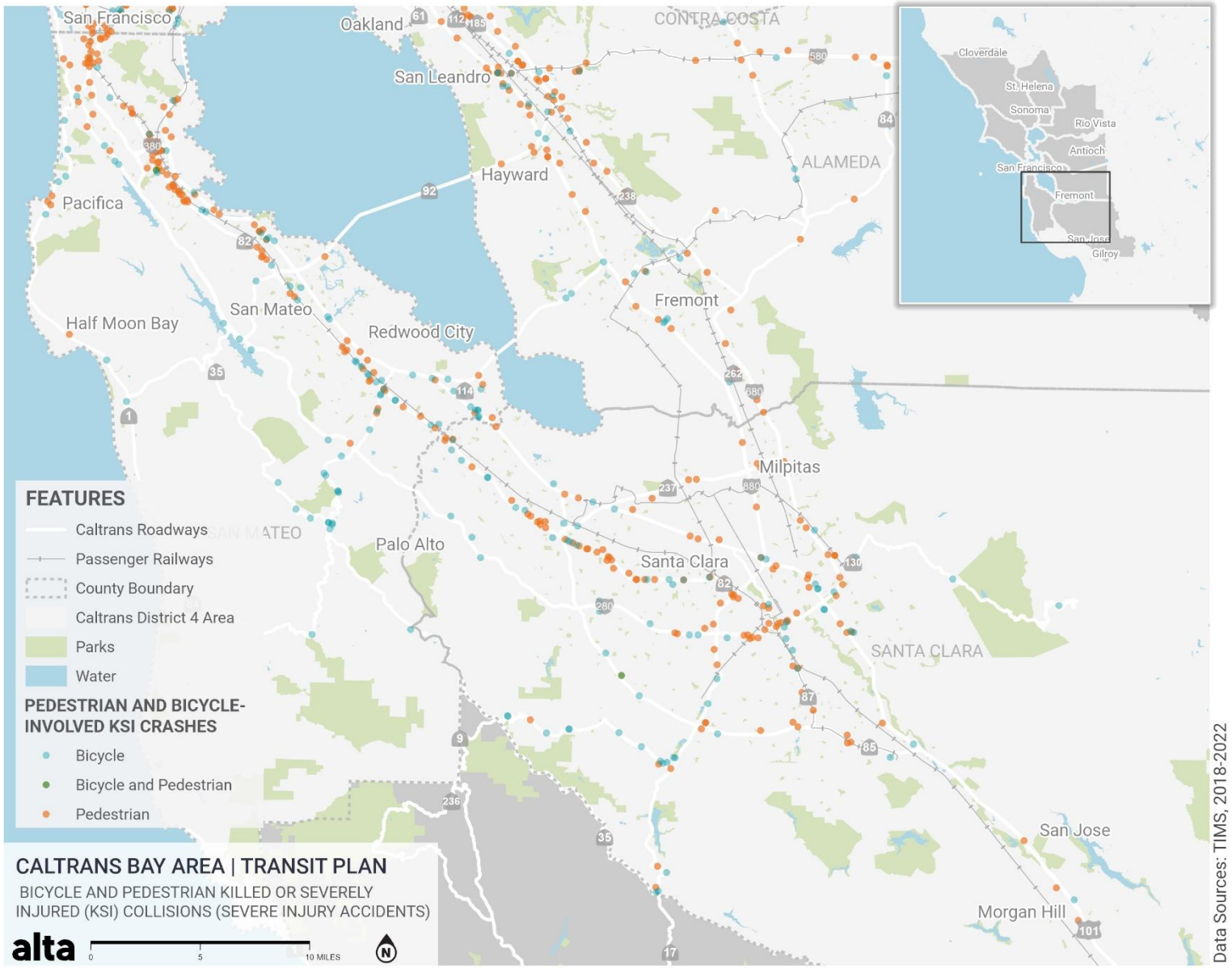

Figure 82: Bicycle and pedestrian KSI collisions (SOUTH)

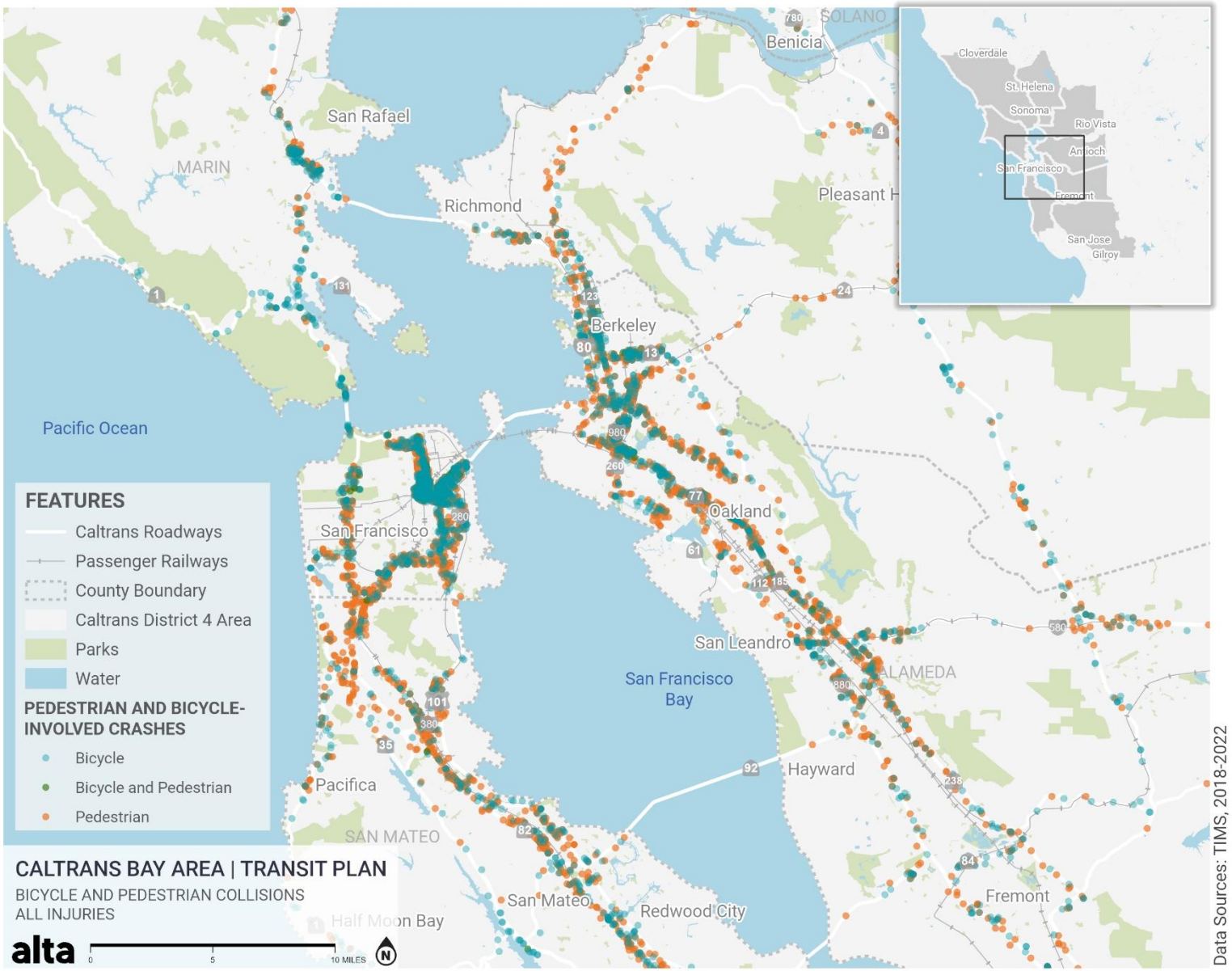

Figure 83: Bicycle and pedestrian collisions (CORE)

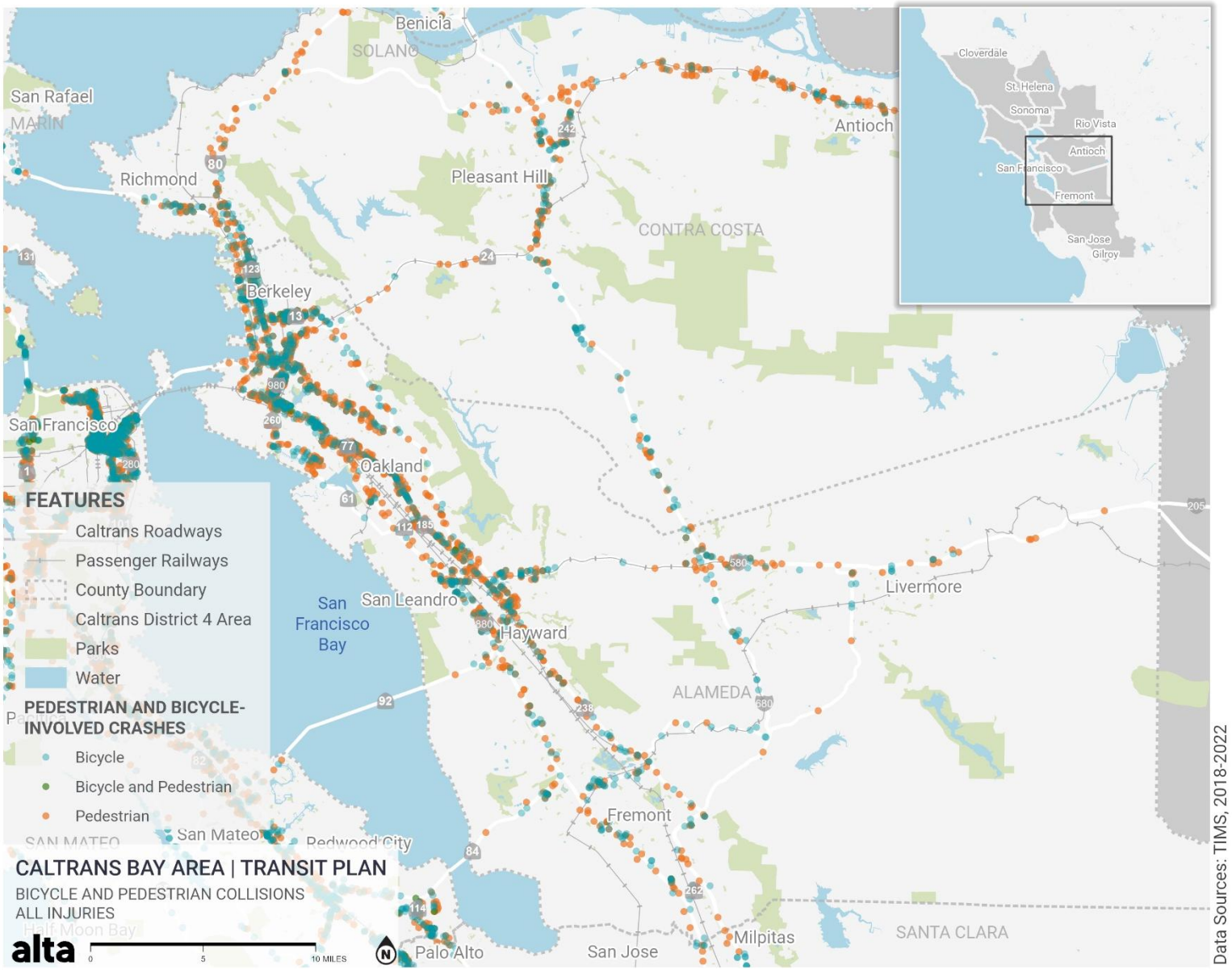

Figure 84: Bicycle and pedestrian collisions (EAST)

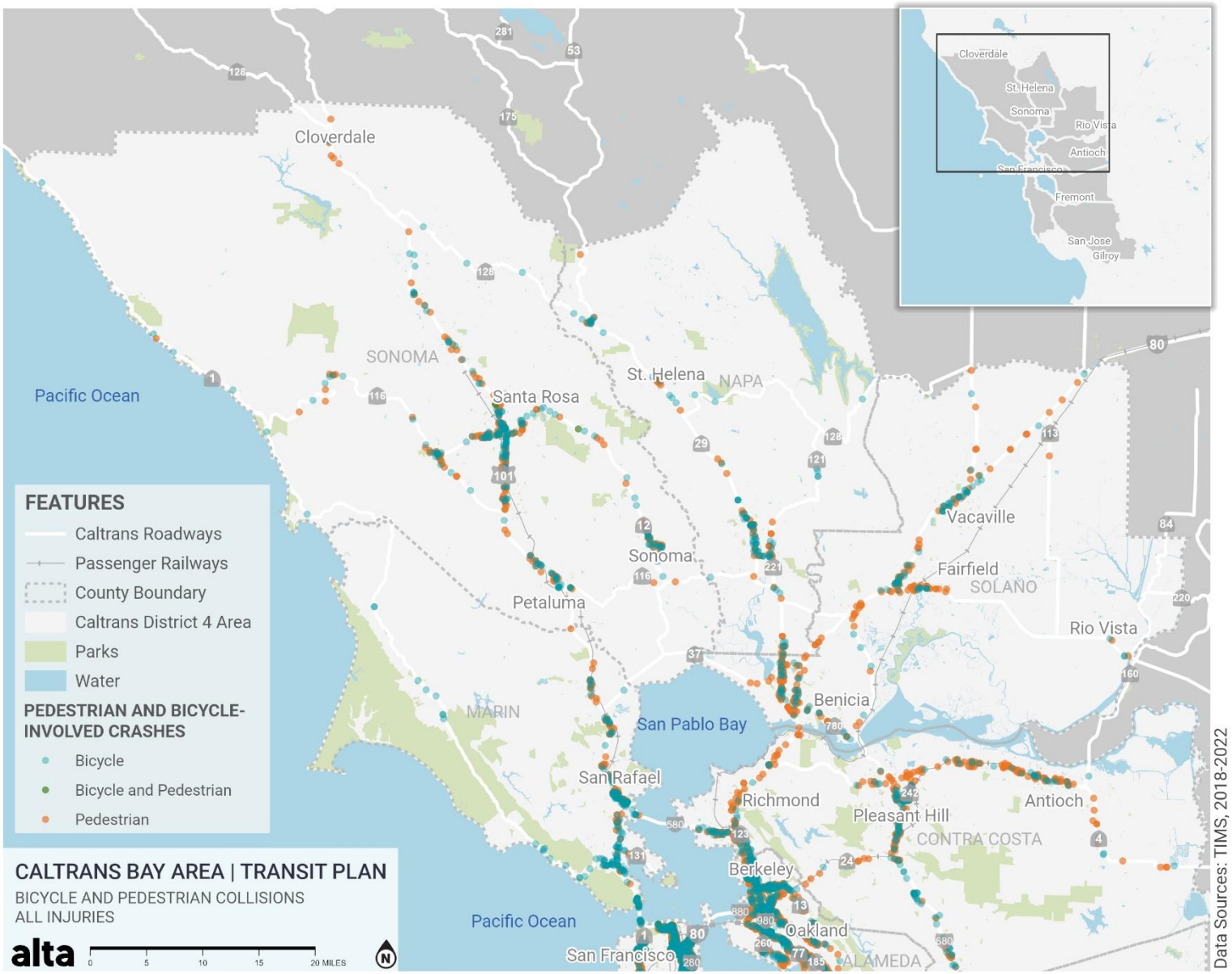

Figure 85: Bicycle and pedestrian collisions (NORTH)

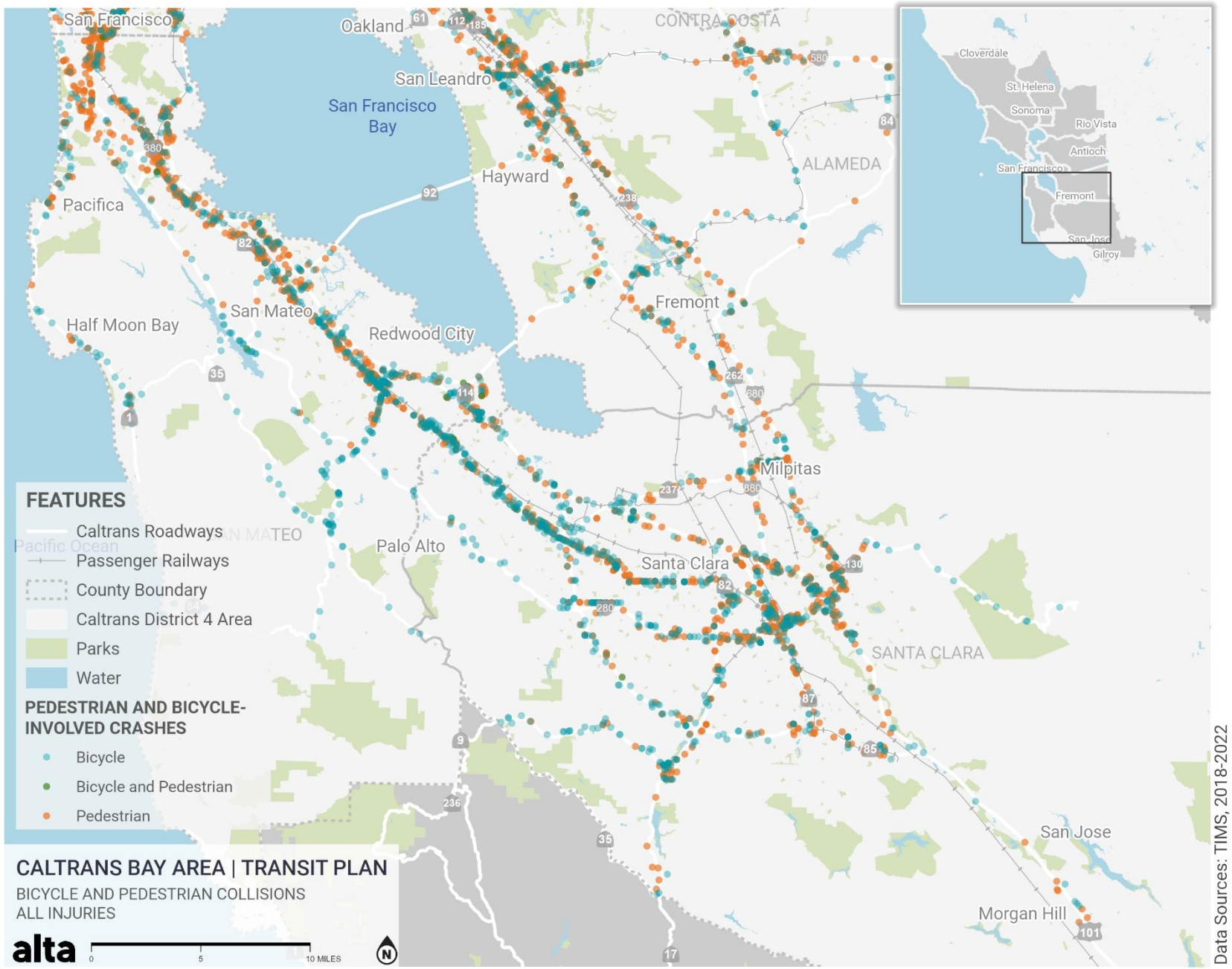

Figure 86: Bicycle and pedestrian collisions (SOUTH)

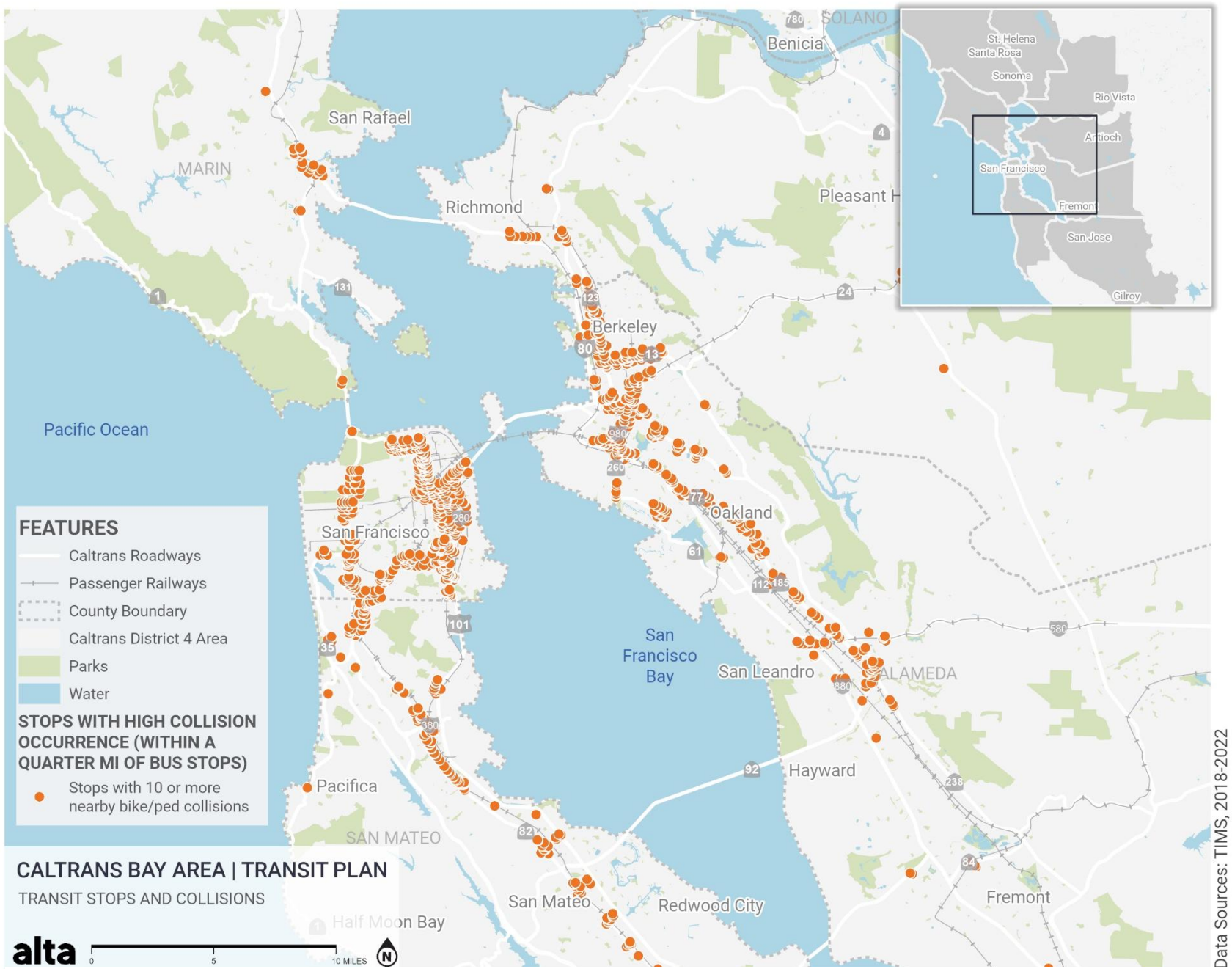

Figure 87: Transit stops with 10 or more nearby bike or pedestrian collisions (CORE)

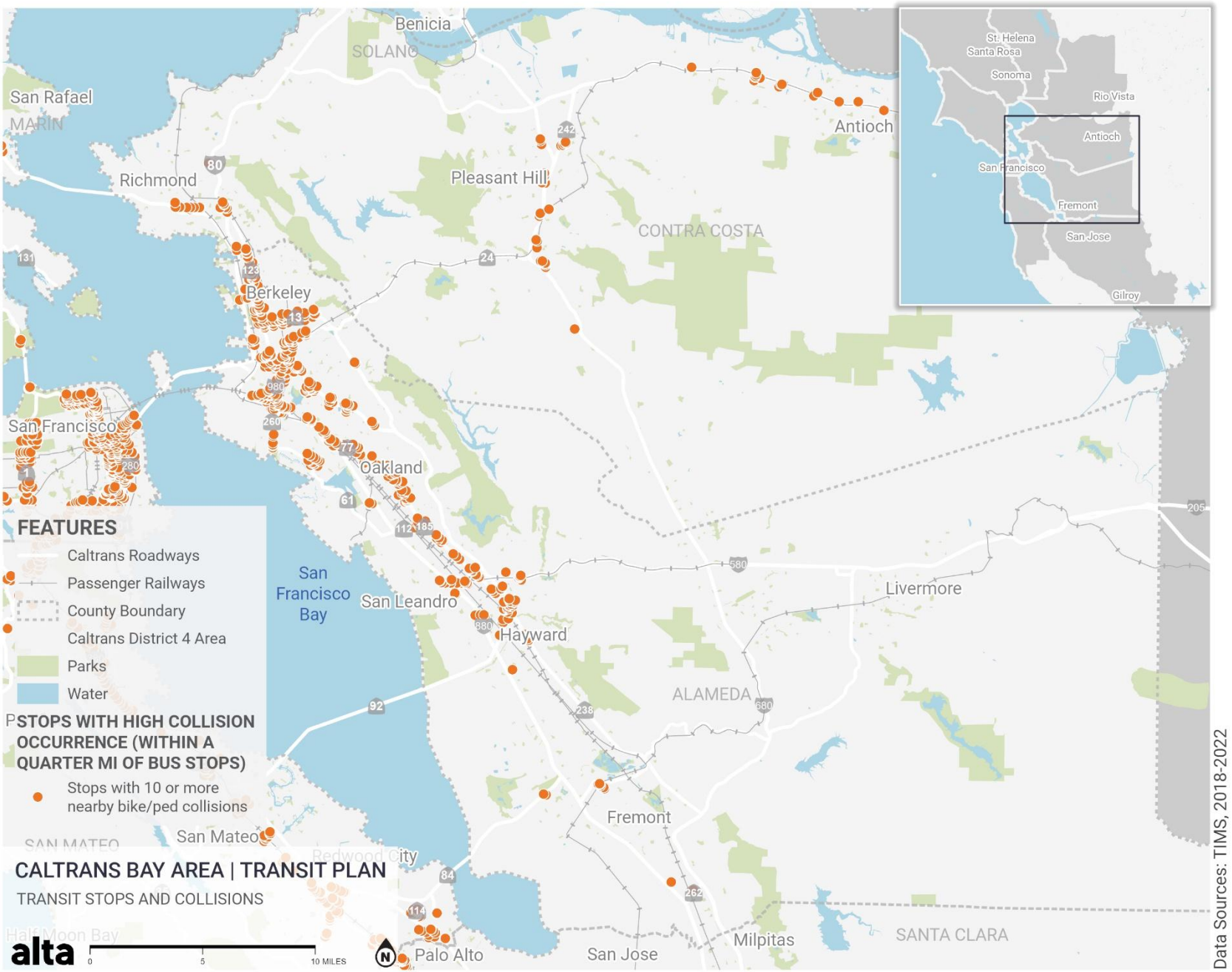

Figure 88: Transit stops with 10 or more nearby bike or pedestrian collisions (EAST)

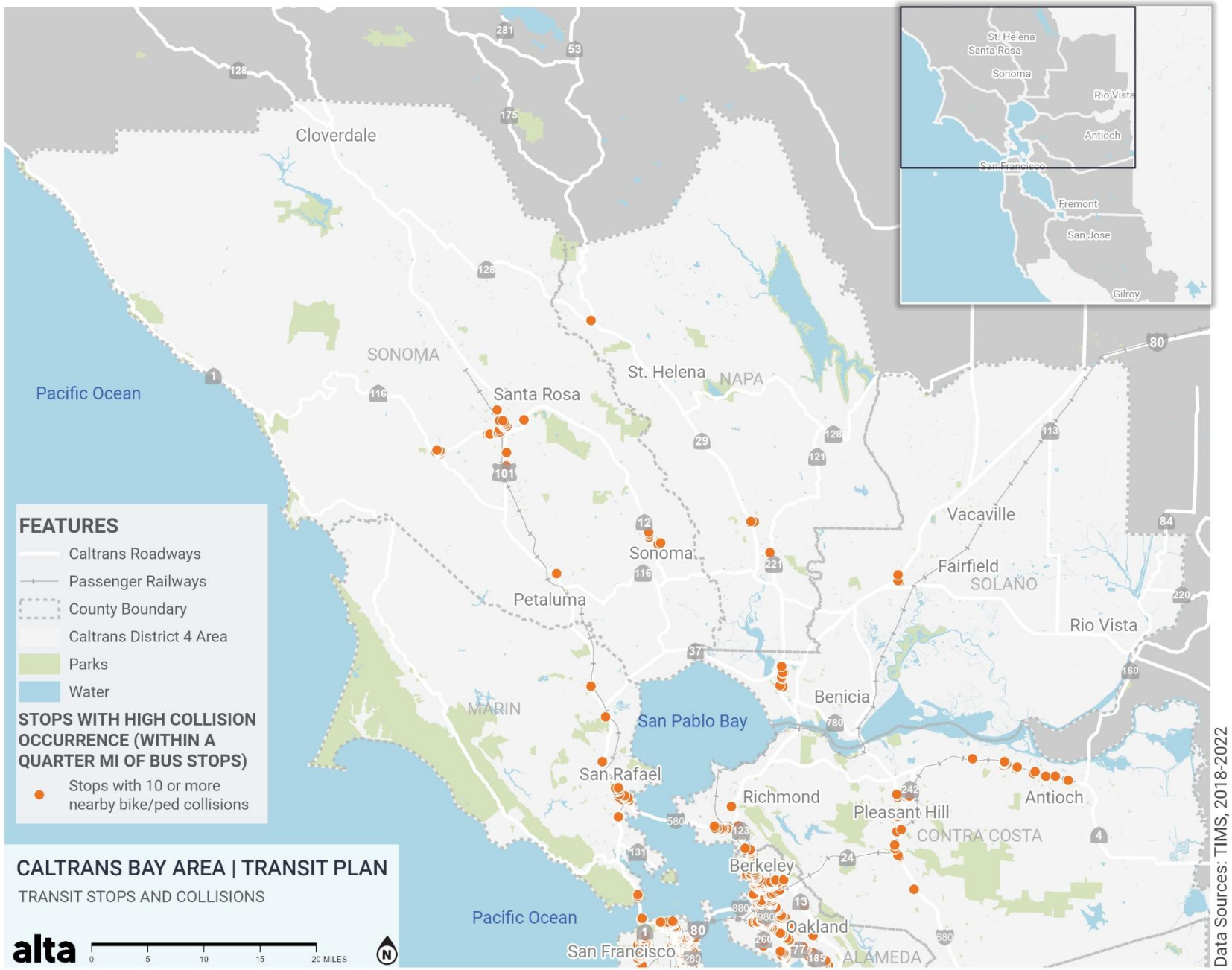

Figure 89: Transit stops with 10 or more nearby bike or pedestrian collisions (NORTH)

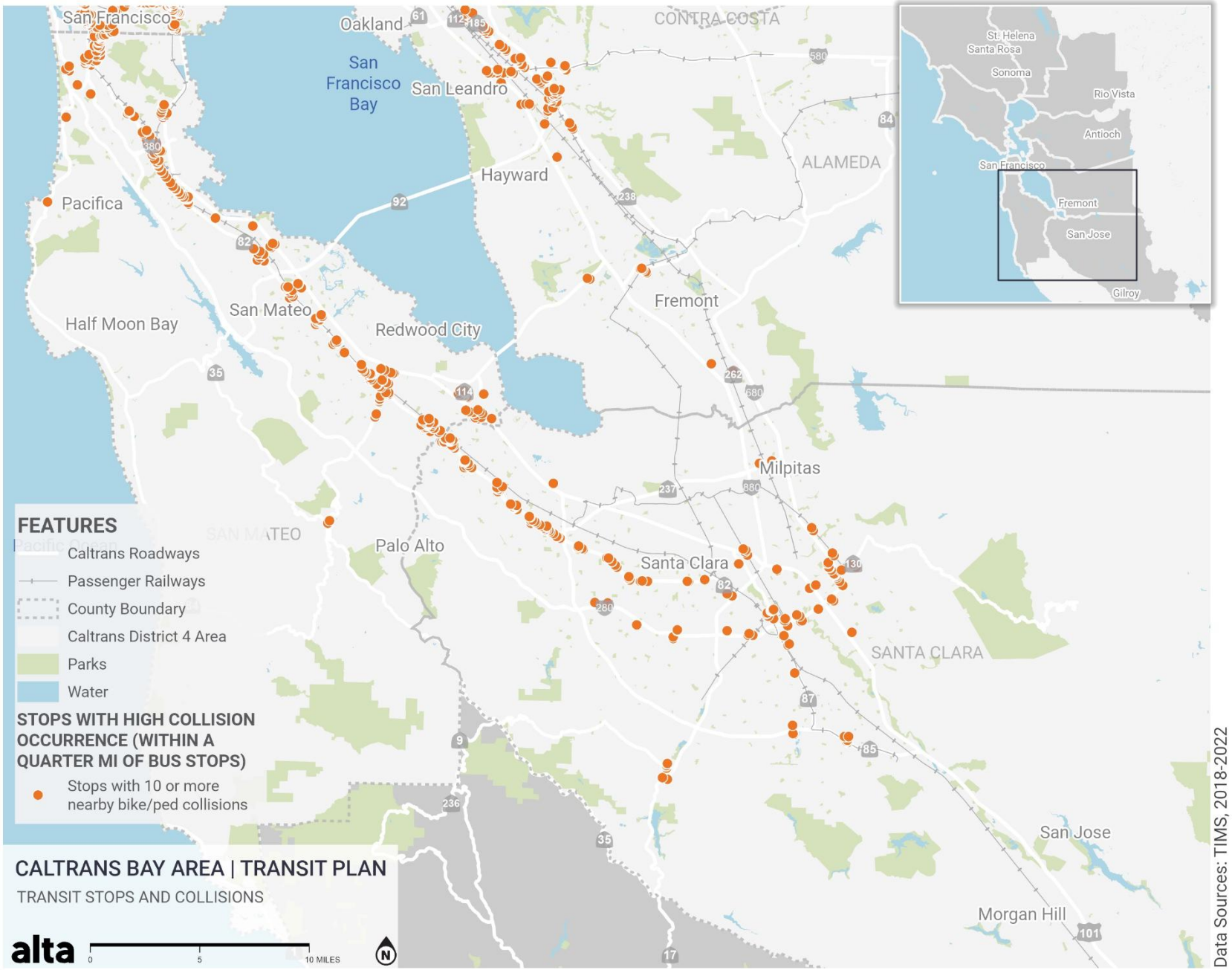

Figure 90: Transit stops with 10 or more nearby bike or pedestrian collisions (SOUTH)

Limitations

Availability of Data

Alta obtained limited data from the Transit Agency Survey conducted from March through April 2024. Through this survey, Alta requested and obtained limited spatial data on locations of known bottlenecks, microtransit zones, future route alignments, and TPI. Alta also obtained limited tabular data on route- and stop-level ridership and station or stop amenities. Table 3 provides a summary of the complete sets of data received.

Table 3. Datasets received from transit agencies

Agency	Bottlenecks	Microtransit zones	Future Route alignments	Route-level ridership	Stop-level ridership	Station/stop amenities	Transit priority infrastructure
AC Transit	No	No	No	Yes	Yes	Yes	Yes
ACE - San Joaquin Regional Rail Commission	No	No	Yes	Yes	No	Yes	No
BART	n/a	n/a	n/a	No	No	No	n/a
Capitol Corridor	No	No	Yes	No	Yes	No	No
City of Fairfield	Yes	Yes	Yes	Yes	Yes	No	No
County Connection	Yes	Yes	No	Yes	Yes	No	Yes
Golden Gate Transit	Yes	No	No	Yes	Yes	Yes	No
Marin Transit	Yes	No	No	Yes	Yes	Yes	No
Napa Valley TA	No	Yes	No	Yes	Yes	Yes	No
Petaluma Transit	No	No	No	Yes	No	Yes	No
SamTrans	Yes	Yes	No	Yes	Yes	Yes	Yes
Santa Rosa CityBus	No	No	No	No	Yes	No	No
SF Muni	Yes	No	No	Yes	Yes	Yes	Yes
SMART	No	Yes	Yes	Yes	Yes	No	No
SolTrans	Yes	No	No	Yes	Yes	Yes	No
Sonoma County Transit	Yes	No	Yes	No	No	Yes	Yes
Union City Transit	No	No	No	No	No	No	No
VTA	No	Yes	No	Yes	Yes	Yes	Yes
Water Emergency Transportation Authority (SF Bay Ferry)	No	No	No	Yes	Yes	No	No
WestCAT	Yes	No	No	Yes	n/a	Yes	No
Wheels Bus (LAVTA)	No	Yes	Yes	Yes	n/a	Yes	Yes

It is important to note that Alta did not validate the data received from agencies through the survey. While MTC and Caltrans Bay Area provided significant portions of data, Alta was not able to obtain comprehensive data from all transportation agencies and important transit providers. This may be linked to the fact that some data is only published by certain cities and some transit agencies did not have data about their systems available.

These data limitations will impact the comprehensiveness of the Prioritized Transit Priority Projects (Task 7B) and Prioritized Transit Access Projects (Task 7C) lists. To mitigate these limitations and improve regional representation, Alta used national data, such as the US Census and University of California Berkeley Safe Transportation Research and Education Center's Transportation Injury Mapping System (TIMS) to identify areas where transit priority and TAI may be warranted based on demographics and safety conditions. The Transit Priority Methodology (Task 7A) will serve as a tool for Caltrans to prioritize projects as data becomes available in the future.

Next Steps

This Transit Supportive Infrastructure Inventory will be used to inform the development of policy and infrastructure as well as guide the prioritization of projects and recommended improvements at the district level. Informed by the Goals, Objectives, and Performance Measures (Task 6) and using the Transit Priority Methodology, Alta will use this data to identify locations where transit priority and transit access improvements could significantly benefit the Bay Area region (Task 7). As part of the prioritization process, Alta recommends incorporating additional datasets such as modeled transit ridership, density, and land use characteristics to consider the additional factors that may influence transit ridership and demand. Further outreach to cities, counties, and transit agencies is needed to fill in data gaps in order to have well rounded recommendations.