

# Caltrain Electric Trains Deep Dive

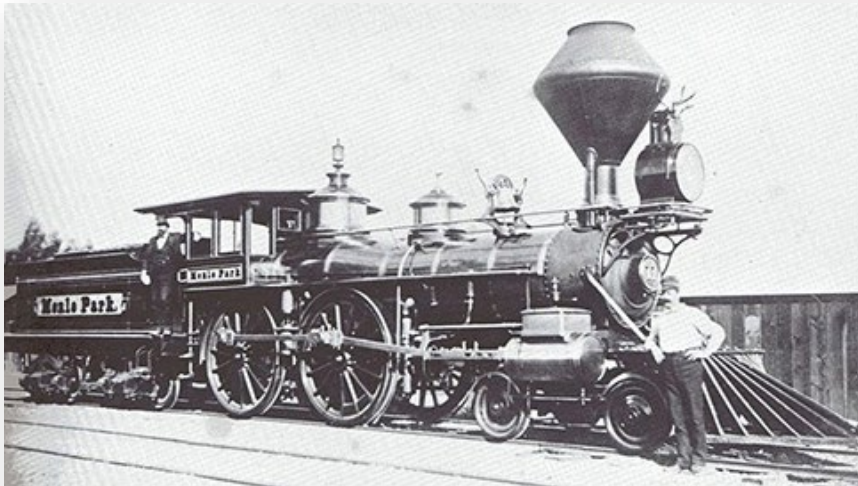
**SPUR Digital Discourse**  
**March 20, 2024**



# Electrification Overview

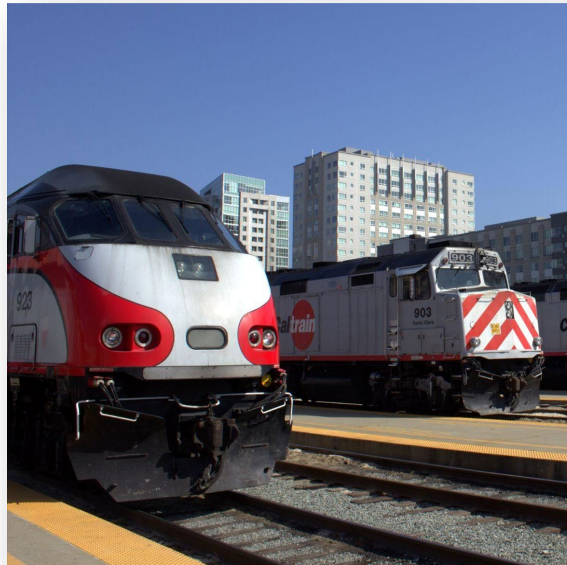
# Transformational Moment

**Electrification will modernize the system and better support our communities with more frequent, reliable and sustainable service**



Locomotive - Locomotive #11 of the San Francisco and San Jose Railroad. Circa 1870.

Steam 1860s



Diesel 1950s to present



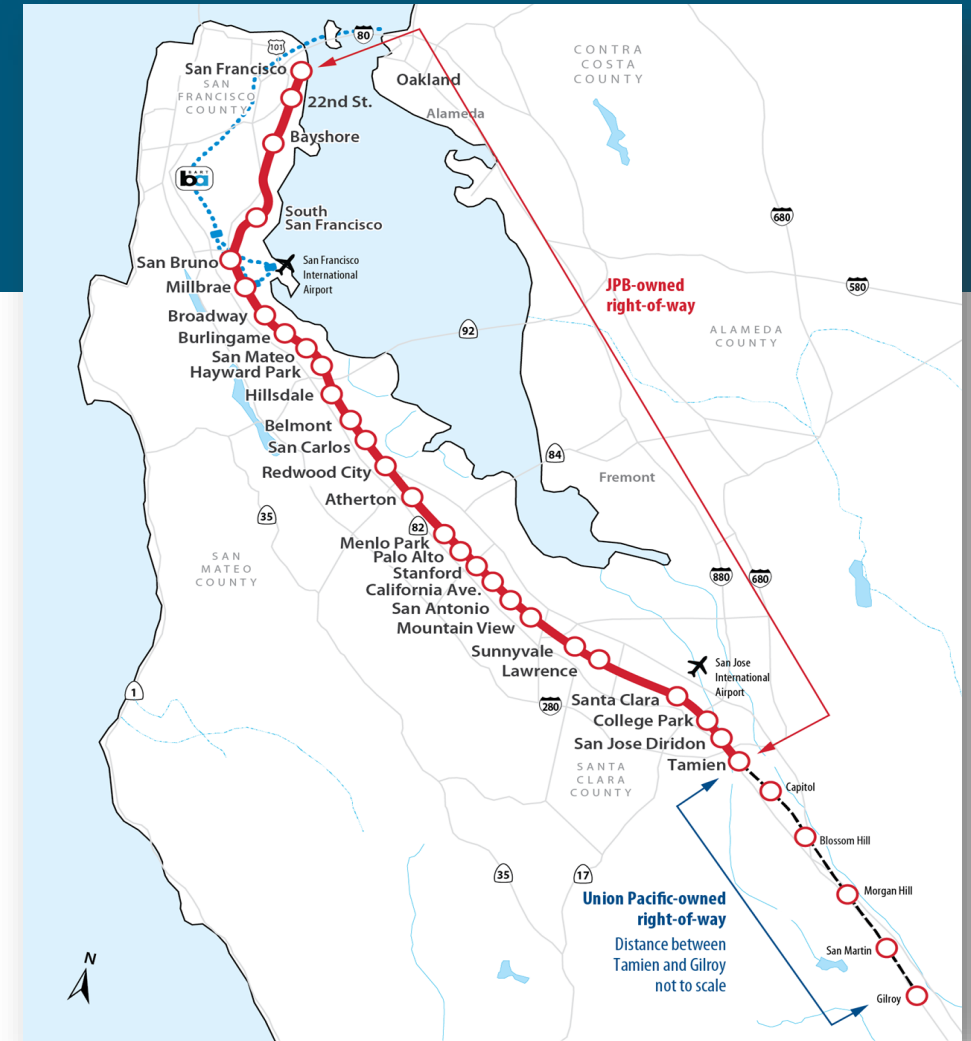
Electric 2024





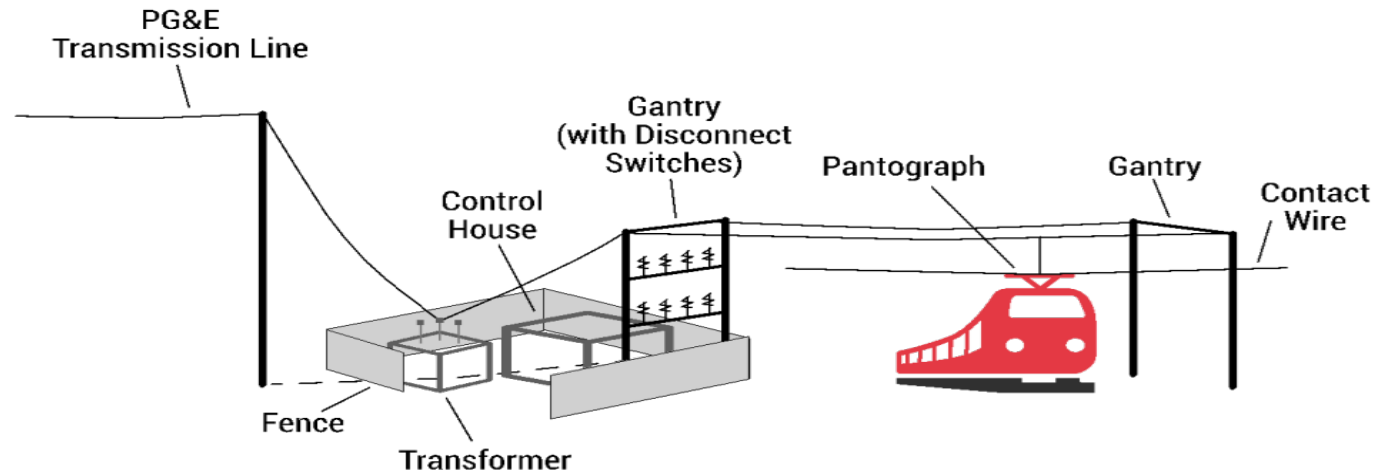
# Caltrain Corridor

- 77 miles of track from end to end
- 31 stations
- Bi-directional commute
- 41 at-grade crossings
- Pre-pandemic
  - 7<sup>th</sup> largest commuter railroad in the country
  - 70% farebox recovery
  - Over 18 million Unlinked Passenger Trips (UPT) in 2019
  - Frequently overcrowded trains, standing room only



# Project Elements

- Electrification
  - Overhead Contact System (OCS)
  - Traction Power Facilities
  - Signal System
- Electric Trains
  - 23 seven-car train sets (161 cars)
  - All Electric between San Francisco and San Jose



# Project Timeline

## The Washington Post

Though shovels are ready, Trump officials delay grant for Caltrain upgrade

April 22, 2017 at 4:24 p.m. EDT



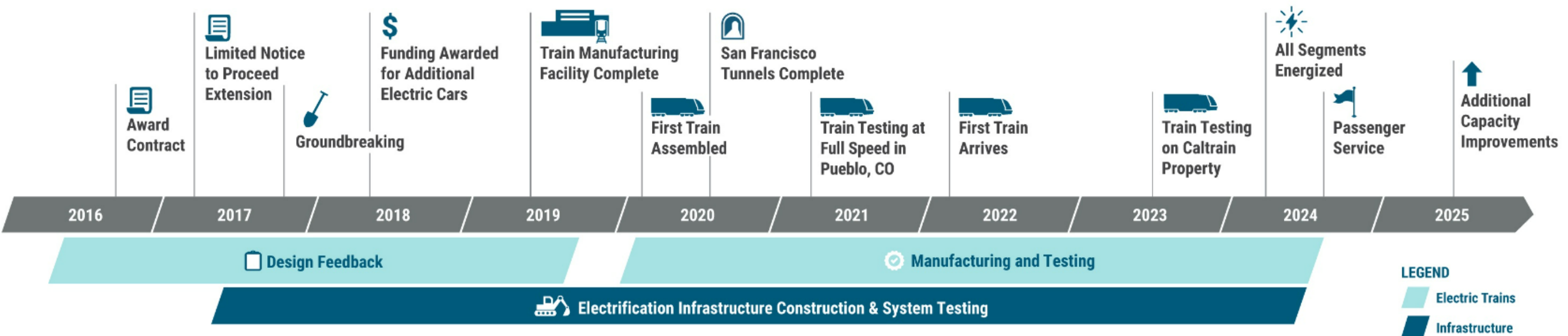
## Work begins to electrify Caltrain

By [Railway Gazette International](#) | 24 July 2017



Caltrain says electric train tests between Redwood City and Mountain View successful

Mar 12, 2024



# Key Milestones

## Complete:

- Foundations (3,000+)
- Poles (2,500+)
- Traction Power Facilities (10)
- Overhead Wire (2.5 million feet)
- Upgraded the Signal System San Francisco to San Jose (31 at grade crossings)
- Energized: Mountain View to San Jose (15 miles)
- 8 trainsets on Caltrain property (1,000 mile passed by 4 trains)
- Over 1,000 First Responders Trained



## Upcoming:

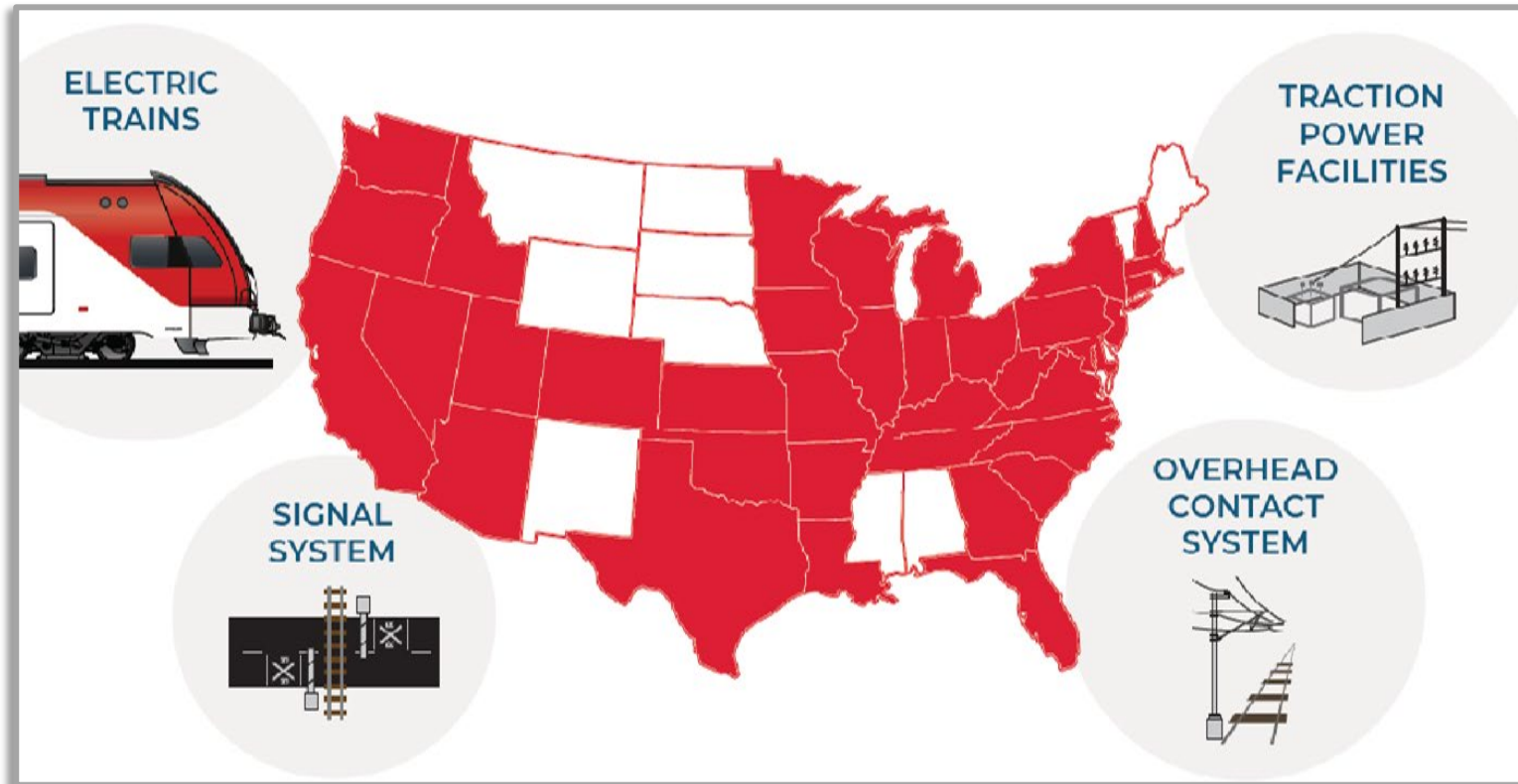
- Repairs of Winter Storm Damage
- Full Corridor Energized (Spring 2024)
- Additional trainsets on property and testing (Throughout 2024)
- Soft Launch (Summer 2024)
- **Passenger Service: September 2024**





# Economic Growth & Job Creation

33,000 Jobs Created in 36 States



- Caltrain (11 Unions)





# Electric Trains

- 23 seven-car trainsets + battery electric pilot
- Car shells manufactured in Switzerland
- Assembled in Salt Lake City Utah
- 2 Traction Power Motors per set
- Regenerative Braking

# 1<sup>st</sup> Class Experience for All

- Free Wi-Fi
- Outlets at every seat
- Digital Trip Displays
- Smoother Ride
- Security Cameras
- Pleasant Lighting
- Better Storage
- Spacious, Accessible Restroom (with a baby changing table)



# Electrified Service Planning



# Outreach Activities

Soliciting Feedback on Proposed Electrified Service Plan  
September – November 2023

20

Community,  
Business and  
Advisory Group  
Presentations

Including Joint Powers Board;  
Local Policy Maker Group;  
Caltrain Citizens Advisory  
Committee; Transit Partners;  
Key Employers; etc.

21

Jurisdictions

1,500+

Table Visitors

10

Community and  
Station Events

5,000+

Website  
views

9

TASI Unions

1,650+

Public Survey  
Responses

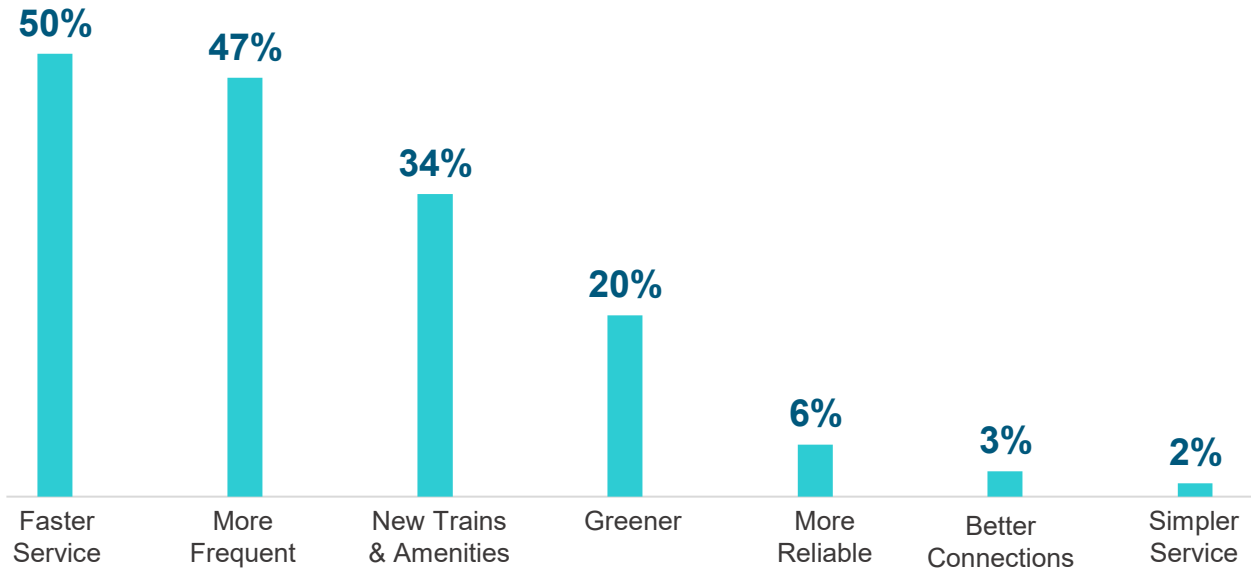




# Customers are most excited about...

- **Faster service**
- **Increased frequencies**
- **New train amenities**

## What Most Excites You about Electrified Service?\*



### More Trains at All Hours

Desire for increased frequency at all hours, on weekdays, and especially on weekends

### Green and New

Support for green, sustainable service and new trains

### Reliable Service

Optimism for more reliable service after years of construction

### Transit Connections

Easy transfers and integration with other transit lines are important for some

\*Respondents could select more than one option

# Electrified Service: Goals & Outcomes

Vision

**Long-Range  
Service Vision**  
(Caltrain Business Plan)

Goals

**Equity**

**Connectivity**

**Recovery &  
Growth**

Outcomes

**More Frequent  
Service**

Tailor station frequency  
to market demand and  
equity goals

**Competitive  
Travel Times**

Offer competitive travel  
times for major  
markets compared to  
autos

**Enhanced Off-  
Peak Service**

Build ridership markets  
outside of typical  
commute trips

**Coordinated  
Transfers**

Coordinate  
connections with BART  
and other transit  
operators

**Simplicity &  
Legibility**

Provide a schedule  
that is easy to  
understand

# Market Analysis Approach

Results from the market analysis can help inform decision-making about additional station stops – beyond the base level of service – during the peak periods.



## Ridership Analysis

Considers current and pre-COVID ridership patterns



## Land Use Analysis

Total population and jobs near stations, including recently-completed or under construction projects\*



## Equity Analysis

Connections to low income and/or minority communities



## Transit Connections

Presence of high frequency rail, bus, and shuttle connections

\*Based on a review of projects listed on City planning websites in Spring 2023

# Planning Constraints



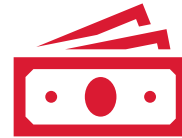
## Infrastructure

Caltrain serves a mostly two track corridor with constrained terminal operations, which limits how it can provide service.



## Fleet

Caltrain's mixed fleet of diesel and electric trains constrains what kinds of train service can be offered on the entire corridor.



## Operating Budget

Caltrain's constrained operating budget and lower ridership/farebox revenue currently limit service expansion opportunities



## Service Coordination

Timing transfers with all connecting transit agencies poses challenges.



# Candidate Stations for Service Expansion

Based on market analysis, the following stations demonstrate the strongest need for additional service frequency during the peak periods:

- South San Francisco
- San Mateo
- Hillsdale
- Menlo Park
- Sunnyvale
- Lawrence
- Santa Clara

The results of this analysis were incorporated into the service planning process alongside operational considerations.

Stations already at maximum peak service level (4 TPHPD)

Stations demonstrating the strongest need for increased peak service frequency

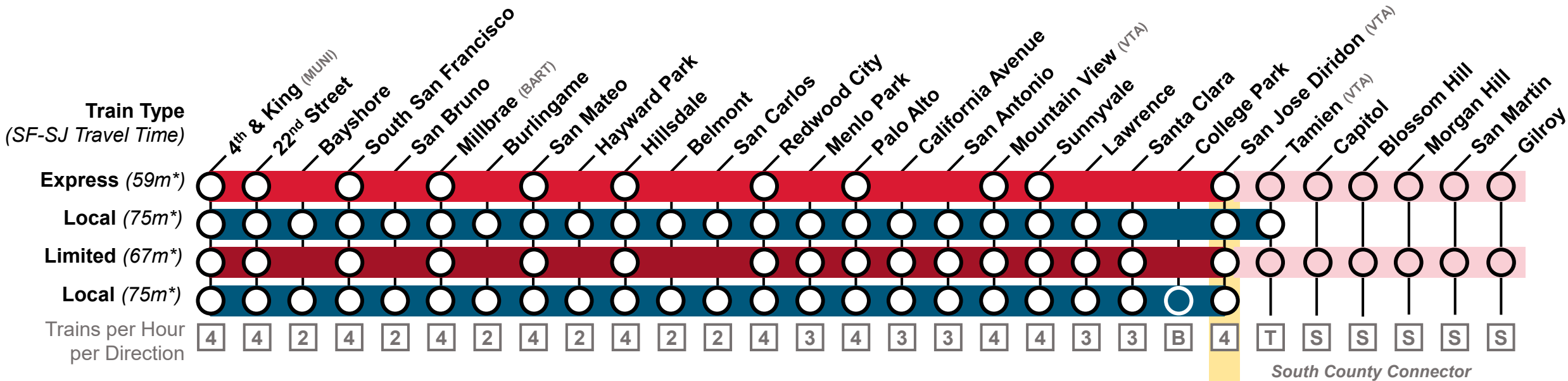
Station	2023 Caltrain Ridership	Land Use Near Stations	Equity Need	Transit Connections
San Francisco				
22nd Street				
Bayshore				
South San Francisco				
San Bruno				
Millbrae				
Burlingame				
San Mateo				
Hayward Park				
Hillsdale				
Belmont				
San Carlos				
Redwood City				
Menlo Park				
Palo Alto				
California Ave				
San Antonio				
Mountain View				
Sunnyvale				
Lawrence				
Santa Clara				
San Jose				
Tamien				
Capitol				
Blossom Hill				
Morgan Hill				
San Martin				
Gilroy				

Scale:



# Weekday Peak Hour Station Service Levels

Peak periods vary by station, generally covering 6:30am-9:30am and 3-7pm on weekdays



### LEGEND

○ Stop (one per hour per direction)

# Stops per hour per direction

T

Tamien Service

2 to 3 stops per hour in peak direction, 1 stop per hour in reverse-peak direction

B

Bellarmino Service

2 stops per day per direction

S

South County Connector Service

4 stops per day per direction with 1-2 trains per hour in the peak direction



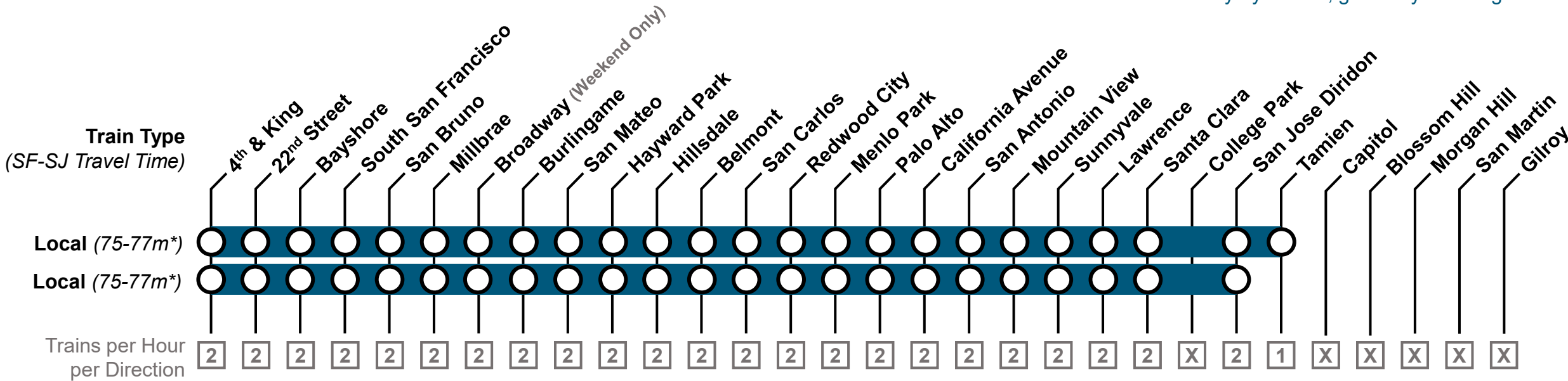
**Timed Cross-Platform Connection**  
Between South County Connector trains and Express trains in both directions



\*Travel times subject to change pending further testing as new electric trains arrive and are prepared for revenue service.

# Off Peak and Weekend Station Service Levels

Off-peak periods generally 5am-6:30am, 9:30am-3pm, and 7pm-1am  
Weekend service hours vary by station, generally covering 7am-1am



## LEGEND



Stop (one per hour per direction)



No Service

Weekday service only



Stops per hour per direction

\*Travel times for SF-SJ refers to 4th and King to Diridon Station. Weekend travel times approximately 77 minutes due to Broadway Station service; weekday off-peak service is 75 minutes without Broadway service.

\*\*Travel times subject to change pending further testing as new electric trains arrive and are prepared for revenue service.



# Electrified Service Plan Benefits

## Improved service for all riders



### Get There Faster

Express from SF to SJ in under an hour

Quicker local service, 75 minutes instead of 100

Save nearly 30 minutes on trips from Southern Santa Clara County to San Francisco



### Ride More, Wait Less

20% more train service

26% more train service at equity priority stations

Half-hourly service during weekends and off-peak



### First Class for Everyone

Free Wi-Fi

Smoother, quieter experience

Outlets at every seat

Digital trip information onboard

Spacious, accessible bathrooms



### Clean and Green

GHG emissions reduced by 250K MTCO2 annually – equivalent to taking 55,000 cars off the road each year

Improves local air quality

Quieter trains, both onboard and off



# City Fact Sheets

[www.caltrain.com/servicebenefits](http://www.caltrain.com/servicebenefits)

## FASTER, MORE FREQUENT CALTRAIN SERVICE COMING IN FALL 2024

### ELECTRIFIED SERVICE PLAN: CITY OF SOUTH SAN FRANCISCO

Electric trains enable Caltrain to run faster, more frequent service with the same number of weekday trains we run today. This handout shows the final weekday plans for electric service in fall 2024. The schedule will be finalized in spring 2024, after the new electric trains are tested.



#### GET THERE FASTER

**SAN FRANCISCO TO SAN JOSE IN UNDER AN HOUR**  
Compared to 65+ minutes today

**75 MINUTES FOR THE SAN FRANCISCO TO SAN JOSE LOCAL TRAIN**  
Compared to 100 minutes today

**21 MINUTES SAVED FOR THE SAN FRANCISCO TO GILROY TRIP**  
Compared to a 2+ hour trip today

#### CLEAN AND GREEN

**ALL-ELECTRIC TRAIN SERVICE FROM SAN FRANCISCO TO SAN JOSE**  
Annual emissions reduced by 250K MTCO<sub>2</sub>, equivalent to taking 55,000 cars off the road

#### RIDE MORE, WAIT LESS

**TRAINS EVERY 30 MINUTES ON WEEKENDS**  
Compared to hourly service today

**TRAINS EVERY 30 MINUTES DURING MID-DAY AND EVENINGS**  
Compared to hourly service at most stations today

**TRAINS EVERY 15 TO 20 MINUTES DURING PEAK HOURS\* AT 16 STATIONS**  
Compared to 7 stations today

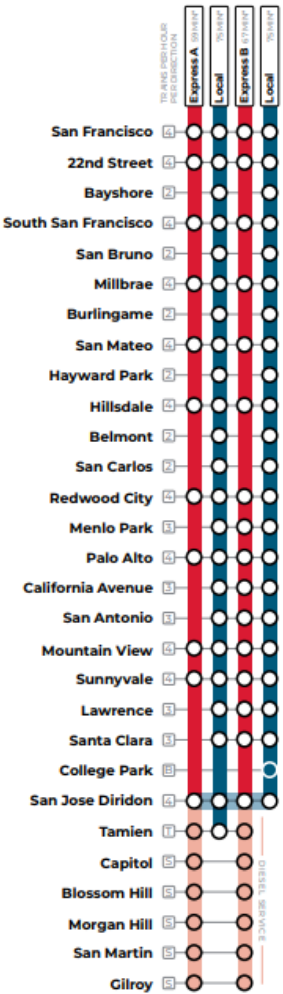
#### FIRST CLASS SERVICE

**STATE-OF-THE-ART VEHICLES FOR SMOOTHER RIDES**  
Free Wi-Fi, outlets at every seat, spacious accessible bathrooms, and digital displays with trip information

### FINAL ELECTRIFIED CALTRAIN SERVICE FOR SOUTH SAN FRANCISCO

STATIONS	STATION STOPS	CURRENT SERVICE	ELECTRIFIED SERVICE
SOUTH SAN FRANCISCO	Stops per Weekday	60	104
	Weekday Stops per Peak Hour*	2	4
	Weekday Stops per Off Peak Hour	1	2

### FALL 2024 ELECTRIFIED SERVICE WEEKDAY PEAK 1-HOUR SNAPSHOT



#### GET THERE FASTER

Most people will have quicker rides compared to service today.

Trip travel times below compare the fastest diesel trip today to the fastest trip with electrified service.

#### SOUTH SAN FRANCISCO EXPRESS

**13 min** 0 MINUTES SAVED  
To / from San Francisco

**25 min** 8 MINUTES SAVED  
To / from Palo Alto

**47 min** 19 MINUTES SAVED  
To / from San Jose Diridon

**Bellarmine Service**  
2 STOPS PER DAY IN EACH DIRECTION

**Tamien Service**  
2-3 STOPS PER HOUR IN THE PEAK DIRECTION\* AND 1 STOP PER HOUR IN THE REVERSE-PEAK DIRECTION

**South County Connector Service**  
4 DAILY ROUNDTRIPS WITH 1-2 DIESEL TRAINS PER HOUR IN THE PEAK DIRECTION\*, WITH TIMED 3-MINUTE CROSS-PLATFORM TRANSFER AT DIRIDON

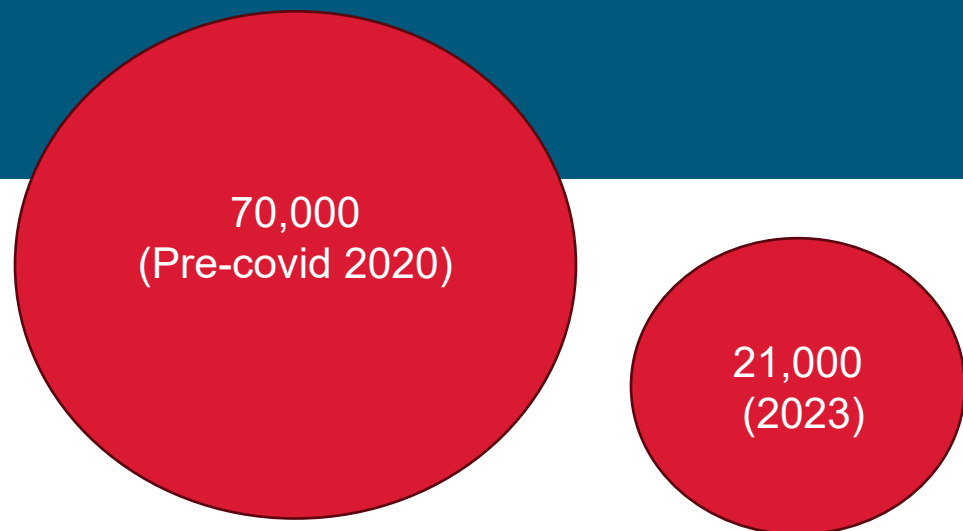
\*TRAIN TIMES SHOWN ARE FOR TRAVEL BETWEEN SAN FRANCISCO 4TH AND KING TO SAN JOSE DIRIDON STATION.  
\*\*PEAK DIRECTION IS NORTHBOUND IN THE MORNING AND SOUTHBOUND IN THE AFTERNOON.  
NOTE: BROADWAY STATION PROVIDES WEEKEND SERVICE ONLY. TRAVEL TIMES MAY CHANGE PENDING FURTHER TESTING AS NEW ELECTRIC TRAINS ARRIVE AND ARE PREPARED FOR SERVICE.

FOR MORE INFORMATION  
caltrain.com/electrification  
calmod@caltrain.com



# Beyond Electrification

# Caltrain Ridership / Fiscal Challenges



**Average Daily  
Riders**

## Notes:

- Farebox Recovery 74% (2020); 30% (2023)
- 20+ closures in 2023 for electrification construction
- Average weekday ridership increased by 14% compared to the same month in prior year

## Operating Deficit, Subject to Change

<u>Fiscal Year 2024</u> : \$0	→ (Thanks to Federal and State TIRCP funds for the Electrification Project)
<u>Fiscal Year 2025</u> : \$0	
* <u>Fiscal Year 2026</u> : \$33M (13% percent of operating budget)	<div></div>
<u>Fiscal Year 2027</u> : \$58M (22% percent of operating budget)	<div></div>
<u>Fiscal Year 2028</u> : \$57M (21% percent of operating budget)	<div></div>

\* Current MTC recommendation \$25M, reduce deficit to \$8M in FY26

NBC Bay Area

## New Work From Home Data Shows Disparities

Among metro areas, the Bay Area had the highest percentage of remote workers, with about 35% of its workforce primarily working from home.

Feb 9, 2023

# Ridership Growth Actions



- Fare promotions
- Activation Events (Summer of Caltrain)
- Business to Business Strategies
- Diversify Ridership (Pass Forward)
- Equitable Service
- Survey general population (positive brand)
- Promote Electrification



*"The benefits of having a transit pass are that I can avoid traffic and it's fast. Taking transit saves me money so I have more to take care of my family." - Geraldo Valencia, Whole Foods*





# A Connected Future

- Enable expansion of the Bay Area commuter/intercity rail network
- Existing and future tenants
  - Capital Corridor
  - Amtrak
  - Altamont Corridor Express
  - California High Speed Rail



California High-Speed Rail, Draft Business Plan, Pg. 23

# Major Projects / Initiatives

- Battery Electric Multiple Unit Train
- Portal (SF Downtown Extension)
- Diridon Business Case
- Transit Oriented Development
- Corridor Crossing Strategy

 Railway Gazette

## Battery train to take Caltrain electric operation beyond the wires

USA: The California Transportation Commission has approved funding for Stadler to supply a battery-electric multiple-unit which will enable...



# Pilot Battery-Electric Multiple Unit (BEMU)

- BEMU train runs off-wire between San Jose and Gilroy with demonstration trips to Salinas
- Improve Air Quality, Zero Emissions
- Benefit other commuter rail systems
  - Working towards FRA approval
  - Less infrastructure (overhead contact systems)
- State CARB In-Use Locomotive Regulation requires rail operators to reach implement fully zero emission fleet



FOR MORE INFORMATION

[WWW.CALTRAIN.COM](http://WWW.CALTRAIN.COM)



# Appendix

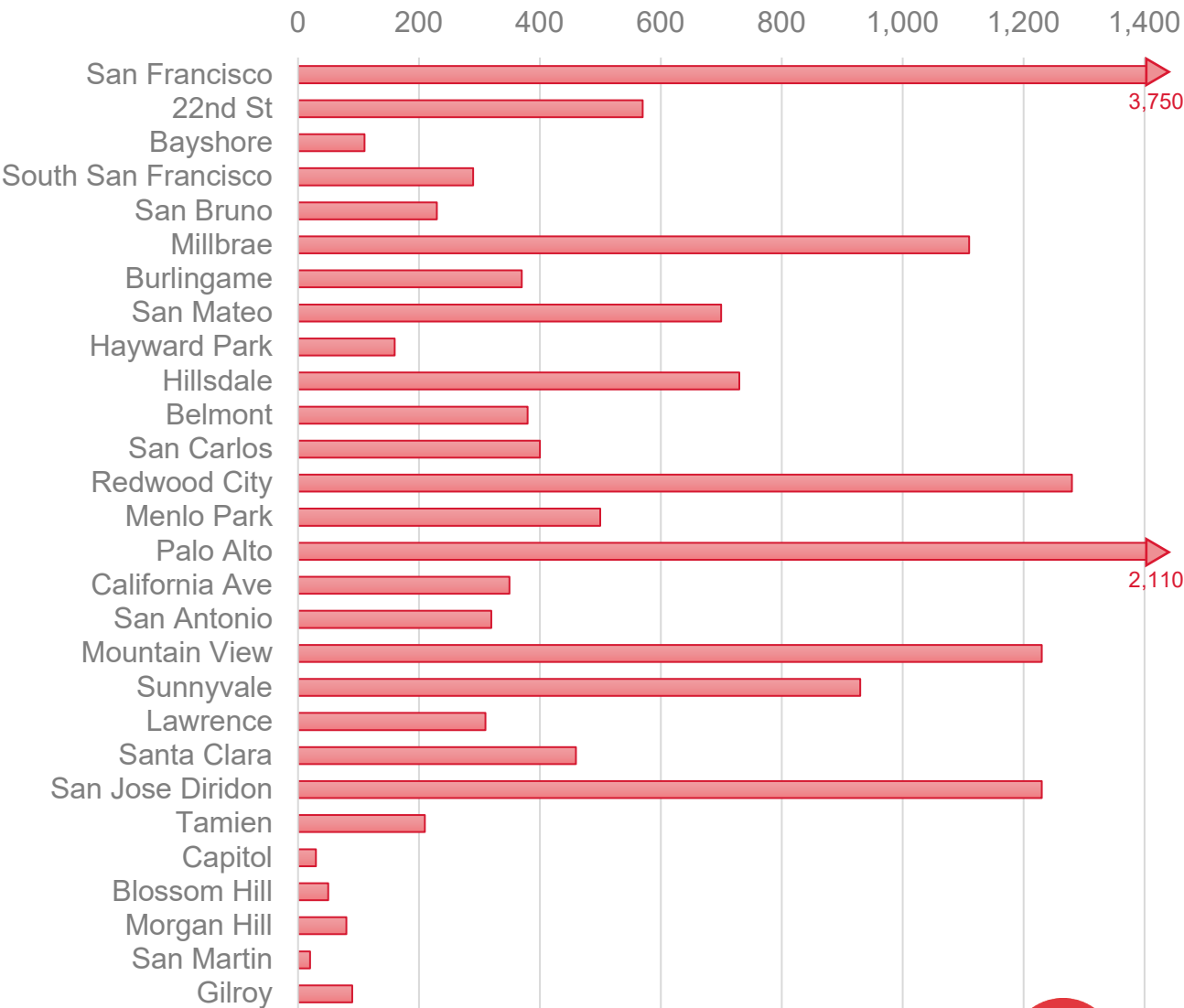


# Ridership Analysis

Caltrain’s current ridership remains focused around key stations:

- San Francisco
- Millbrae
- Redwood City
- Palo Alto
- Mountain View
- Sunnyvale
- San Jose Diridon

Average Weekday Ridership by Station (2023)



Ridership estimates based on Clipper data and limited conductor counts Jan-Mar 2023

# Land Use Analysis

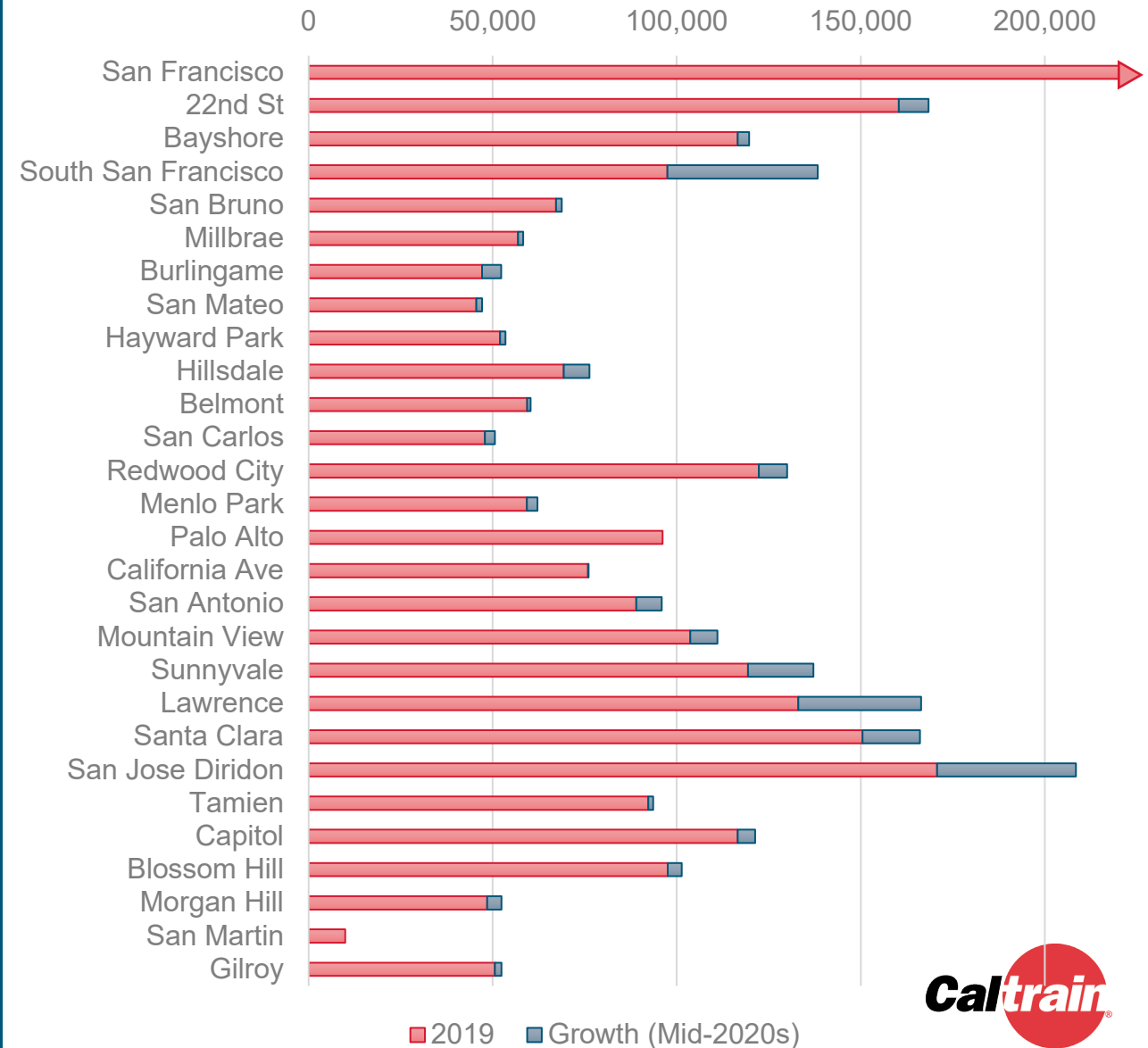
Proximity to population and jobs is an indicator of potential latent demand for Caltrain.

Some Caltrain station areas are experiencing substantial growth, particularly:

- South San Francisco
- Sunnyvale
- Lawrence
- Santa Clara
- San Jose Diridon

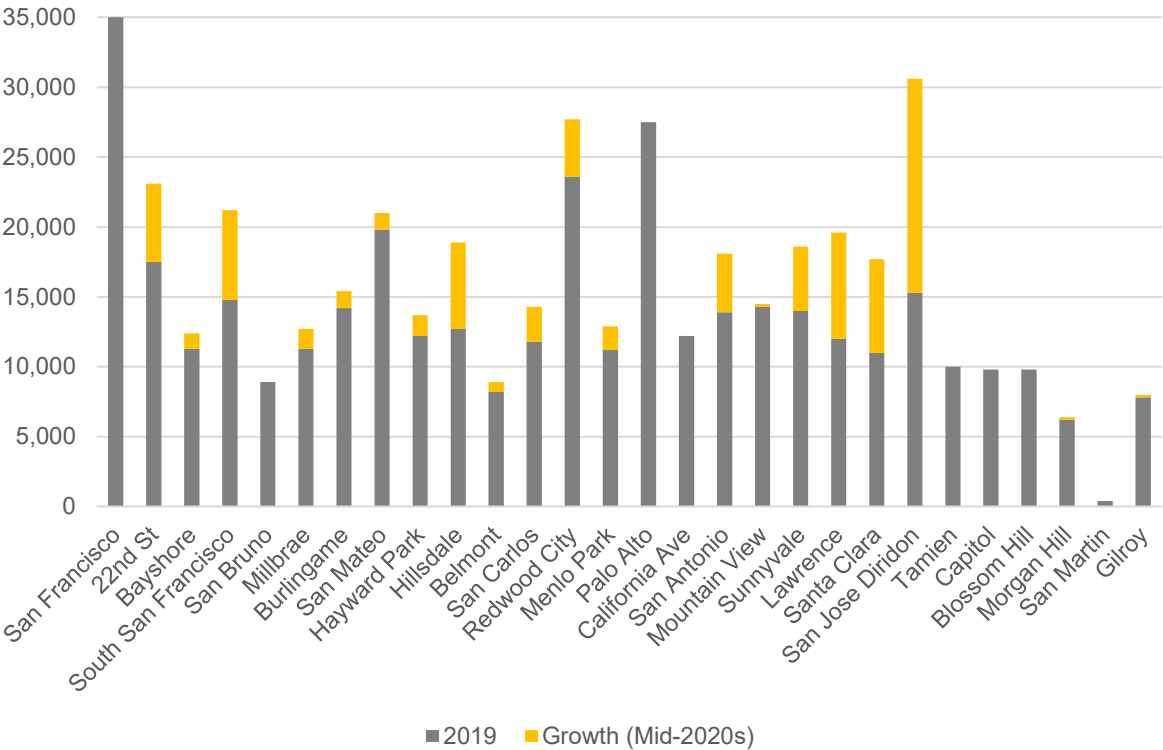
*Growth based on inventory of projects under construction or completed since 2019*

## Population and Jobs within 2 Miles of Caltrain Stations: Mid-2020s Estimate

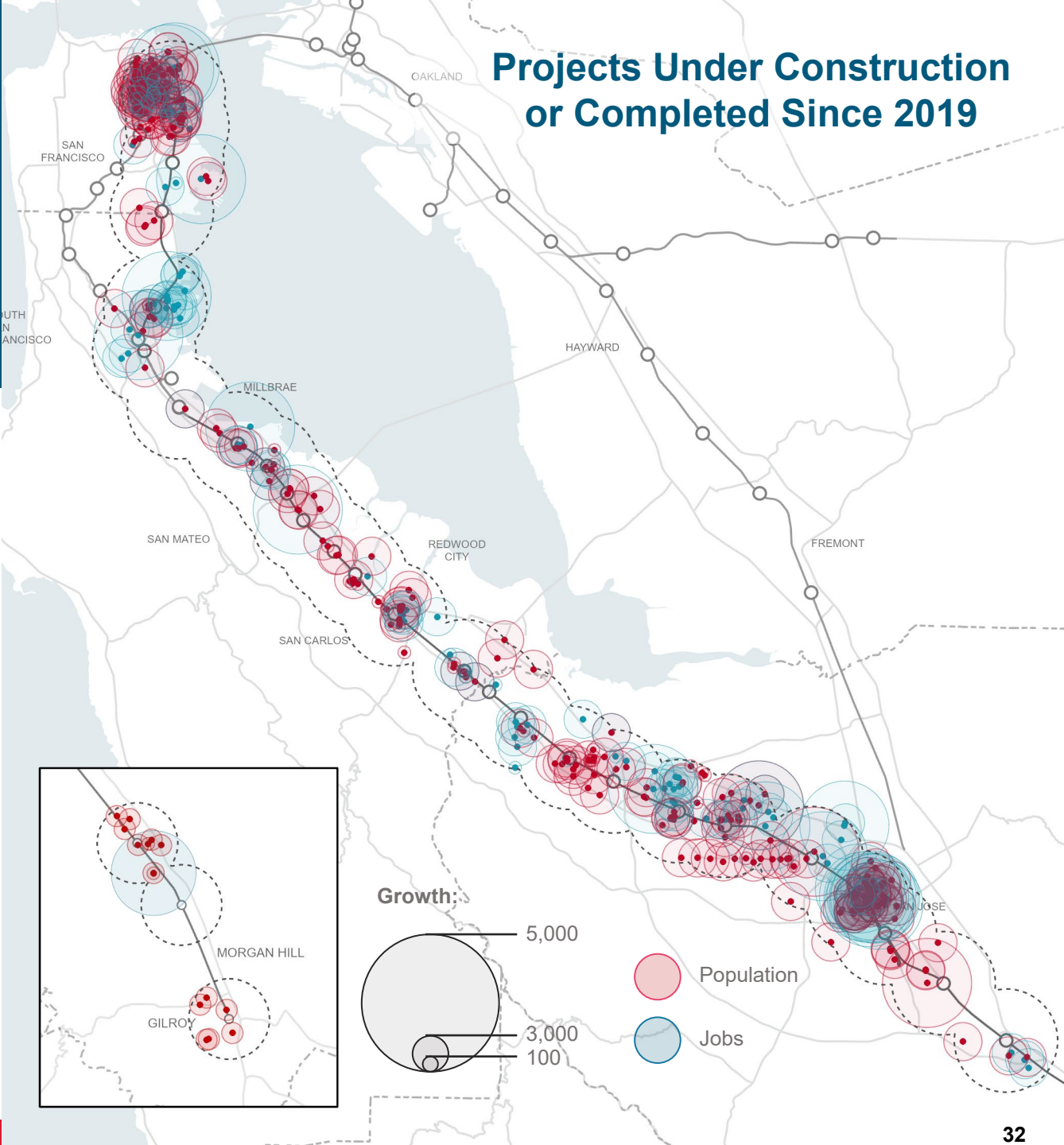


# Corridor Development Inventory

Population and Jobs within ½ Mile of Caltrain Stations:  
Mid-2020s Estimate



Growth based on inventory of projects under construction or completed since 2019

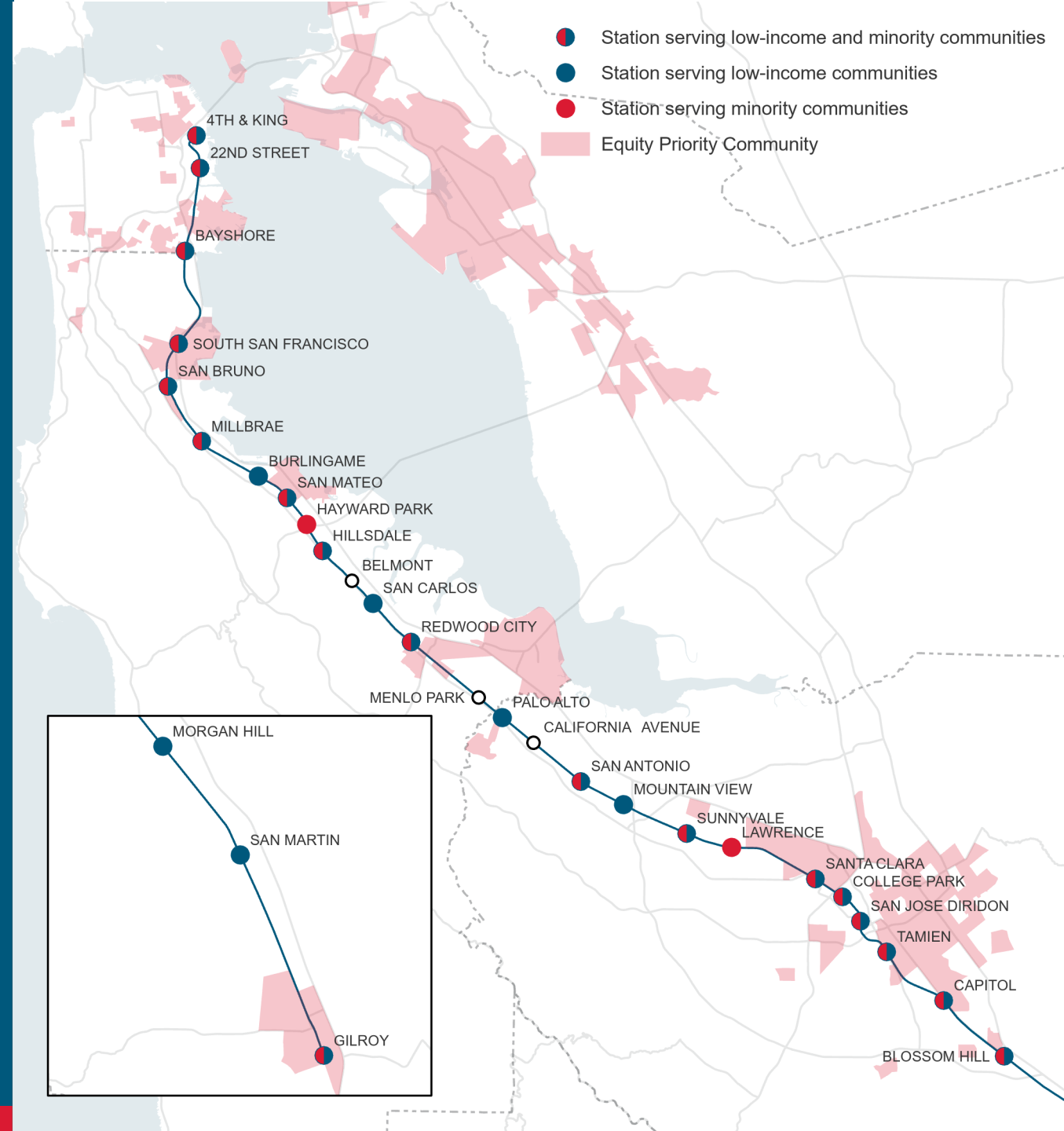


# Equity Need

The Metropolitan Transportation Commission designates Equity Priority Communities across the region. Caltrain also identifies specific stations that serve minority or low-income riders for Title VI purposes.

Caltrain has historically underserved the following stations that serve equity priority populations:

- Bayshore
- South San Francisco
- San Bruno
- San Mateo
- Menlo Park
- Sunnyvale
- Lawrence
- Santa Clara
- Tamien
- Capitol
- Blossom Hill
- Gilroy



# Transit Connections

Most Caltrain stations include connections to other transit operators that serve communities along the Caltrain corridor, including but not limited to:

- ACE
- BART
- Capitol Corridor
- Commute.org
- SamTrans
- SFMTA
- VTA

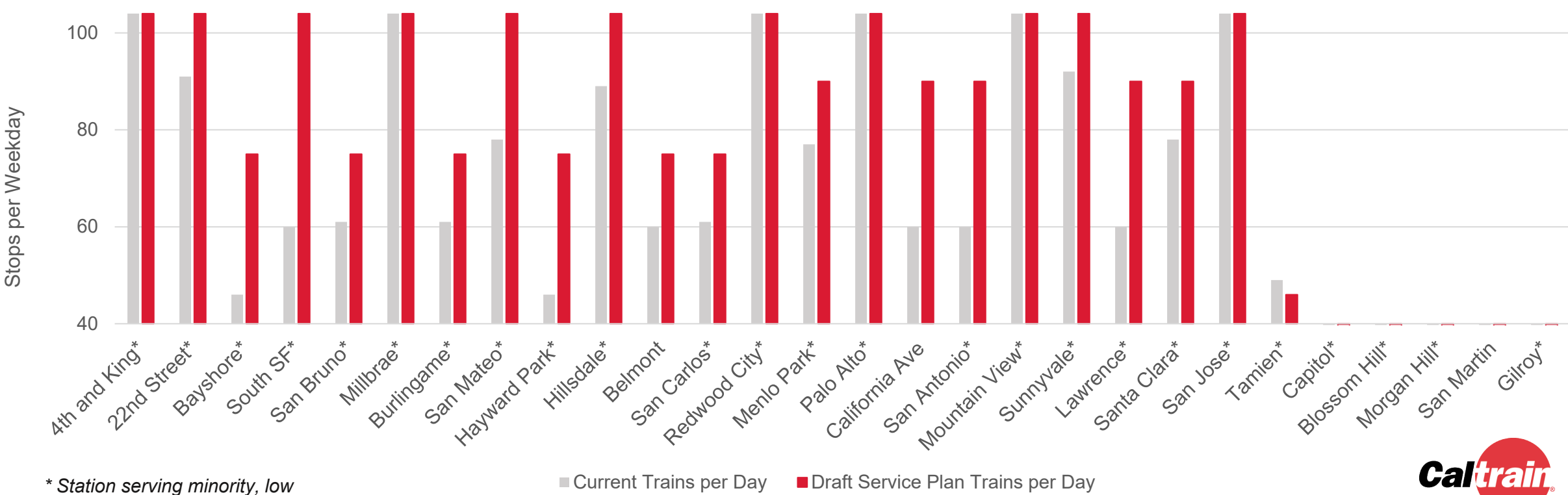
Caltrain Station	Connecting Transit Operator(s)	Other Transit Operators' Peak Hour Trips per Direction
San Francisco	SFMTA	28
22nd Street	SFMTA	7
Bayshore	Commute.org	3
South San Francisco	SamTrans, Commute.org, City Shuttle	17
San Bruno	SamTrans	2
Millbrae	BART, SamTrans, Commute.org	17
Burlingame	SamTrans	2
San Mateo	SamTrans	4
Hayward Park	Commute.org	1
Hillsdale	SamTrans, Commute.org	13
Belmont	SamTrans	6
San Carlos	SamTrans	6
Redwood City	SamTrans, Commute.org	22
Menlo Park	SamTrans, City Shuttle	10
Palo Alto	VTA, SamTrans, Stanford, Dumbarton	68
California Ave	VTA	1
San Antonio	VTA	2
Mountain View	VTA , MVGO Shuttle	36
Sunnyvale	VTA	13
Lawrence	-	-
Santa Clara	VTA, ACE, Capitol Corridor	24
San Jose Diridon	VTA , ACE, Capitol Corridor, Highway 17 Express	27
Tamien	VTA	9
Capitol	VTA	7
Blossom Hill	VTA	2
Morgan Hill	VTA	7
San Martin	VTA	6
Gilroy	VTA, County Express	11

Gray = Caltrain stations with greater than 10 peak hour trips from connecting transit operators

# Weekday Stop Frequency by Station

Total weekday stops increase by 20% corridor-wide

Weekday Stops per Station (Draft Service Plan vs. Existing Service Today)



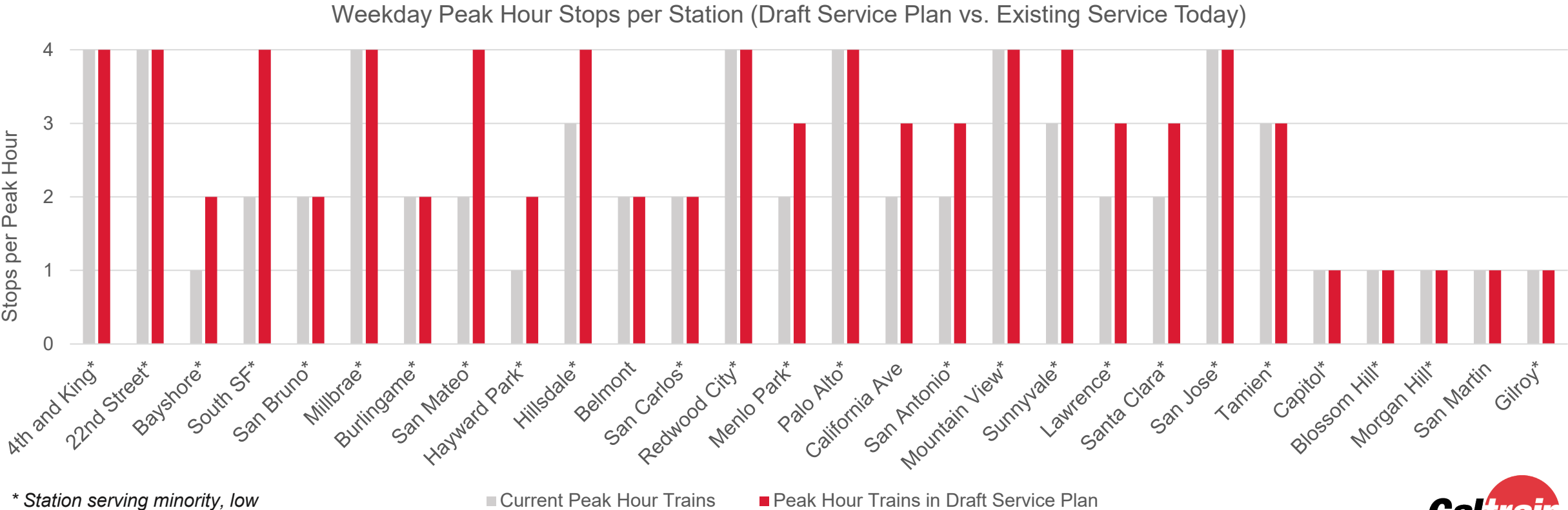
\* Station serving minority, low income, or Equity Priority Community





# Weekday Peak Hour Stop Frequency

Total peak hour stops increase by 20% corridor-wide



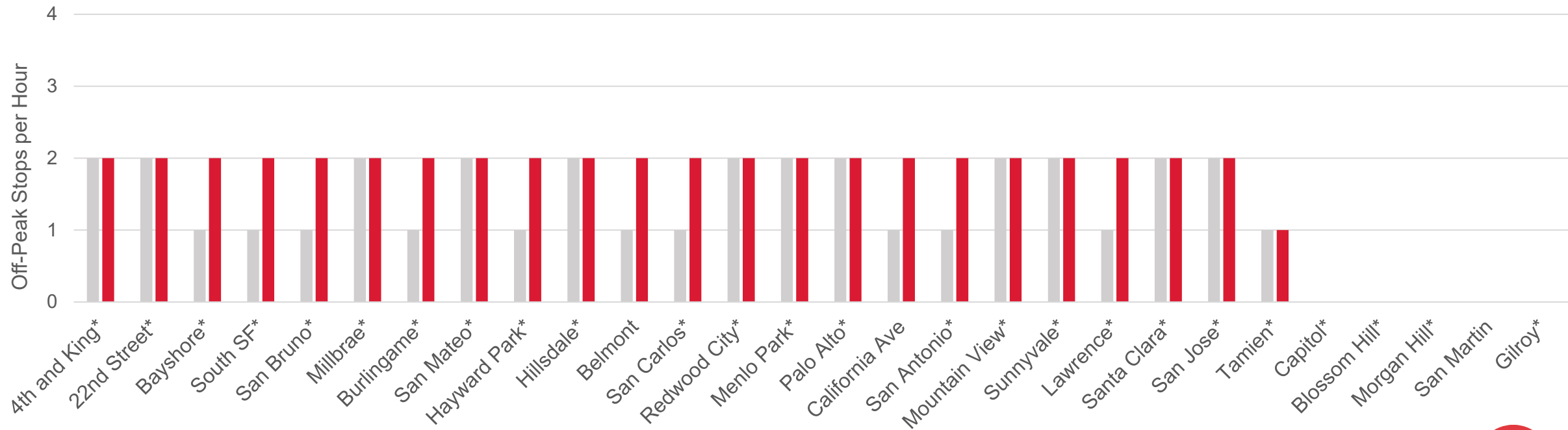
\*22nd St: 4 TPH peak direction, 2 TPH reverse-peak direction. Tamien: 2-3 TPH peak direction, 1 TPH reverse-peak direction.



# Off-Peak Stop Frequency

Total off-peak stops per hour increase by 30% corridor-wide

Draft Service Plan Off Peak Trains per Hour



\* Station serving minority, low income, or Equity Priority Community

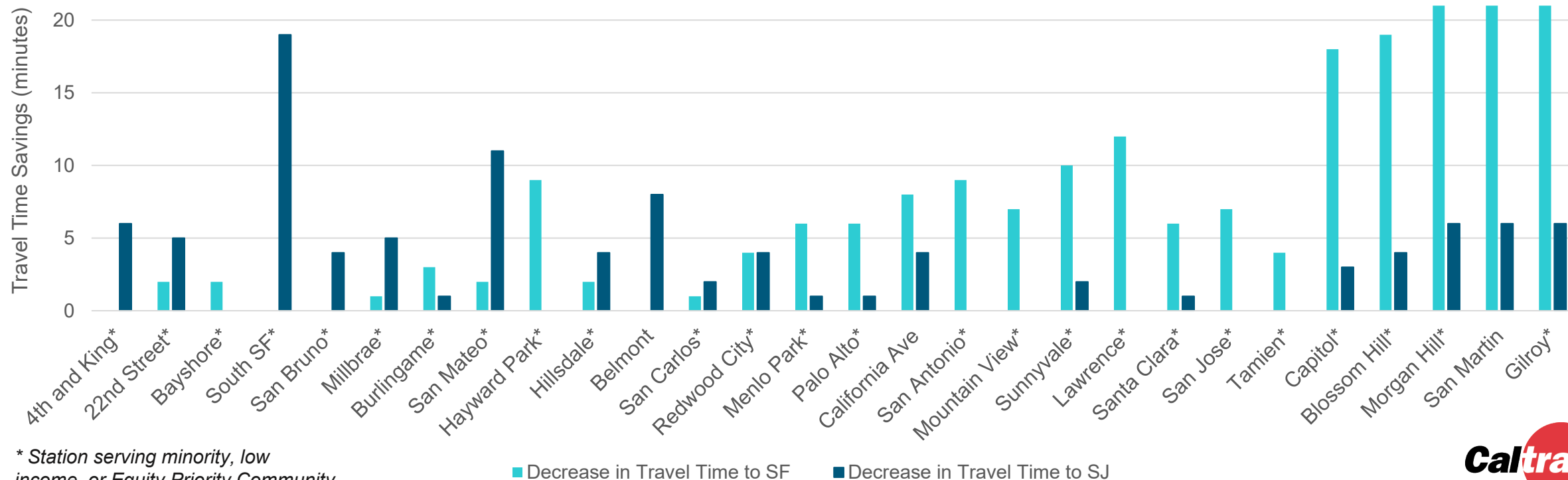
■ Current Off-Peak Trains per Hour    ■ Off-Peak Trains per Hour in Draft Service Plan



# Travel Time Savings to SF & SJ

Most stations will see 3 to 5 minutes of savings to San Francisco or San Jose (comparing the fastest trains)

Reduction in Travel Time for Fastest Trip (Draft Service Plan)



# Southern Santa Clara County Corridor Survey: **Priorities**

- Online survey for South County was conducted in June 2023 and targeted residents in those communities; 1,552 responses received
- Respondents ranked frequency, later morning service, and shorter travel time as top priorities
- 85% of passengers traveled within Santa Clara County or southern San Mateo County (<10% traveled to San Francisco)\*

## Service Improvement Preferences in Ranking Order

	Frequency	Earlier AM service	Later AM service	Earlier PM service	Later PM service	Shorter trip time	One seat ride
<b>Capitol</b>	1	4	3	6	7	2	5
<b>Blossom Hill</b>	1	5	2	4	7	3	6
<b>Morgan Hill</b>	1	5	2	6	4	3	7
<b>San Martin</b>	1	5	2	4	6	3	7
<b>Gilroy</b>	1	4	2	5	6	3	7

*Ranking Order: 1=most requested improvement; 7=least requested improvement*

