Caltrain Business Plan

NOVEMBER 2018

LPMG

November 29, 2018

The 2040 Vision: Planning For More

What is the Caltrain Business Plan?

What Addresses the future potential of the railroad over the next 20-30 years. It will assess the benefits, impacts, and costs of different service visions, building the case for investment and a plan for implementation.

Why Allows the community and stakeholders to engage in developing a more certain, achievable, financially feasible future for the railroad based on local, regional, and statewide needs.

What Will the Business Plan Cover?

Technical Tracks

Service

- Number of trains
- Frequency of service
- Number of people riding the trains
- Infrastructure needs to support different service levels

Business Case

- Value from investments (past, present, and future)
- Infrastructure and operating costs
- Potential sources of revenue

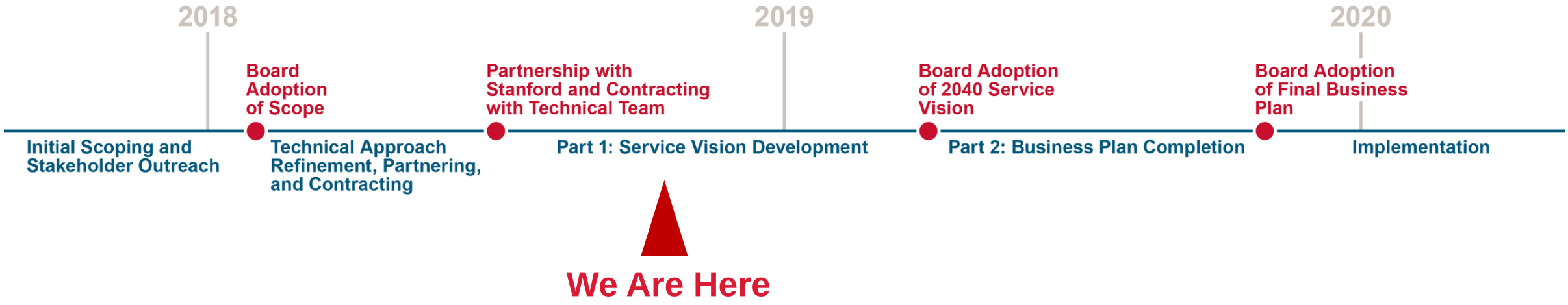
Community Interface

- Benefits and impacts to surrounding communities
- Corridor management strategies and consensus building
- Equity considerations

Organization

- Organizational structure of Caltrain including governance and delivery approaches
- Funding mechanisms to support future service

Where Are We in the Process?



Service Planning

Service Planning Process & Goals

Service Planning Process & Goals

2040 Market Demand

Service Concept Development

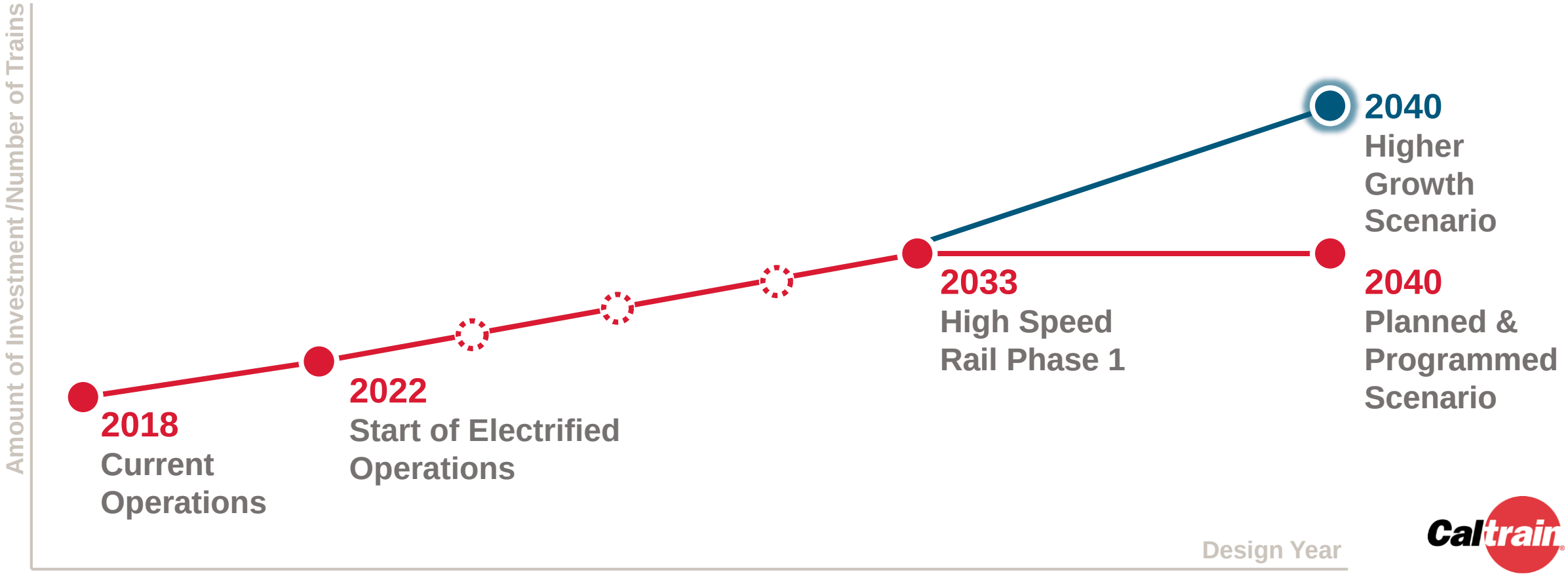
Service Concept Evaluation

Choosing a Vision: How Will the Railroad Grow?

What In the Spring of 2019 the team will present two growth scenarios to the Board. One will generally reflect past and ongoing Blended System planning efforts while another will explore a higher level of growth. Each scenario will provide a detailed picture of how the railroad could grow over the next 20-30 years. The Board will be asked to choose one of these growth scenarios as the “Service Vision” for the corridor

Why In selecting a long range Service Vision the Board will answer the question “How should the railroad grow?” This will allow Caltrain to further optimize and refine the Vision while developing a Business Plan that builds towards the future in a consistent and efficient manner

Context: Two Ways to Grow



What is the Process for Developing the Higher Growth Service Plan?

1. Develop service planning assumptions, parameters, and goals
2. Identify initial service approaches
3. Develop detailed peak hour concepts

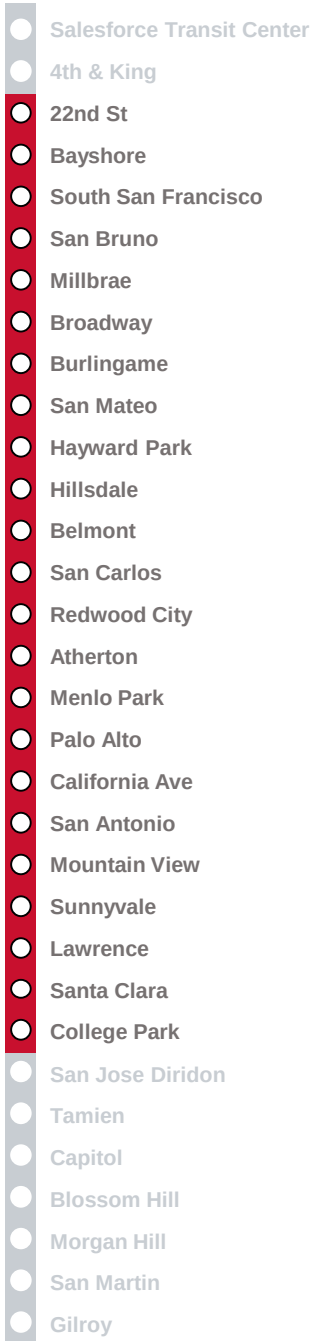
Future Steps

4. Refine and evaluate detailed service concepts
5. Expand service concepts to include terminals in San Francisco and San Jose and service to South San Jose and Gilroy
6. Develop all-day and weekend service plans

Initial Service Planning: Geographic Scope

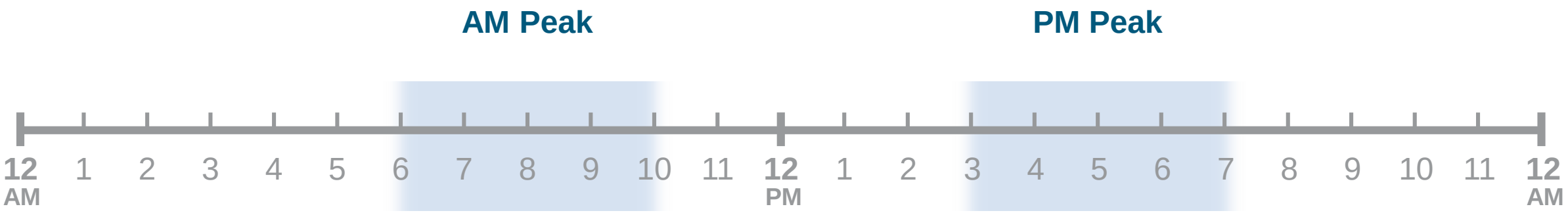
Initial service planning focuses on the Caltrain corridor between San Francisco and San Jose

Terminal operations in San Francisco and San Jose will be analyzed next as will service to South San Jose, Morgan Hill, San Martin and Gilroy



Initial Service Planning: Temporal Scope

Initial service planning is focused on the AM and PM peak periods. All day service plans will be developed later in the service planning process.



Key Concept

Improving Service Requires Investment

There are many different ways to invest in a railroad.

Delivery of both the “Planned and Programmed” and “Higher Growth” scenarios will require substantial investment into the corridor

Operations

- Increased service coordination and expanded operations to maximize the use of physical infrastructure

Systems

- Improved train performance
- Fleet expansion
- Improved train control and signaling

Infrastructure

- Track enhancement and expansion
- Station and terminal improvements
- Grade crossing investments

Example Investments

As service plans are refined, conceptual investments will be detailed, costed and incorporated into the development of the Business Case for each Scenario.

Types of Investment Assumed in All Scenarios		Conceptual Additional Investment Needed to Support Higher Growth
Curve straightening and track upgrades to support up to 110 mph operation	→	Potential 3- or 4-track overtakes to allow for additional service (either at stations or as “running” overtakes)
New signaling system and PTC upgrades to support 2 min headways and 110 mph operation	→	No further enhancement necessary to support increased service levels
Catenary pole placement adjustment to enable 110 mph operation	→	Power supply and catenary system upgrades to support higher service levels
Some terminal and shared station modification as needed to support the Blended System	→	Terminal modifications or expansion to accommodate increased service levels
Platform lengthening and level boarding	→	Additional platform lengthening to support longer train consists
Full fleet electrification and expansion	→	Further fleet expansion to allow for increased service and longer trains
Storage and maintenance expansion / reconfiguration	→	Revised depot and maintenance strategy to accommodate increased fleet size
Grade separations and grade-crossing improvements	→	Additional grade separations and improvements to at-grade crossings
General station, customer amenity and access facility improvements	→	Improvements scaled with service levels and ridership

Caltrain

Initial Rail Operating Parameters

The following rail operating parameters are used as the starting point for 2040 service planning. Some variation to these parameters may be explored as service planning progresses.

Parameter	HSR	Caltrain
Minimum headway between trains	2 minutes	2 minutes
Turnaround time at terminal	20 minutes	20 minutes
Minimum station dwell time	2 minutes	1.0 (high-ridership stations) 0.7 (low-ridership stations)
Train equipment	High speed trainset	8-car electric multiple unit trainset
Speed limit	110 MPH	110 MPH
Recovery time	10% distributed	10% distributed

Service Planning Goals

The following directional "goals" are suggested as the basis for developing initial service concepts. Not every goal is fully achievable within the constraints of the Caltrain corridor. Different concepts will achieve different goals with varying degrees of success.

Service

- Achieves 15 minute frequencies at most stations during peak
- Improves travel times between major markets
- Maintains service coverage between most origin-destination pairs

Ridership

- Provides differentiated service levels based on market demand
- Provides throughput capacity responsive to demand

Infrastructure

- Can be phased over time
- Meets multiple objectives
- Provides flexibility in response to changing demands
- Efficient design and sizing

Users

- Regularity, legible route structure & clockface schedule
- Reliability
- Facilitate Transfers to local, regional and state connections

Community

- Maintain local access and circulation
- Minimize mainline track expansions

SHARING SESSION

Do you have any initial questions about the service planning process?

2040 Market Demand

Service Planning Process and Goals

2040 Market Demand

Service Concept Development

Service Concept Evaluation

Existing Ridership

Today, Caltrain serves bidirectional and polycentric ridership demand

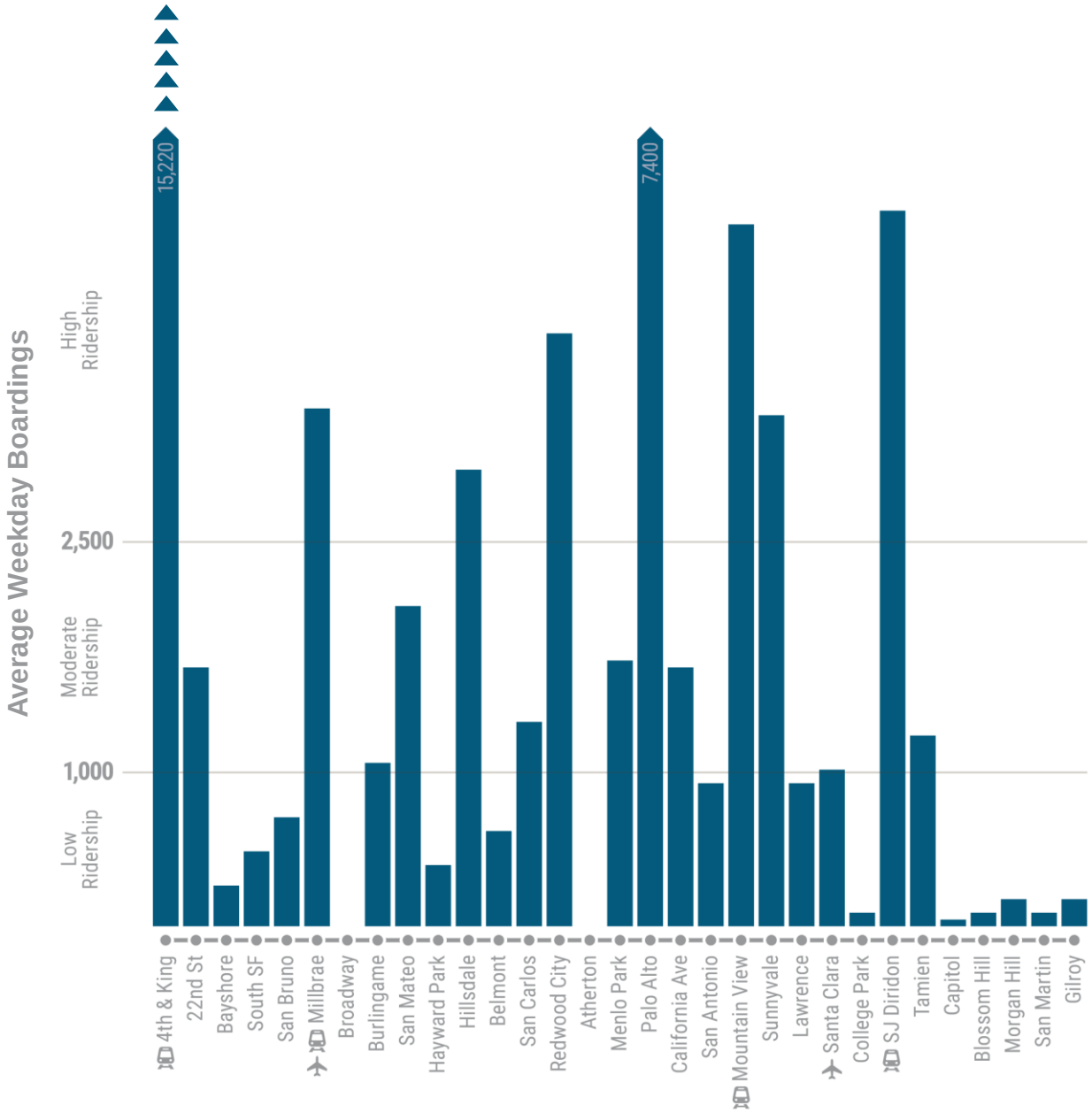
- 62,000 daily boardings[1]
- 64%-36% NB-SB split during AM peak period
- Half of trips occur outside of San Francisco

Ridership is highly concentrated around stations with fastest & most frequent Service

- 73% of ridership at 8 Baby Bullet stations served by 4 or more trains per hour, per direction

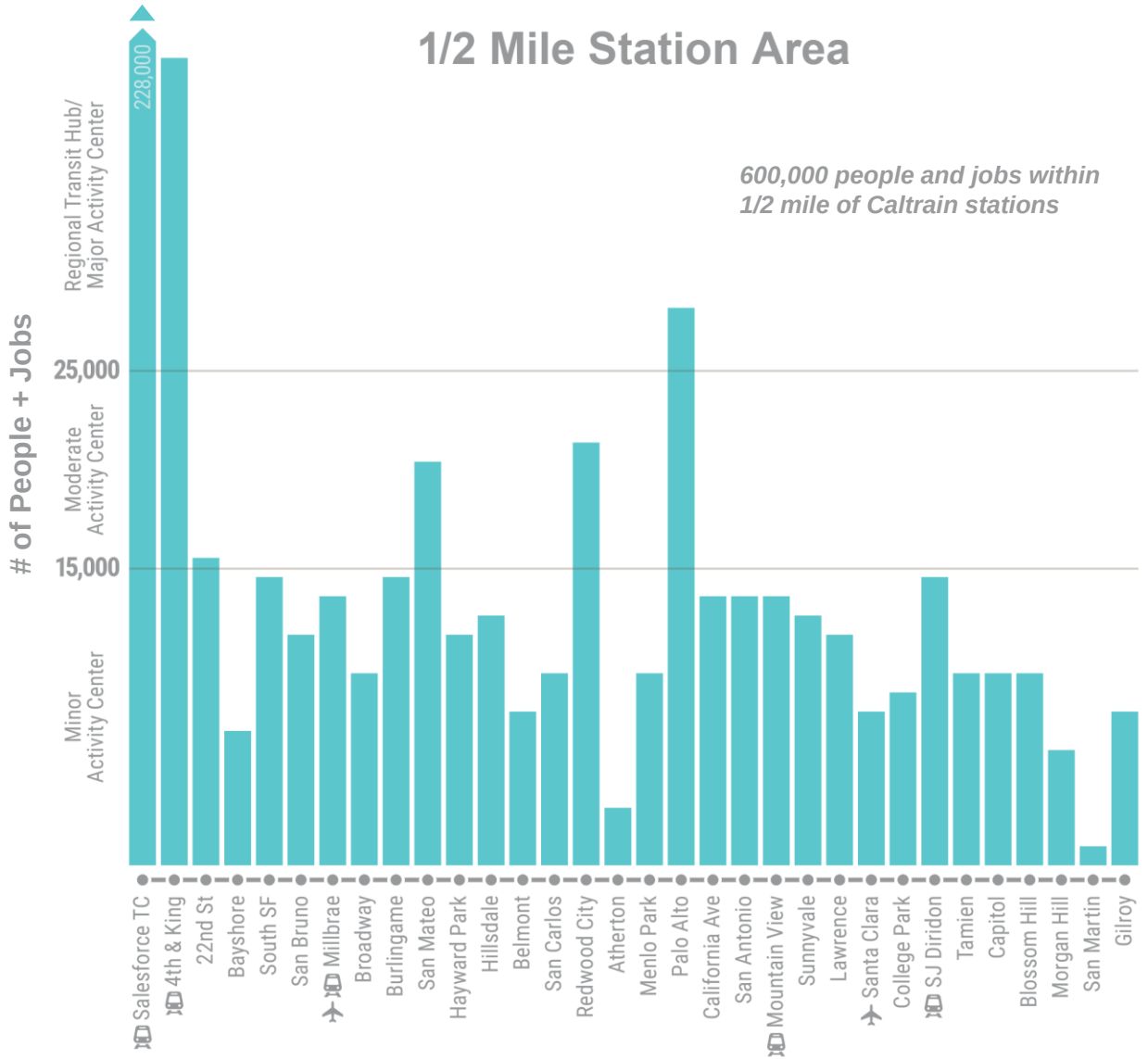
Caltrain serves a relatively small share of corridor travel demand

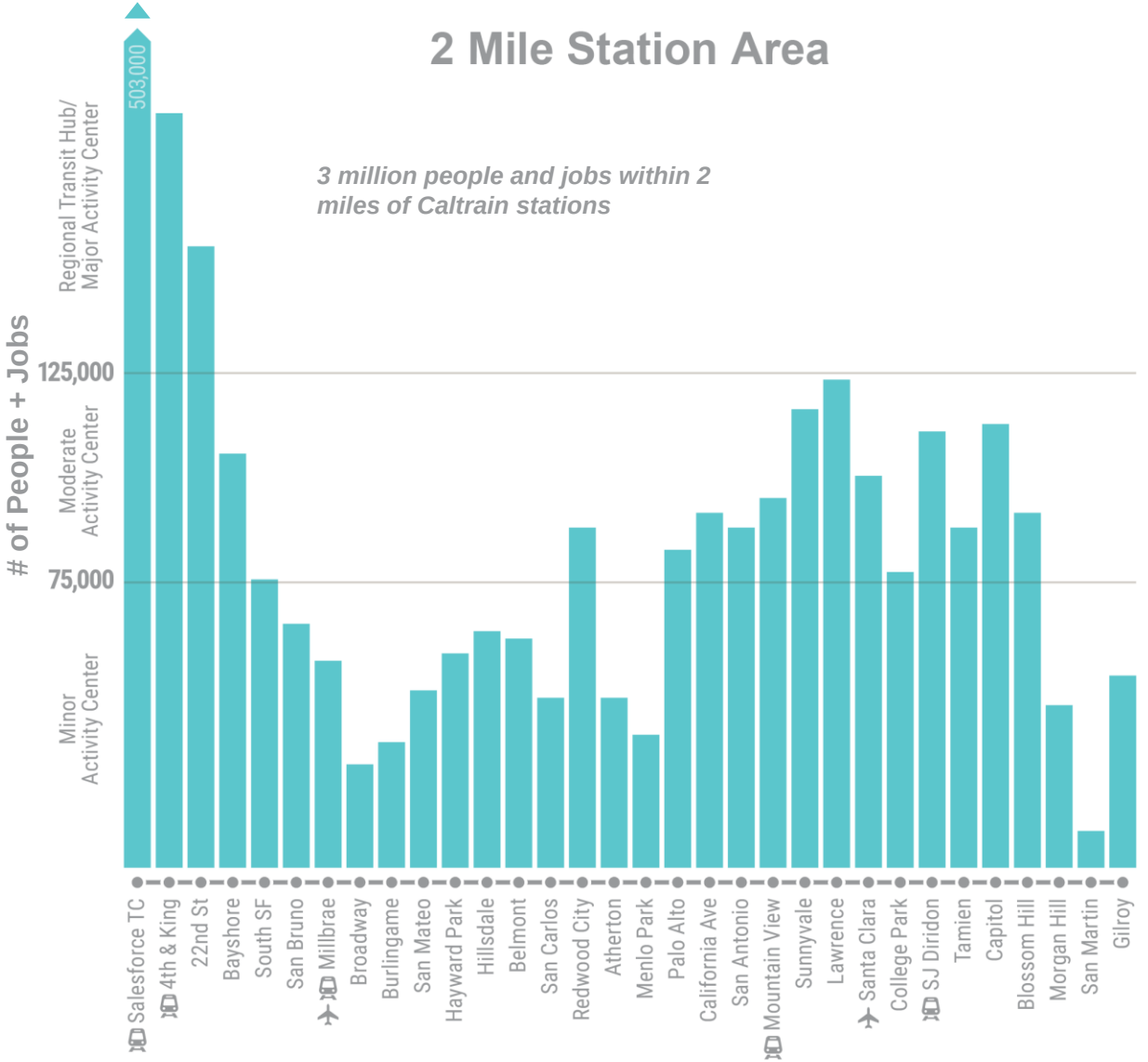
- About 9% mode share for regional north-south travel
- Service, access, and capacity constrain ridership
- Latent demand for increased service at many stations



[1]Based on 2017 ridership data

Existing Land Use & Transportation Context





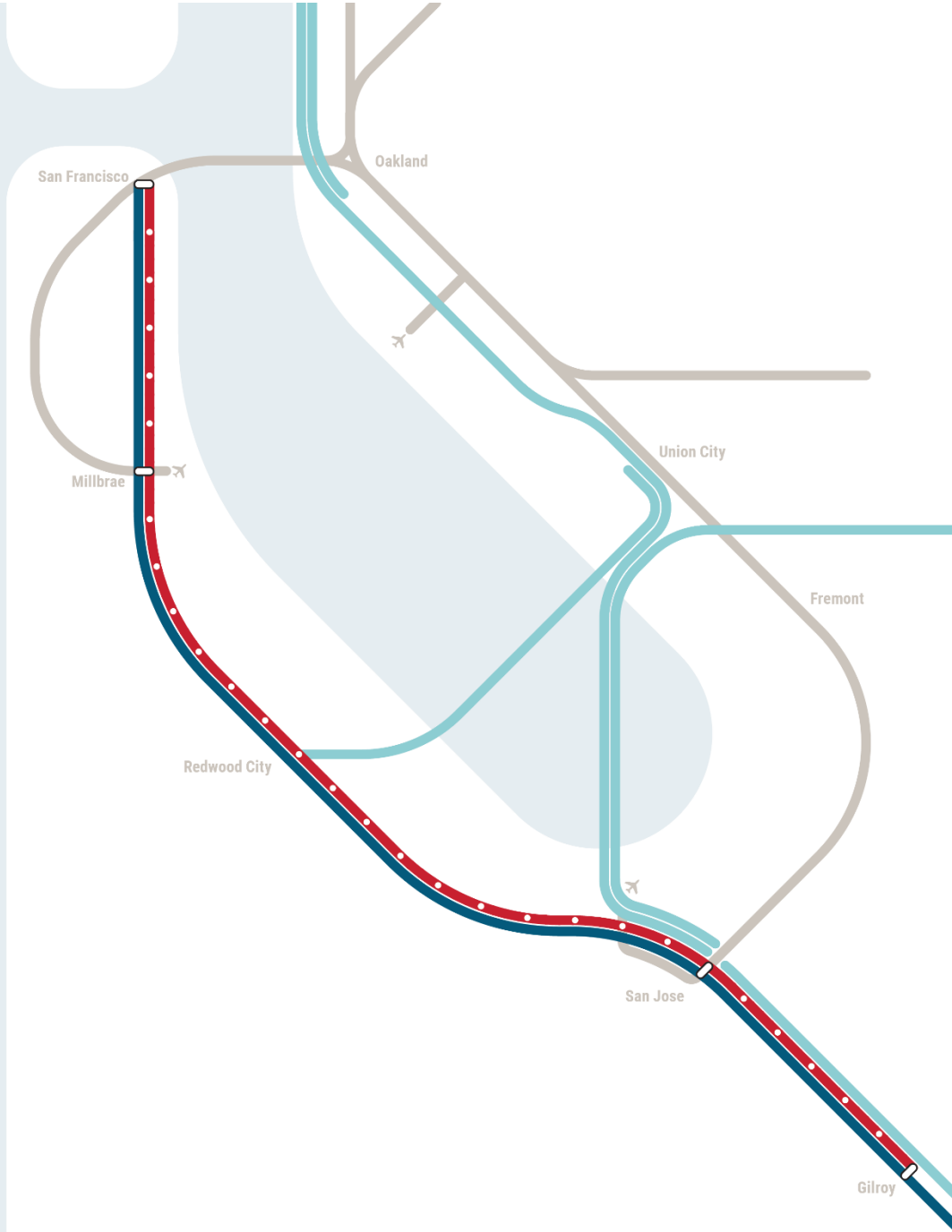
2040 Demand

The Caltrain corridor is growing

- Corridor expected to add 1.2 million people and jobs within 2 miles of Caltrain (+40%)[1]
- 80% of growth expected in San Francisco and Santa Clara Counties

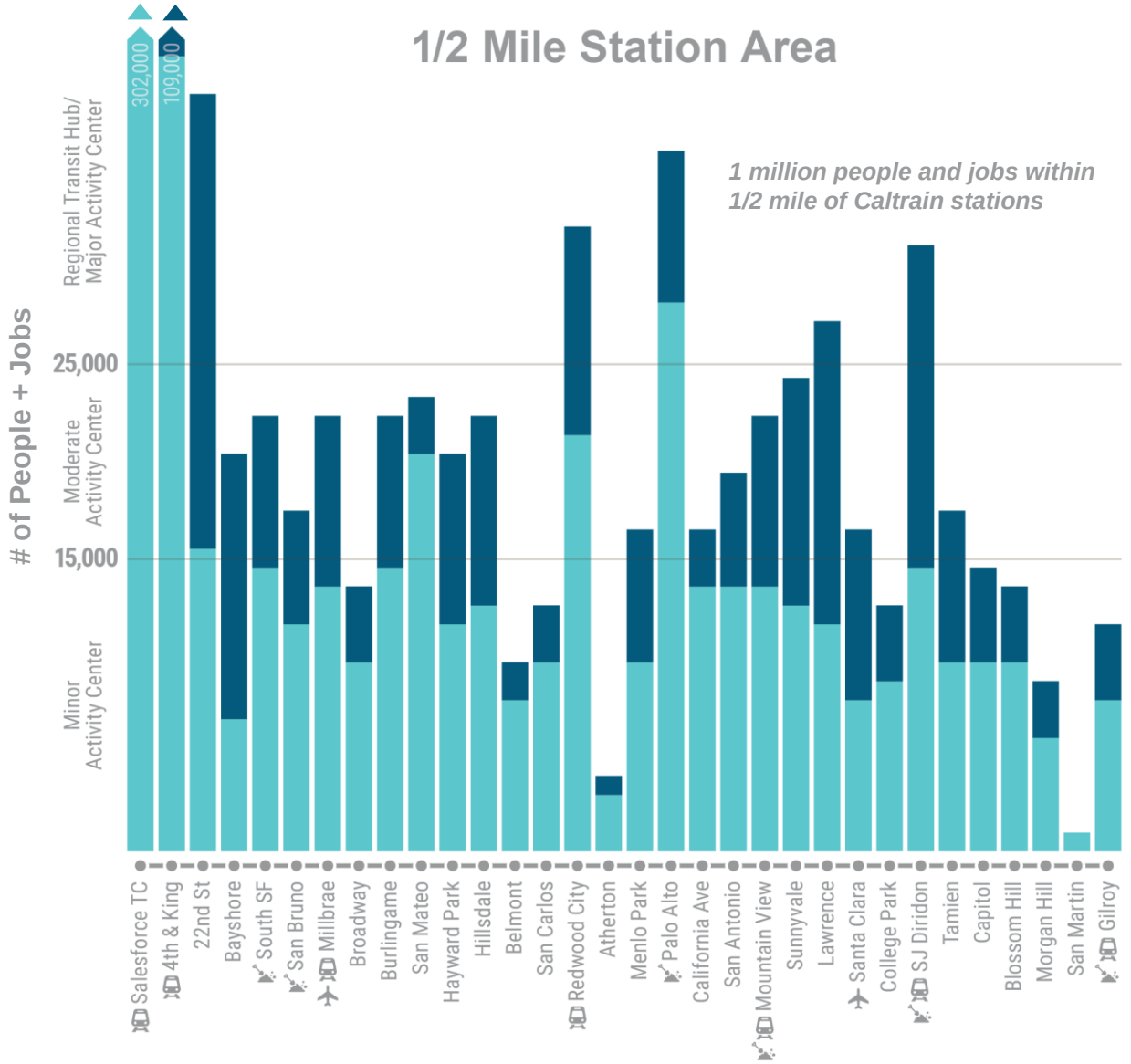
Major transit investments are opening new travel markets to Caltrain

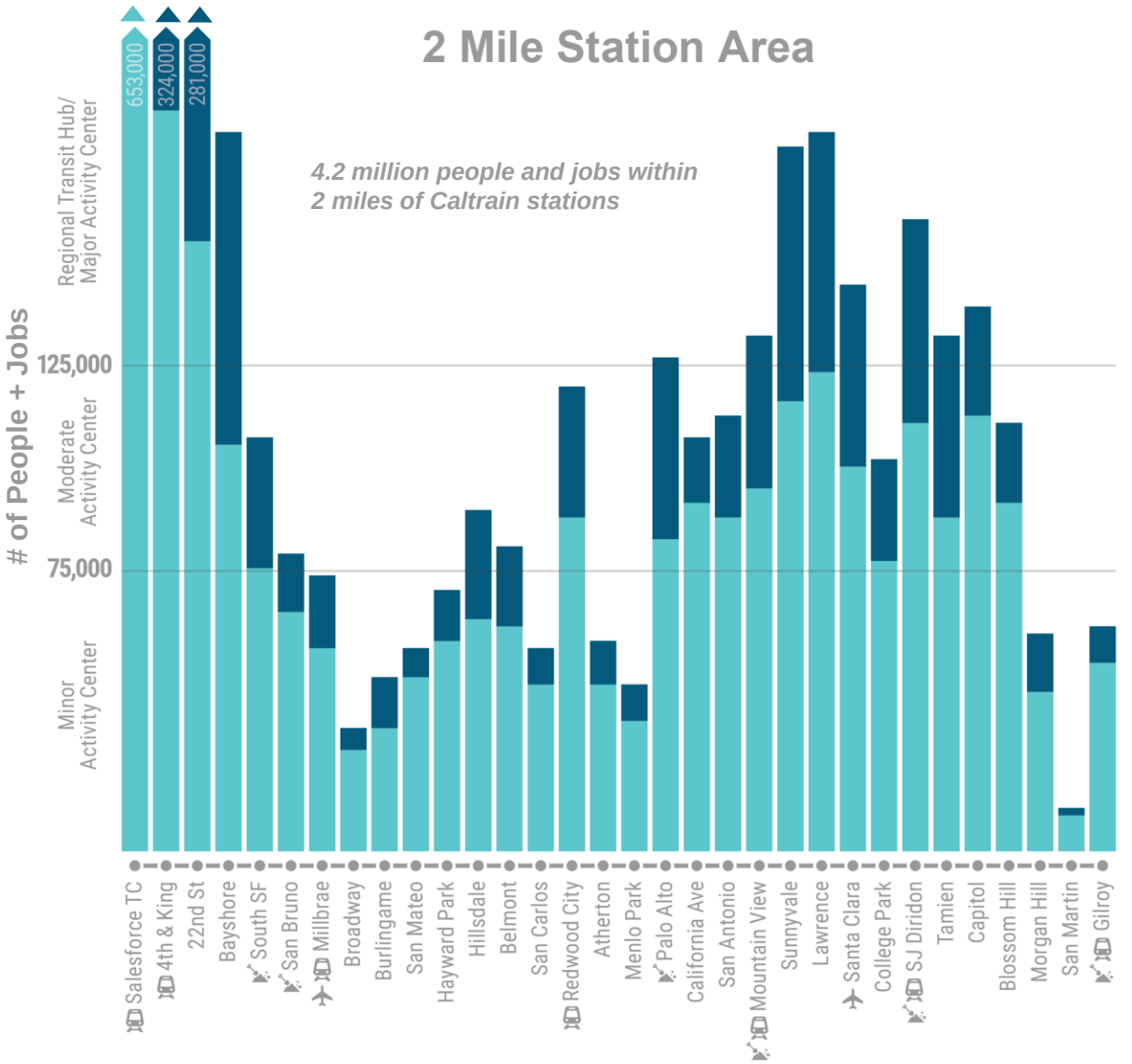
- Downtown Extension and Central Subway to provide more direct connections to downtown San Francisco
- Dumbarton Rail, BART to San Jose, and improvements to Capitol Corridor and ACE to strengthen connectivity with East Bay
- HSR and Salinas rail extensions to increase interregional travel demand



[1]Based on Plan Bay Area forecasts and approved projects by individual cities
[2]Derived from a rough order-of-magnitude sensitivity test using the C/CAG Model

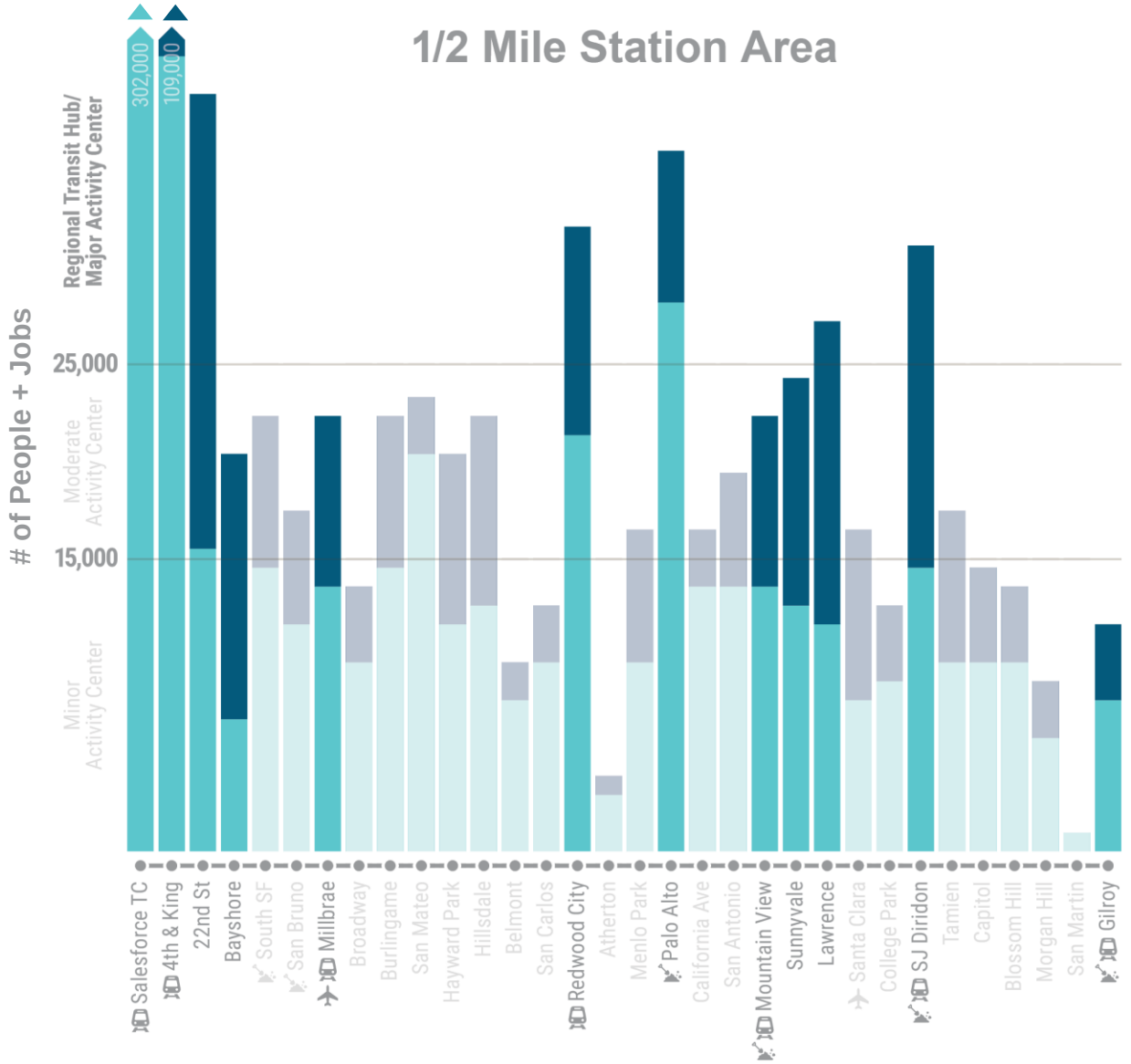
2040 Land Use & Transportation Context

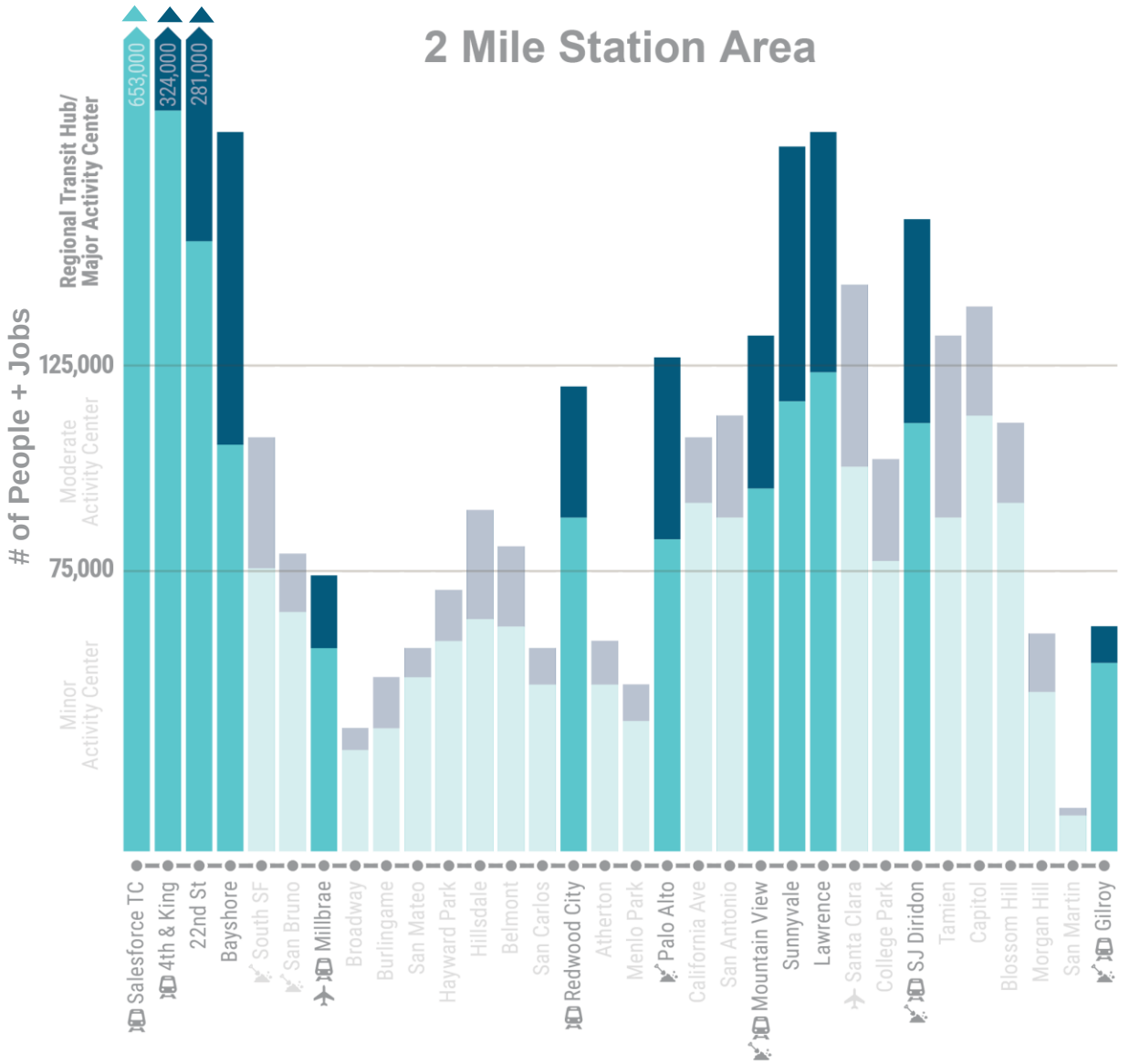




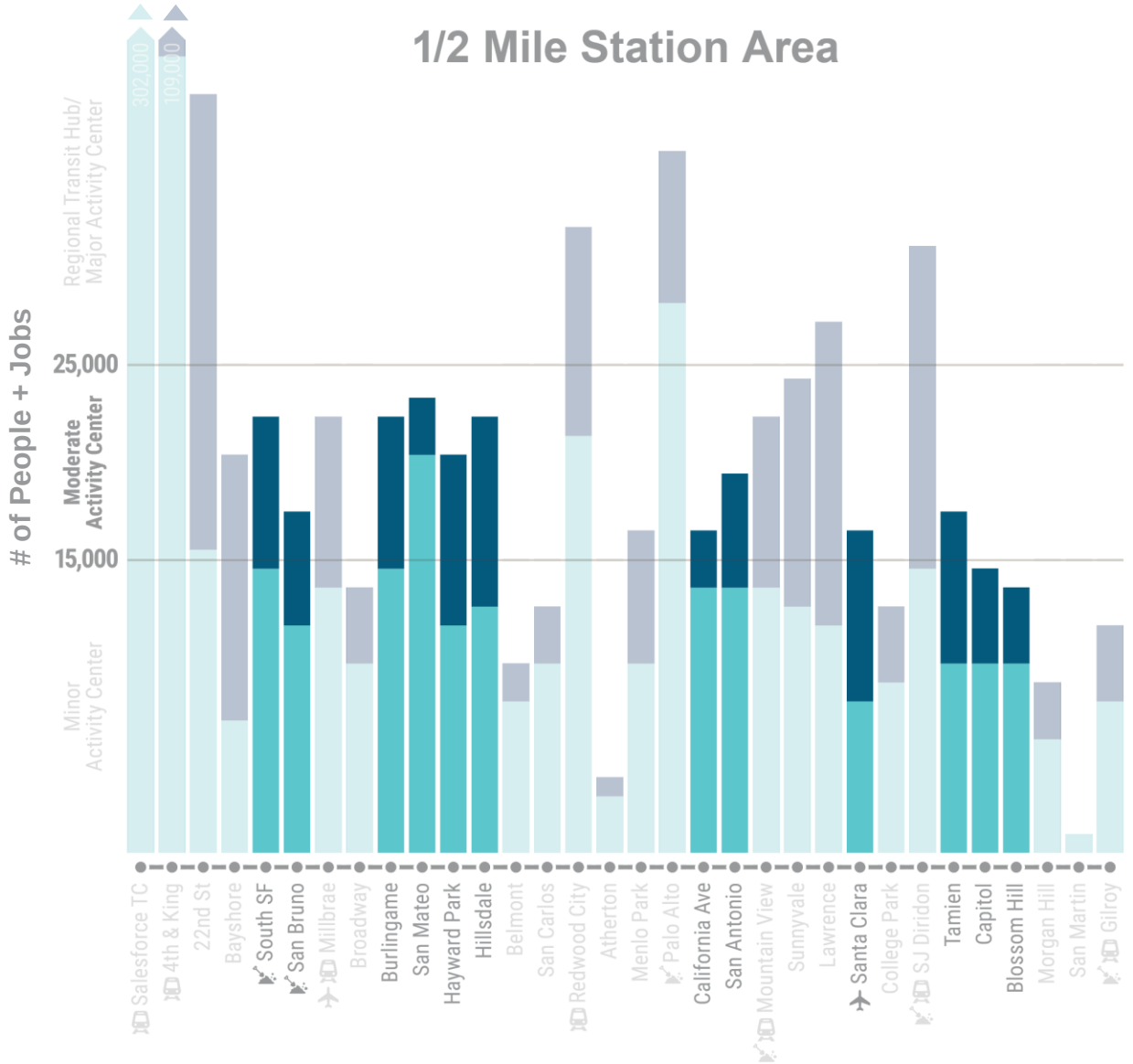
Indicates a station where substantial growth beyond Plan Bay Area forecasts is anticipated, but not yet approved

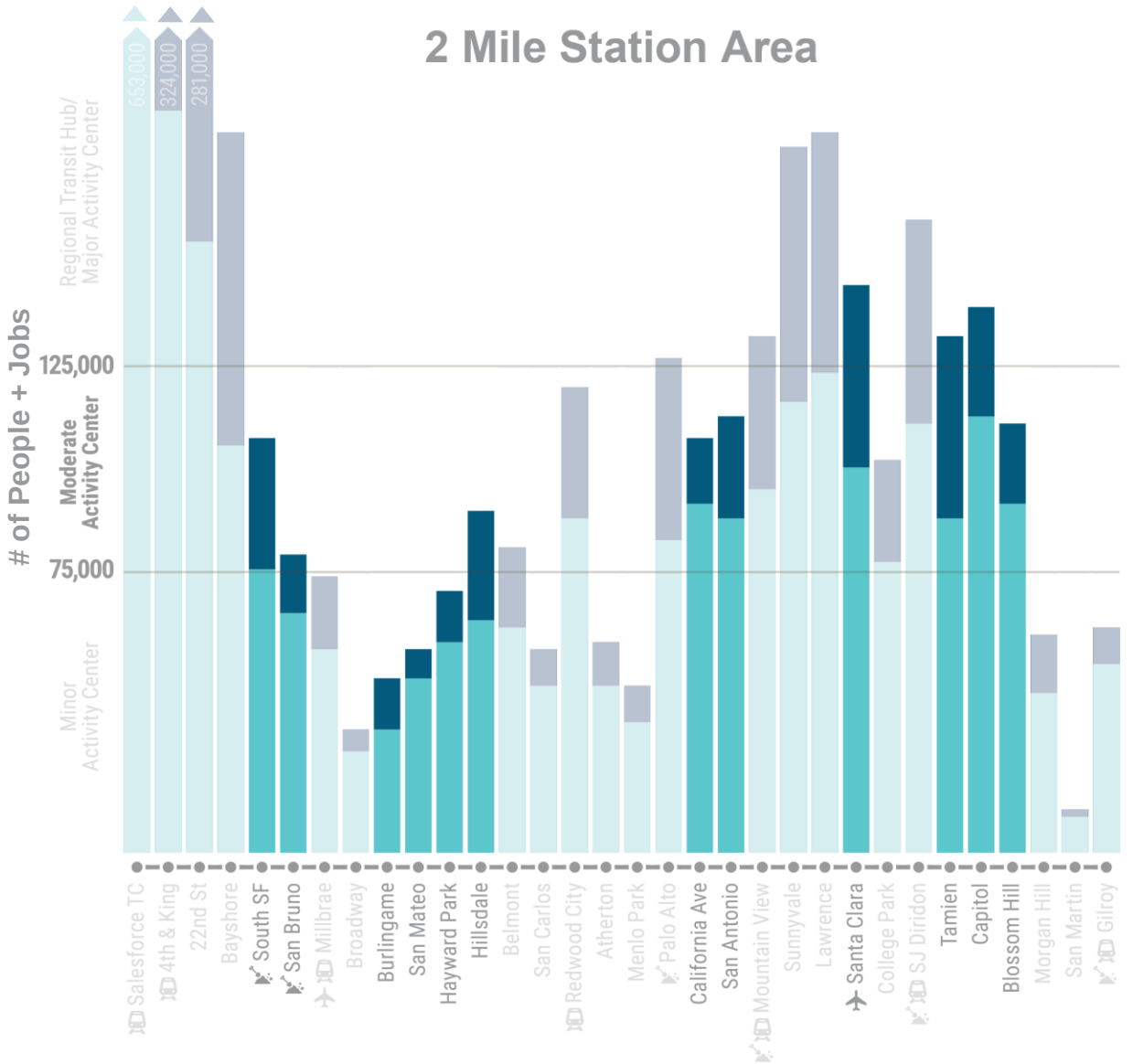
2040 Stations with Higher Demand Potential



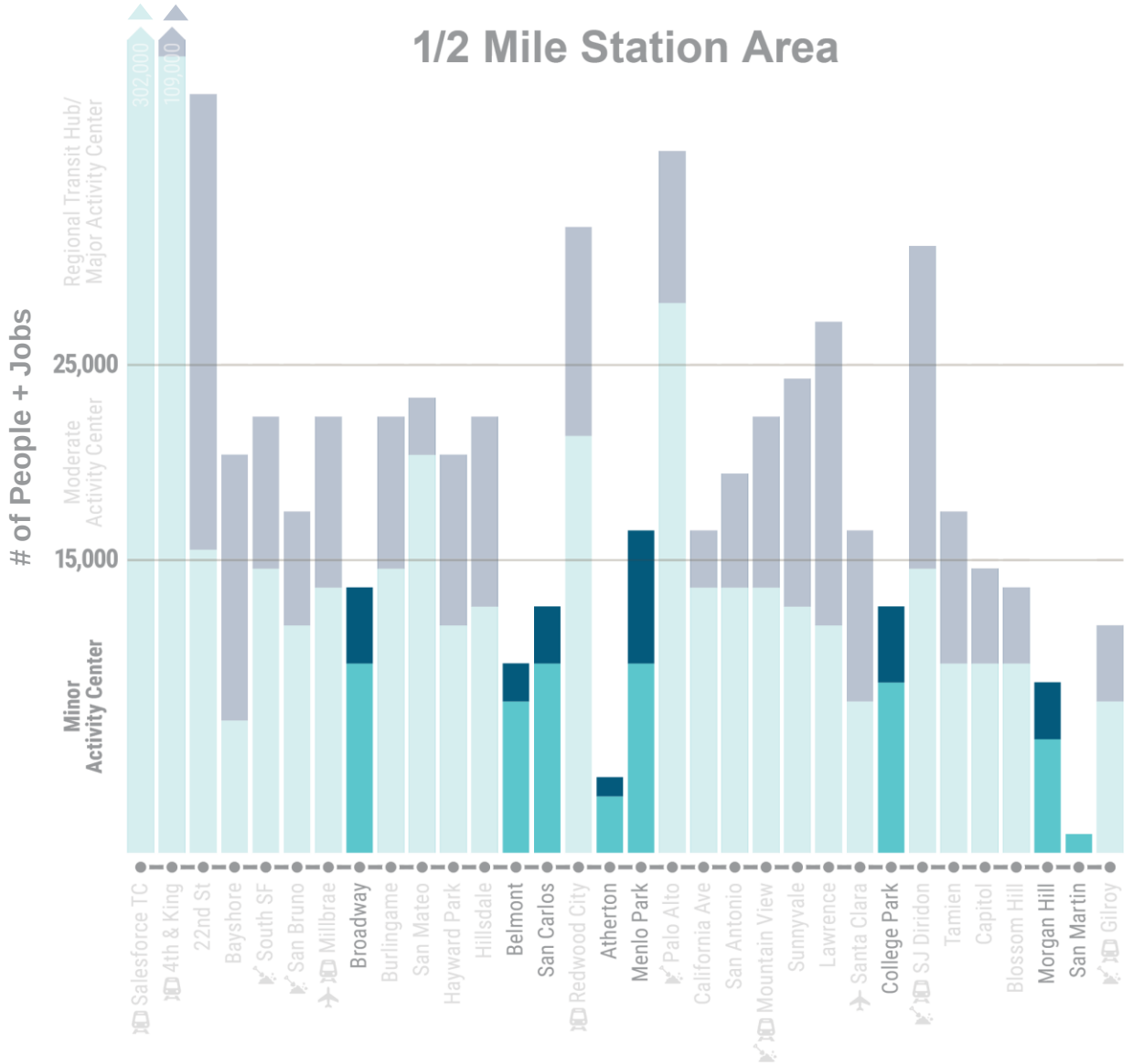


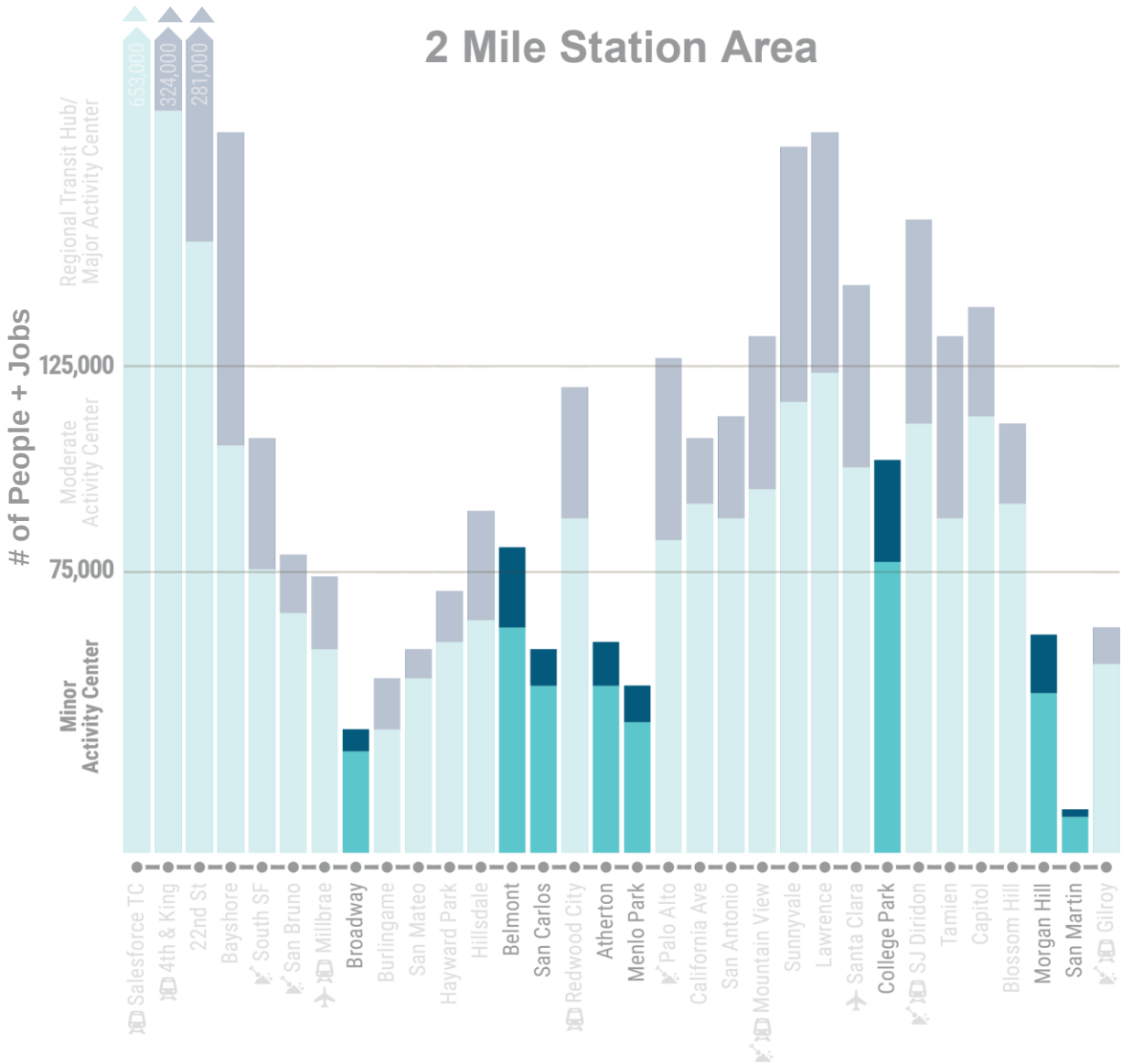
2040 Stations with Moderate Demand Potential





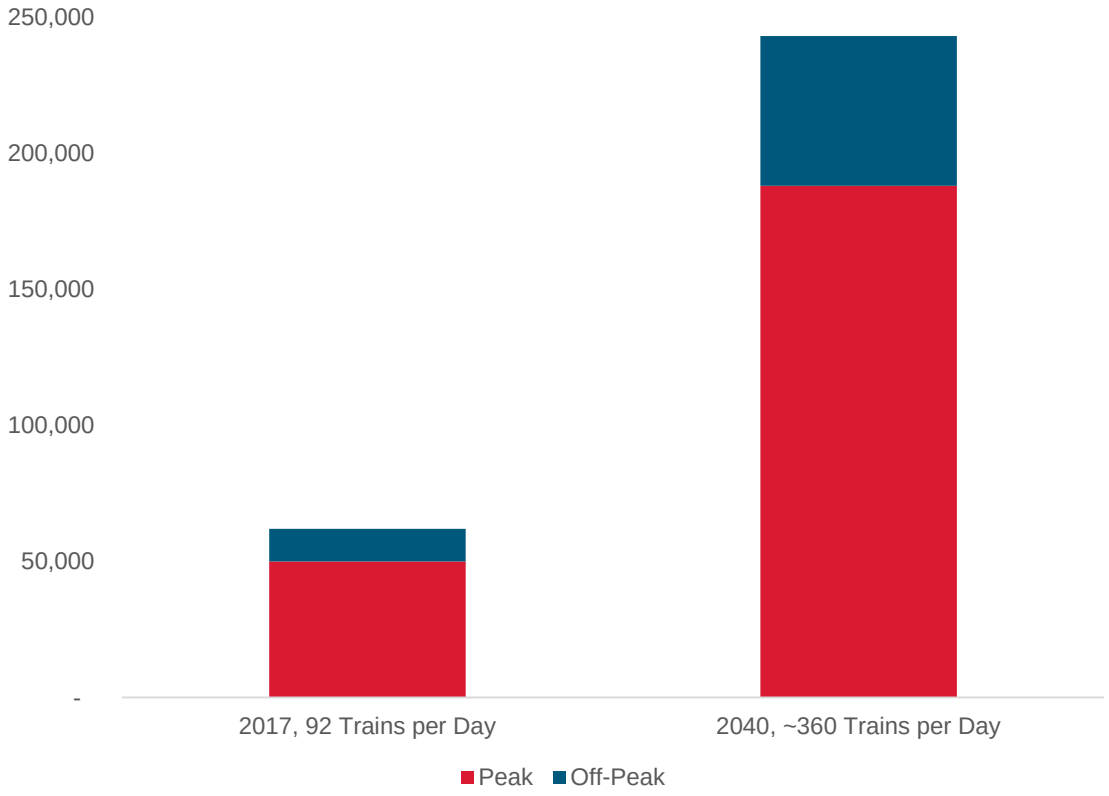
2040 Stations with Lower Demand Potential





Exploring the Potential Long Term Demand for Caltrain Service

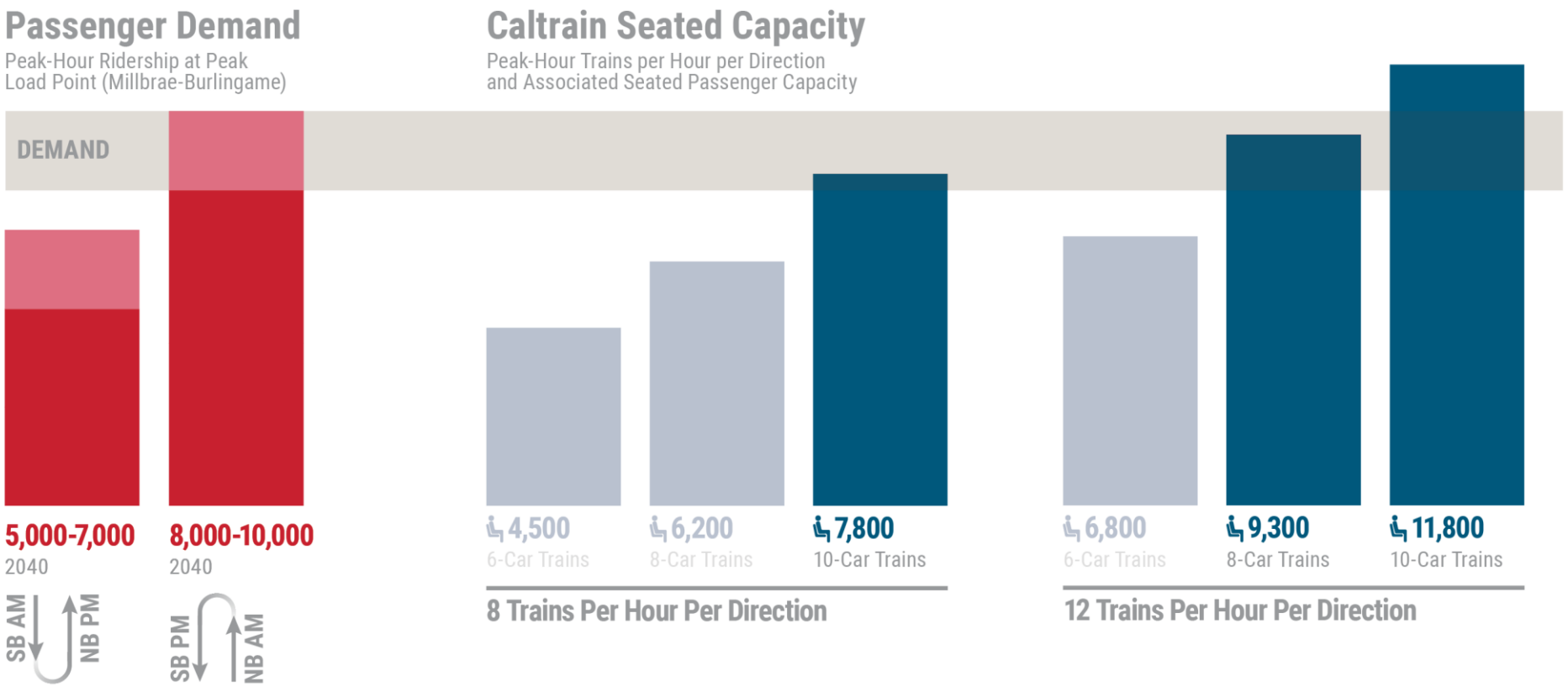
Using Plan Bay Area numbers for projected growth in jobs and housing, an unconstrained model run of high frequency, all-day BART-like service in the Caltrain corridor suggests that by 2040 there could be demand for nearly 250,000 daily trips on the system.



Description	2017: 92 Trains/Day	2040: ~360 Trains/Day
Daily	**62,000**	**243,000**
Peak	50,000	188,000
Off-Peak	12,000	55,000

Throughput Demand vs. Capacity

To comfortably serve this level of demand in 2040, Caltrain would need to operate 8 trains per hour, per direction (TPHPD) with 10 car trains or 12 TPHPD with 8 or 10 car trains



Seated capacity based on Stadler EMU with different door and bike car configurations. Does not include consideration of potential HSR capacity to serve demand

SHARING SESSION

Does the analysis of 2040 demand potential shown ring true for your community and stations?

Do you have any questions about the analysis and “sizing” of potential long term demand?

Service Concept Development

Service Planning Goals

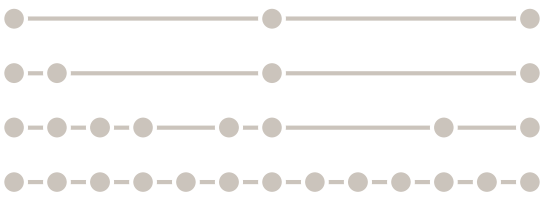
2040 Market Demand

Service Concept Development

Service Concept Evaluation

Planning within Constraints – Tradeoffs and Choices Required

The Caltrain corridor is not a blank slate. Service can be improved and expanded but tradeoffs and choices are required. There is no perfect answer.



1. Service Differentiation

How can local, regional and high speed services be blended and balanced on the corridor to best serve multiple markets?

2. Peak Service Volume

How much growth in peak train traffic volume can the corridor support and what kinds of growth may be required to meet long term demand?

3. Service Investments

What types of investments into operations, systems and infrastructure will be required to achieve the desired types and volumes of service?

Important Notes and Caveats

The Service concepts shown are intended to illustrate tradeoffs and to help guide the selection of promising options for further study and refinement .

Service at Broadway, Atherton & College Park Stations

- Service to College Park is assumed to continue in the future as it does today (on a limited/ exception basis)
- Restoring weekday service to Broadway and Atherton generally requires redistributing service/stops from adjoining stations
- Restored service to Broadway is shown in the following concepts
- Restored service to Atherton is still under study

At Grade Crossings

- All of the concepts shown relate to a potential “high growth” scenario
- We understand that the volumes of train traffic shown will impact at-grade crossings
- Grade separations and improvements to at-grade crossings will be discussed and accounted for in the plan

Overtakes

- Caltrain understands that expansion of rail infrastructure is an extraordinarily sensitive issue for corridor communities
- The concepts shown deliberately analyze a range of infrastructure levels to illustrate trade-offs relative to service outcomes
- Overtakes are shown both at stations (“standing”) and along longer track segments (“running”)

Service Context

Caltrain's existing service is complex and highly customized across the peak period, including express, zone, and skip stop service.

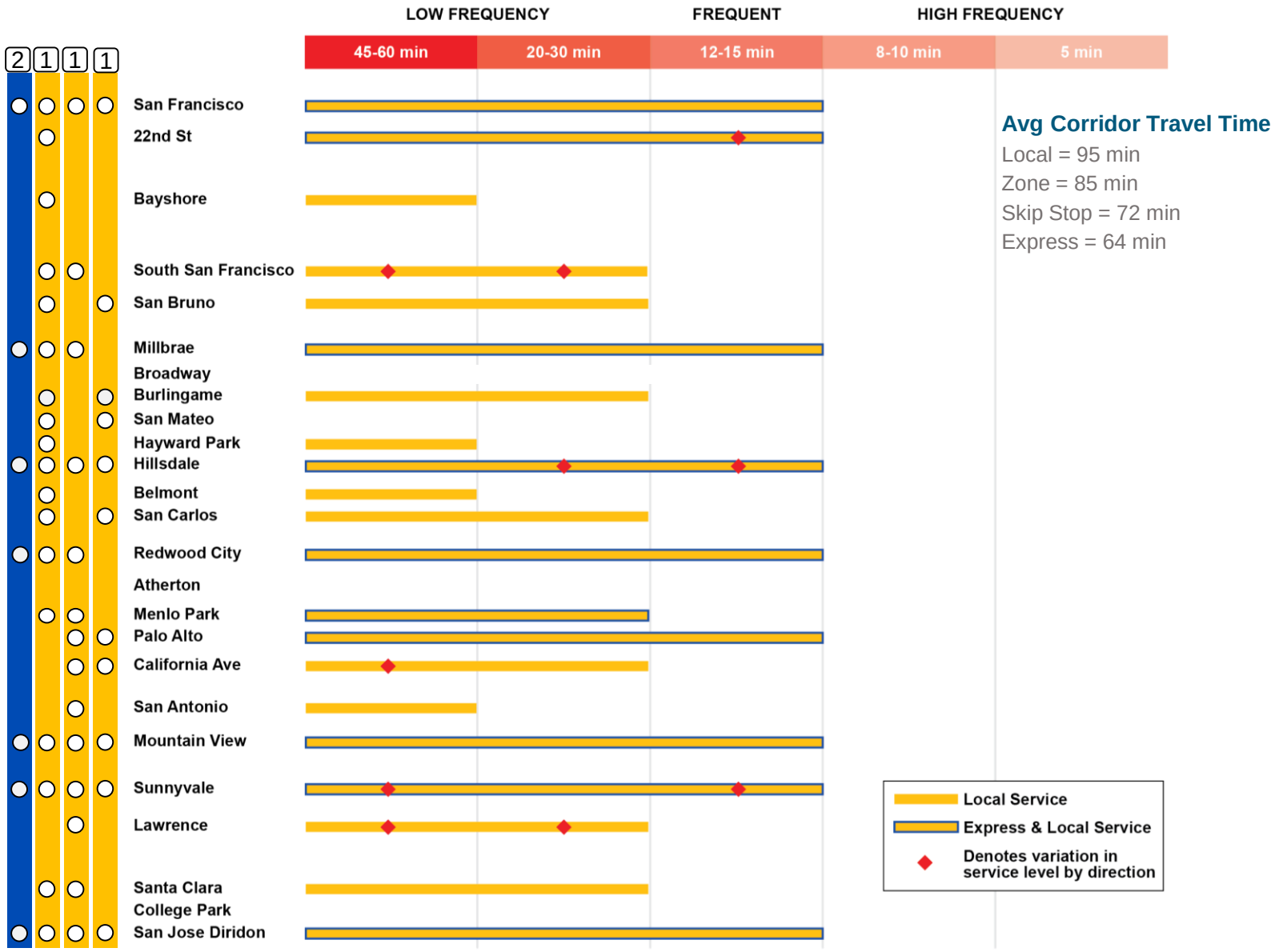
The diagram to the right shows a "simplified" representation of typical peak hour northbound, weekday service.

The bars on the far right represent the average number of stops per direction each station receives. Today, northbound and southbound service is not symmetrical meaning that some stations receive significantly more stops per hour in either the north- or southbound direction

Today, 7 of 25 Caltrain stations receive 4 or more TPHPD during the peak period. On average, stations are served by about 2 TPHPD.

Illustrative Stopping Pattern

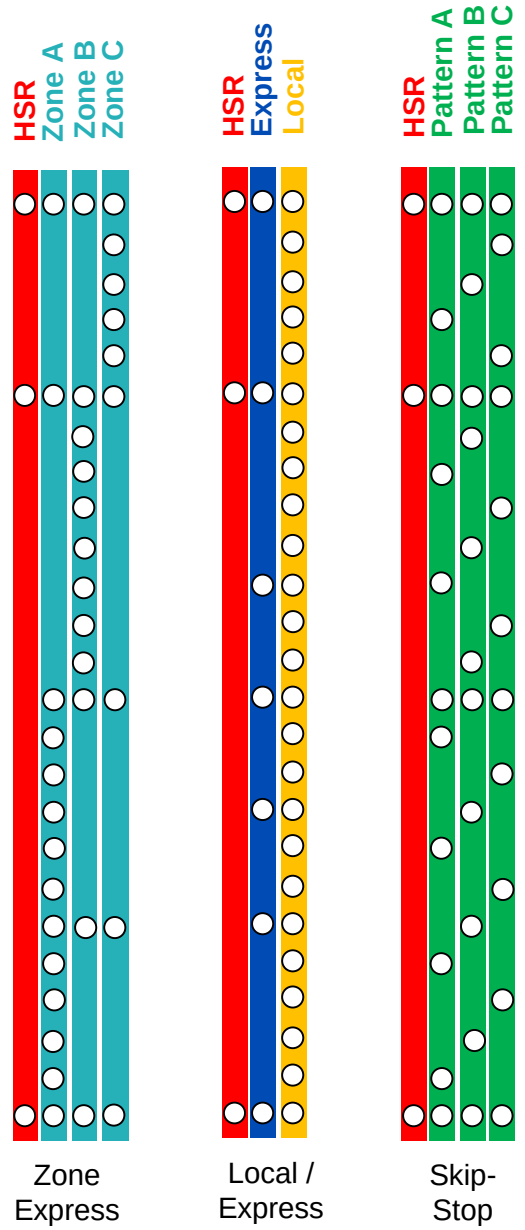
(NB AM/SB PM service pattern shown; service varies in SB AM/NB PM pattern)



Service Approaches & Peak Hour Concepts

The service planning work began by initially considering three different “approaches” or styles of service that could be used on the corridor in 2040

Illustrative peak hour service concepts were then developed using each of the three different approaches

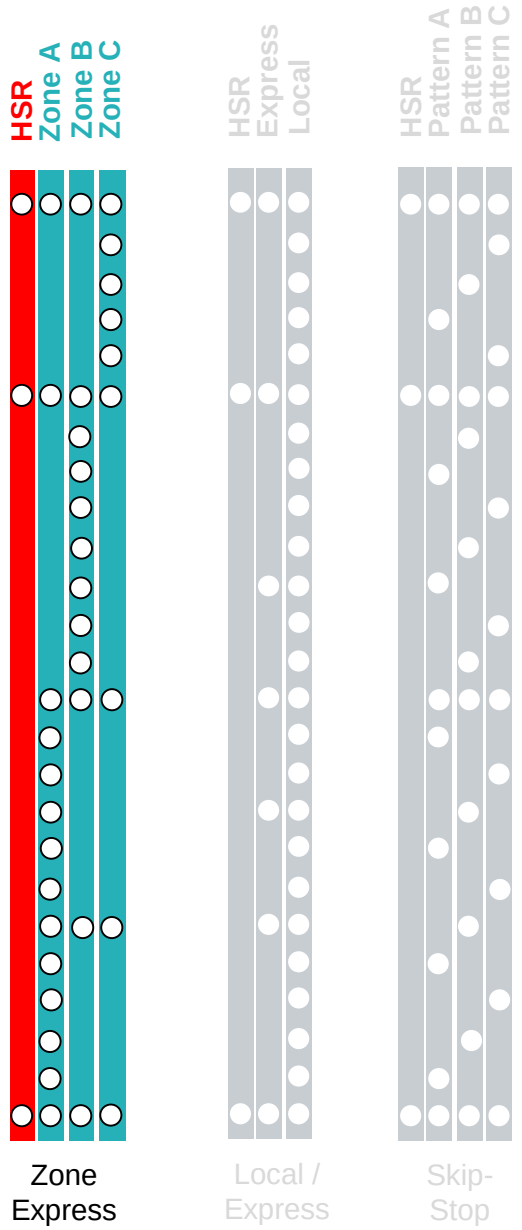


Zone Express

Description:
Local service within a zone, then express service to major markets

Typical Applications:
Commuter rail lines with a single major employment center as destination

Pros	Cons
• Provides semi-express trips to major terminal from all markets • Ability to effectively match available seats to market demand by adjusting size of zone	• Lacks good internal connectivity, transfer required to get from zone to zone • Requires multiple trains to serve all markets. • Operational complexity results in more difficult transition to off peak and contingency plans



Zone Express: 12 Trains per Hour

Illustrative Stopping Pattern

(Some variation in service levels and stopping pattern possible)

Features

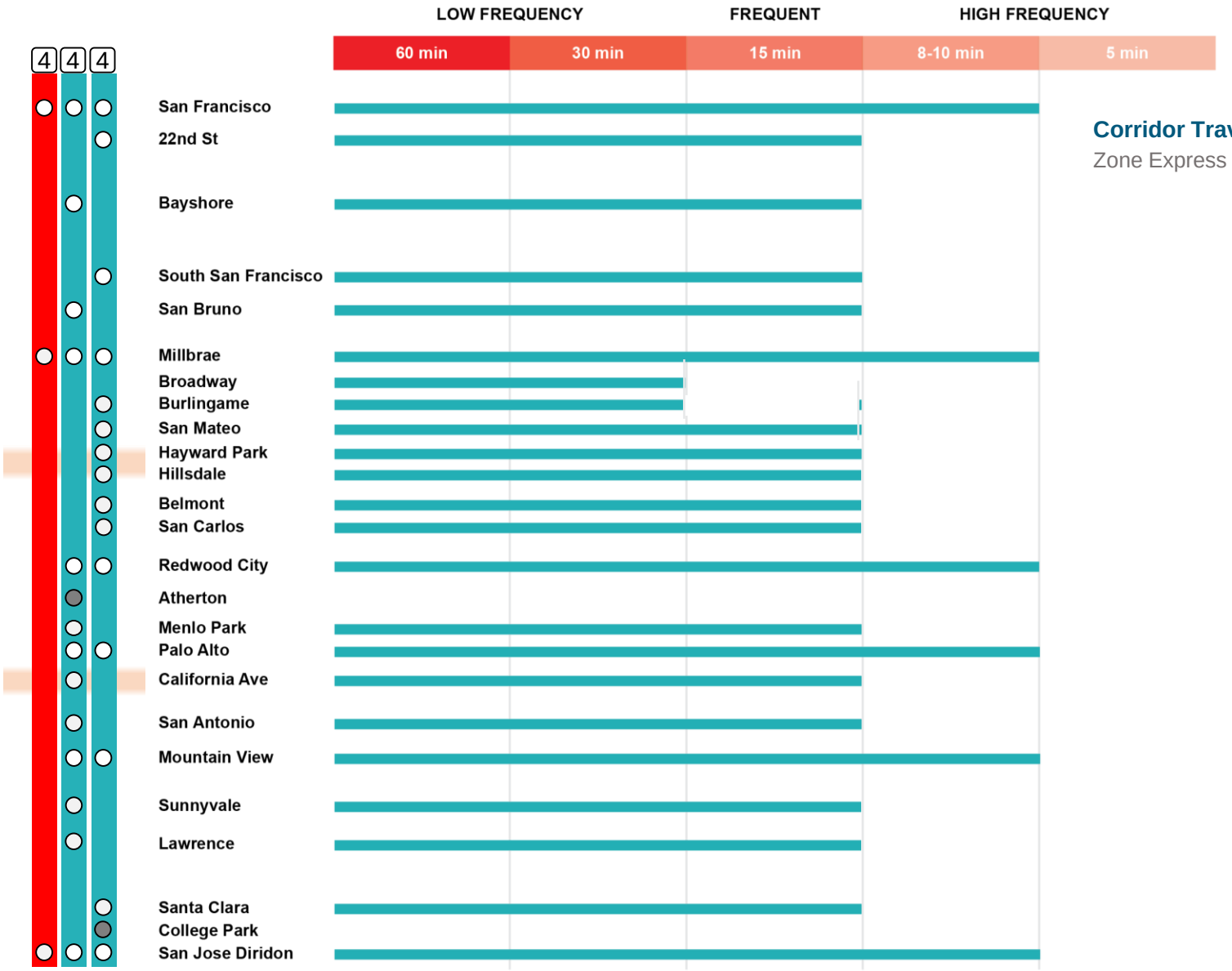
- Provides 15-minute service to all stations except Broadway/Burlingame with two semi express zone patterns
- Major activity centers receive 8 TPH
- Direct service from all markets to major activity centers, but transfer required between minor stations in different zones

Passing Track Needs

- Requires 2 new miles of 4-track passing track between Hayward Park to Hillsdale and a 4-track station in northern Santa Clara county (shown: California Ave)

Options with Service Structure

- Each pattern can only stop at 2 of the 4 stations north of Millbrae
- Middle-zone train needs to stop at two stations south of California Ave
- Flexible station-based overtake location in northern Santa Clara County



Corridor Travel Time

Zone Express = 67 min

Zone Express

Conceptual
4-track segment or station

Zone Express: 16 Trains per Hour

Features

- Provides 15-minute service to all stations except Broadway/Burlingame with three semi express zone patterns (with major activity centers receiving 12 TPH)
- Direct service from all markets to major activity centers, but transfer required between minor stations in different zones

Passing Track Needs

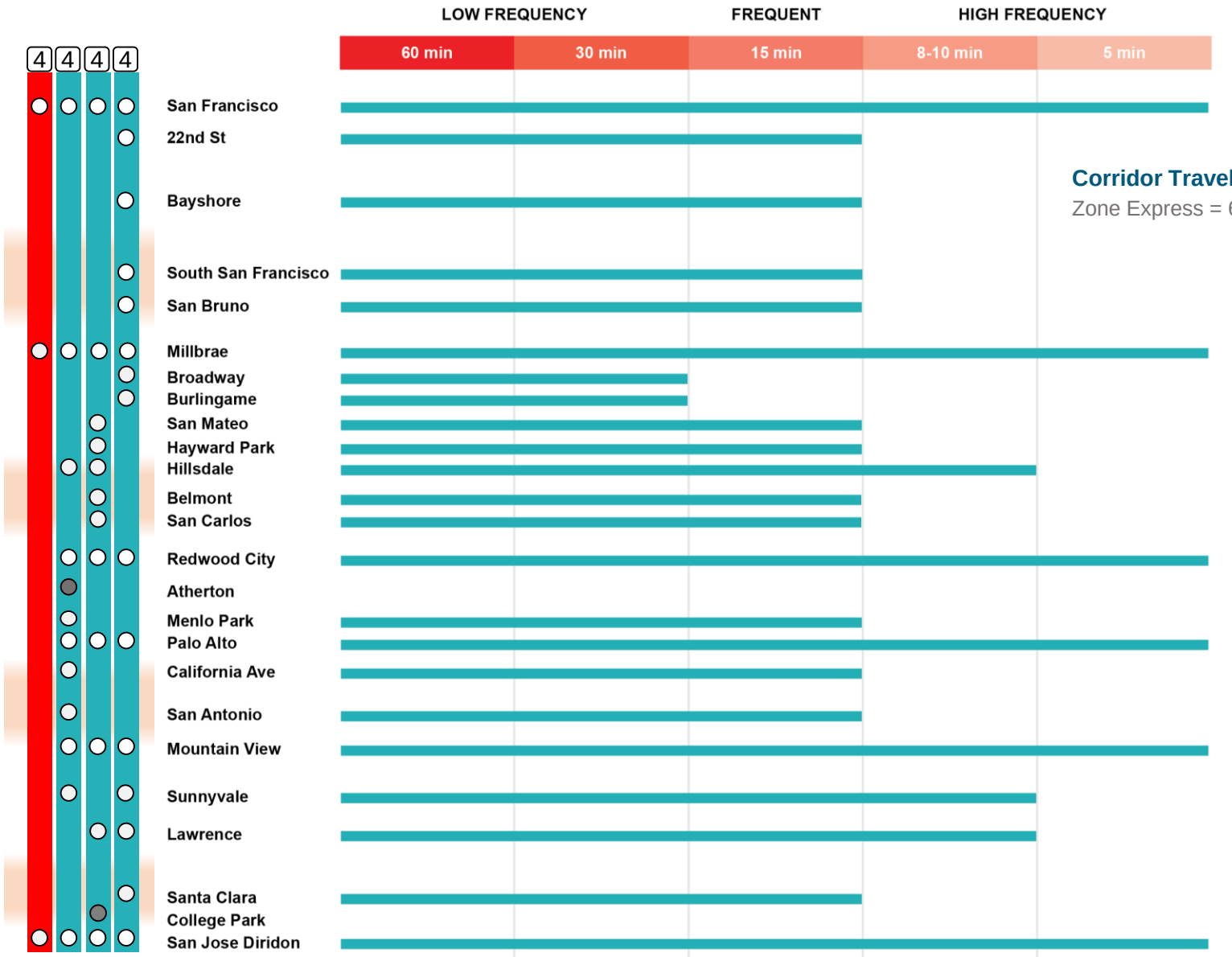
- 15 miles of new 4-track segment required: south of Bayshore to San Bruno, mid-Peninsula (shown: Hillsdale to San Carlos), northern Santa Clara County (shown: California Avenue to north of Mountain View), and south of Lawrence to Santa Clara

Options with Service Structure

- Flexible location for 3 mile passing track in mid-Peninsula and 5 mile passing track in northern Santa Clara County

Illustrative Stopping Pattern

(Some variation in service levels and stopping pattern possible)



Corridor Travel Time

Zone Express = 63 min

Zone Express

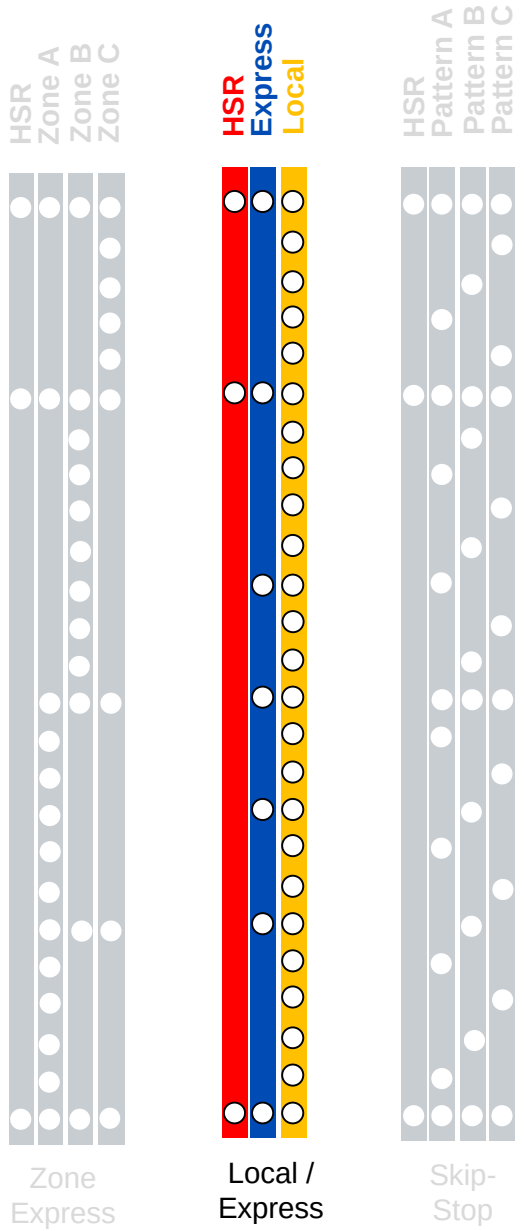
Conceptual 4-track segment or station

Local/Express

Description:
Local service with express line between major markets

Typical Applications:
High volume transit lines and polycentric corridors

Pros	Cons
• Serves all markets with single train providing simple connectivity between all stations. • Regional express train provides faster direct trips between major markets • Consistent and high level of frequencies at all station types • "Legibility" of service plan for customer • Easy transition to off peak	• Differential in run times between local and express makes application challenging on two track corridor • Inclusion of multiple overtakes could result in extended run times for local service • Transfers may be required to achieve fast trip times between local markets and terminal stations



Local/Express: 12 Trains

Illustrative Stopping Pattern

(Some variation in service levels and stopping pattern possible)

Features

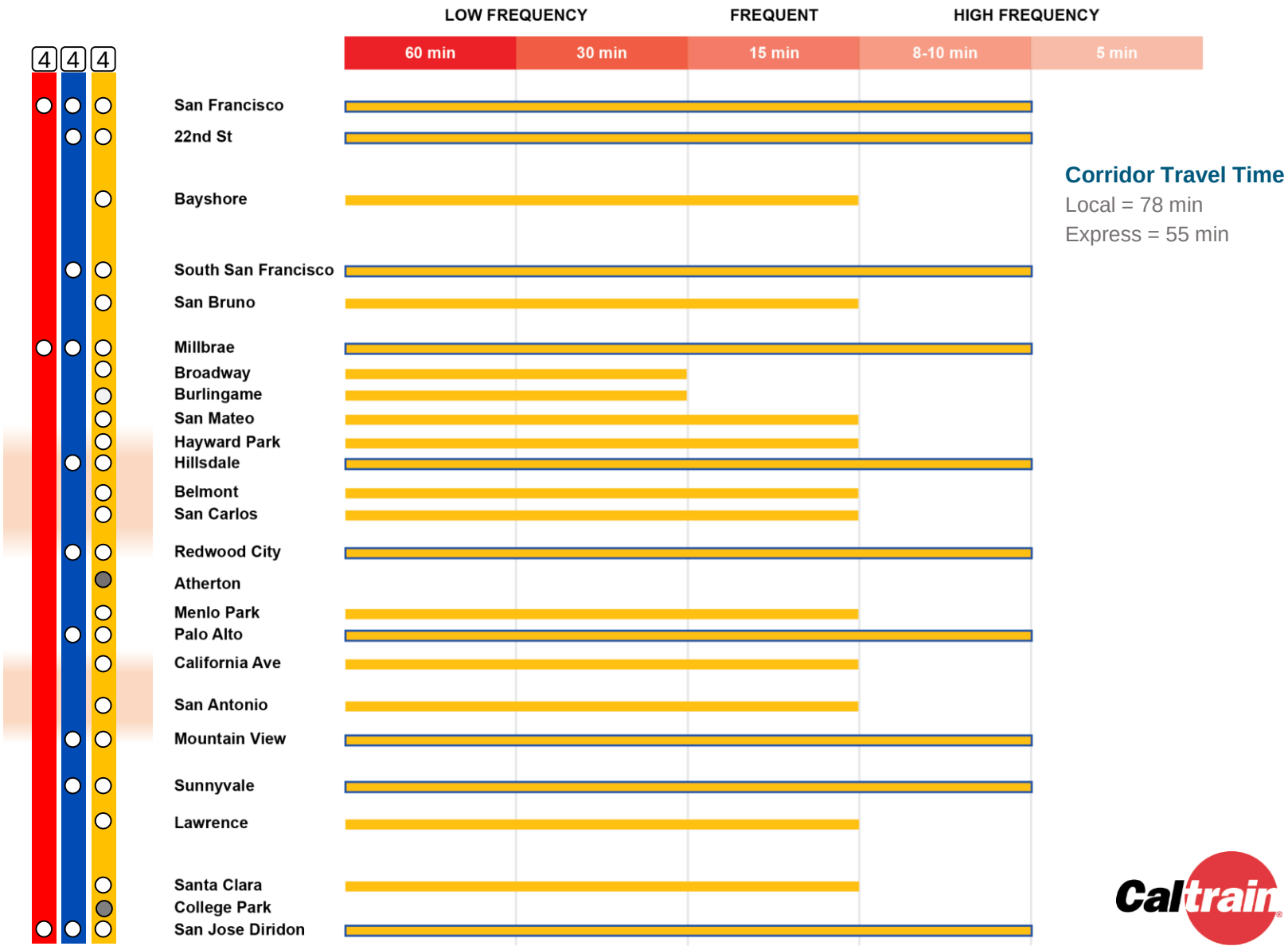
- Regional Express serves all Major Activity Centers at 15-minute headways
- All stations receive local service at 15-minute headways except Broadway and Burlingame
- Timed local-express transfer at Redwood City

Passing Track Needs

- 10 miles of new 4-track passing tracks: Hayward Park to Redwood City and northern Santa Clara County (shown: California Avenue to north of Mountain View)

Options with Service Structure

- One stop on Express Train can be flexible between Millbrae and Redwood City
- One or two stops on express south of Palo Alto can be flexible
- Flexible 5 mile passing track location in northern Santa Clara County



Corridor Travel Time

Local = 78 min

Express = 55 min

Local Service

Express & Local Service

Conceptual 4-track segment or station

All service concepts assumed to be bi-directional and symmetrical. Southbound only shown for clarity

Local/Express: 16 Trains

Illustrative Stopping Pattern

(Some variation in service levels and stopping pattern possible)

Features

- Complete local stop service
- Two express lines serving major markets
- All stations receive at least 4 TPH, with many receiving 8 or 12 TPH

Passing Track Needs

- 15 miles of new 4 track passing tracks: South San Francisco to Millbrae, Hayward Park to Redwood City, and northern Santa Clara County (shown: California Avenue to north of Mountain View)

Options with Service Structure

- Express B pattern must run non-stop from 22nd St to San Mateo, but has some flexibility in number and location of stops along mid-Peninsula
- Flexible 5 mile passing track location in northern Santa Clara County
- Passing tracks between Lawrence and San Jose may enhance reliability and save 1-2 min of travel time for HSR and Caltrain (for passengers traveling south of Diridon)

Corridor Travel Time

Local = 78 min

Express = 59 min

Local Service

Express & Local Service

Conceptual 4-track segment or station

Local/Express: 12 Trains- Reduced Passing Tracks

Illustrative Stopping Pattern

(Some variation in service levels and stopping pattern possible)

Features

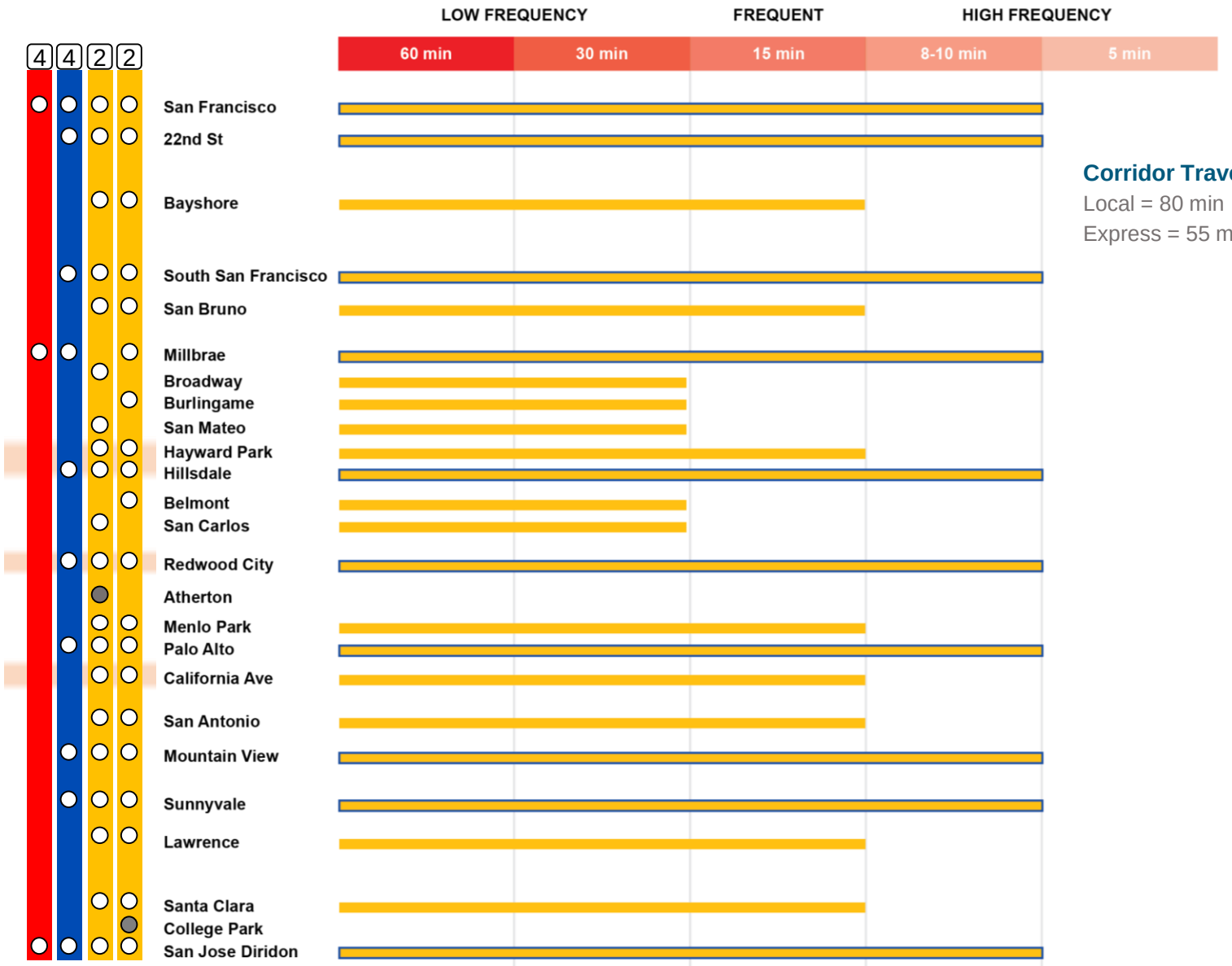
- Regional Express serves all Major Activity Centers at 15-minute headways
- Most stations served by local service at 15 minute headways
- Closely-spaced mid-Peninsula stations served at 30 minute headways (Broadway, Burlingame, San Mateo, Belmont, and San Carlos)
- Timed local-express transfer at Redwood City

Passing Track Needs

- 3 miles of new 4-track passing tracks: Hayward Park to Hillsdale, at Redwood City, and a 4-track station in northern Santa Clara county (shown: California Ave)

Options with Service Structure

- Each local pattern can only stop once Millbrae to Hillsdale
- Each local pattern can only stop once Hillsdale to Redwood City
- Flexible station overtake location in northern Santa Clara County



Corridor Travel Time

Local = 80 min

Express = 55 min

Local Service

Express & Local Service

Conceptual 4-track segment or station

DRAFT

Local/Express: 16 Trains- Reduced Passing Tracks

Illustrative Stopping Pattern

(Some variation in service levels and stopping pattern possible)

Features

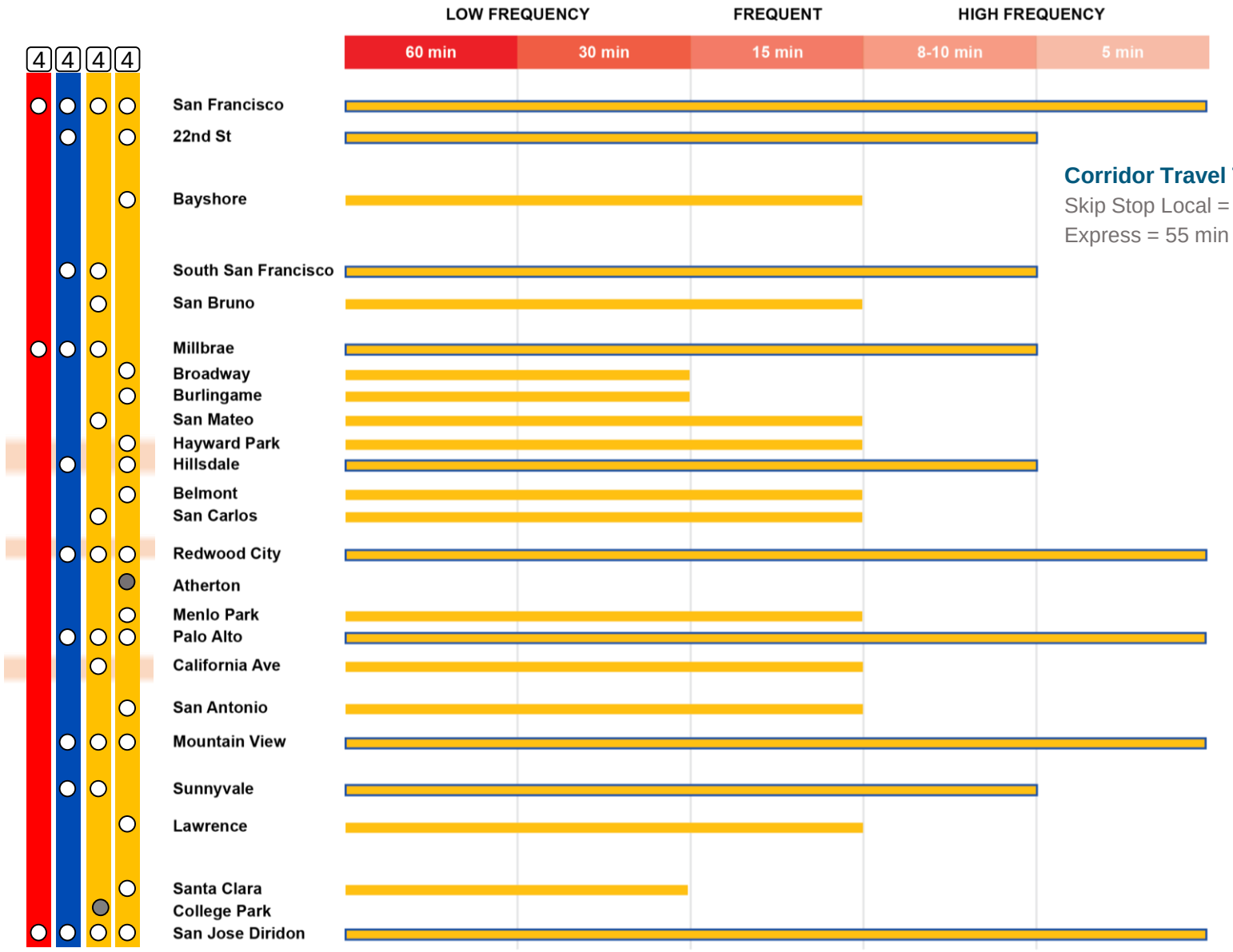
- Local service becomes skip-stop service
- All stations receive 15 minute headways with major stations receiving 8 or 12 trans per hour
- Many station pairs require transfer at regional hubs
- ~50% of station OD pairs between 22nd Street and San Carlos are not served at all

Passing Track Needs

- 3 miles of new 4-track passing tracks: Hayward Park to Hillsdale, at Redwood City, and at a 4-track station in northern Santa Clara county (shown: California Ave)

Options with Service Structure

- Generally need each pattern to stop at every other station
- Pattern overtaken by express must stop at Hayward Park & Hillsdale; other pattern cannot stop at these stations
- Flexible station overtake location in northern Santa Clara County



Corridor Travel Time

Skip Stop Local = 67 min

Express = 55 min

Local Service

Express & Local Service

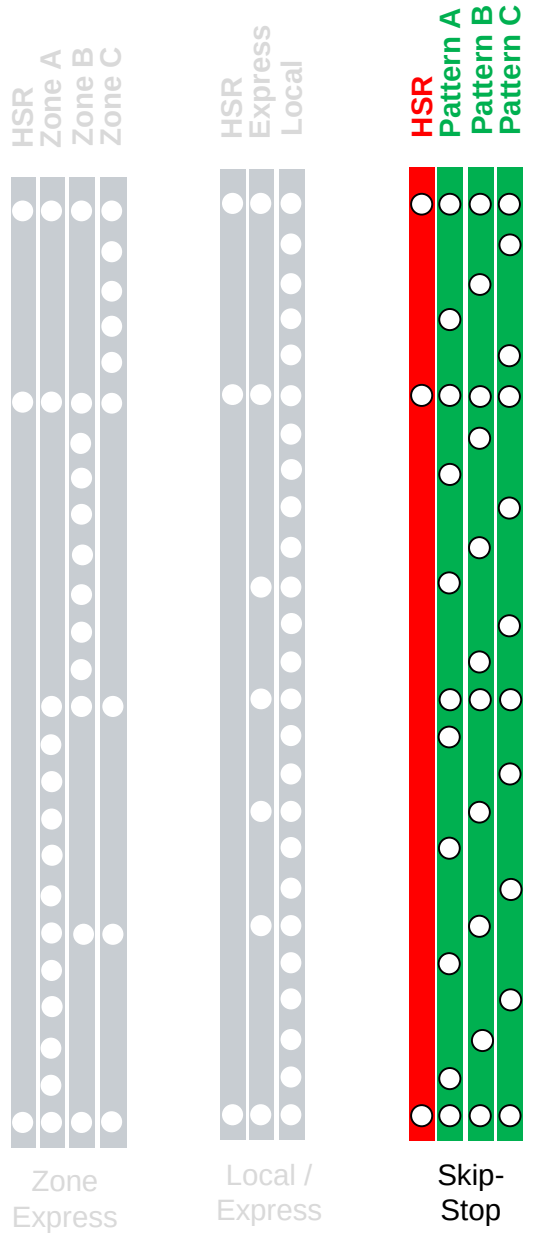
Conceptual 4-track segment or station

Skip Stop

Description:
Multiple lines with limited stopping patterns

Typical Applications:
High-volume transit lines with constrained infrastructure

Pros	Cons
• Faster trip times for local service vs all stop trains. • Fast trip times and high frequencies between major stations • Ability to deliver more total seats (double the trains, same station headways)	• Many local station pairs not served with direct service, transfer required. Some minor pairs not served at all • Service plan may be confusing for non-regular users of the system, and in case of service disruption • Requires multiple trains to serve all markets. • Operational complexity results in more difficult transition to off peak and contingency plans



Skip Stop: 16 Trains per Hour

Features

- Provides 15-minute service to all stations with three skip stop patterns
- Major activity centers receive 8 TPH
- Direct service from all markets to major activity centers, but transfer required between minor stations in different zones

Passing Track Needs

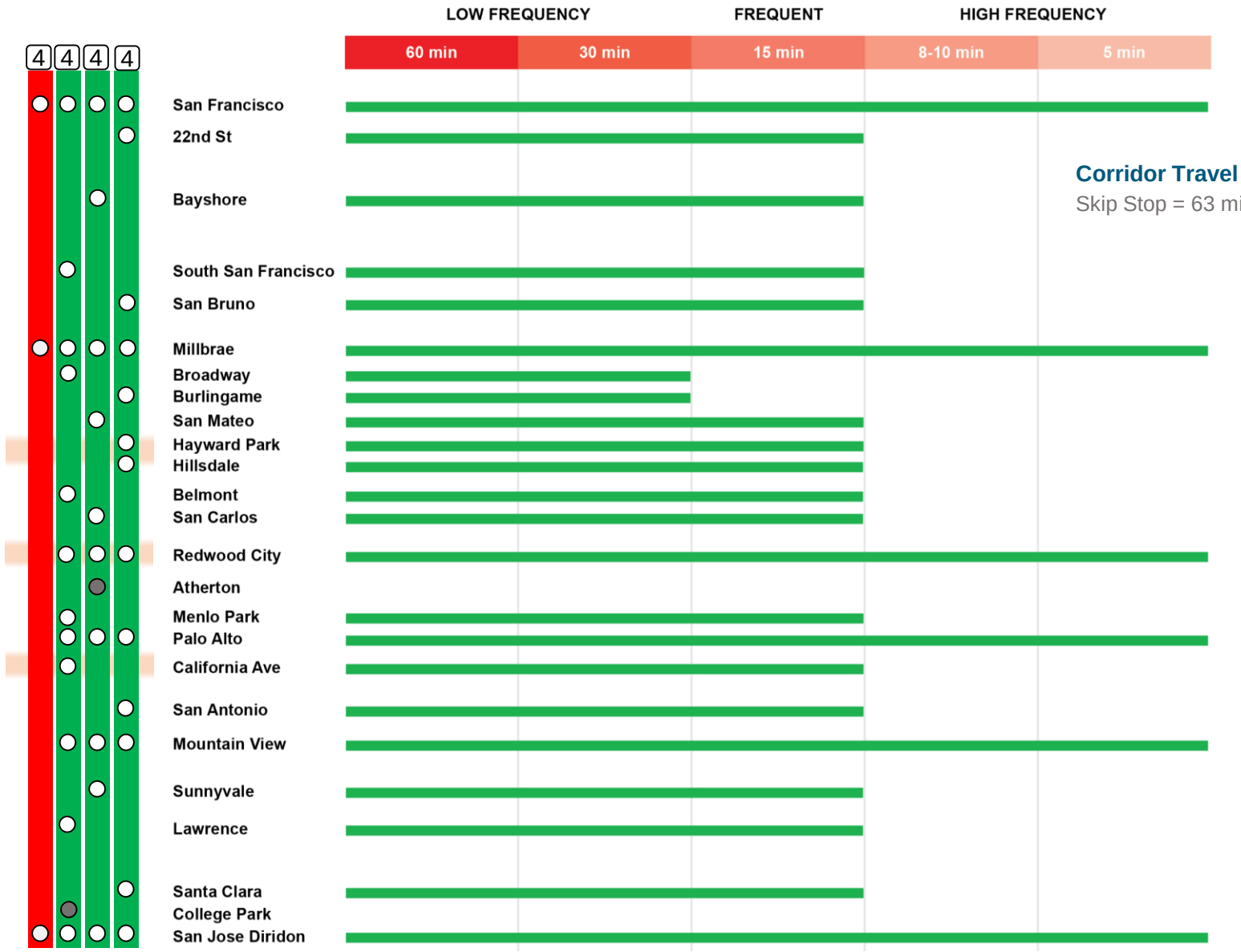
- 3 miles of passing track between Hayward Park and Hillsdale, at Redwood City, and at a station in northern Santa Clara county (shown: California Ave)

Options with Service Structure

- Some flexibility in stopping pattern along each line; however, some origin-destination pairs of nearby stations cannot be served

Illustrative Stopping Pattern

(Some variation in service levels and stopping pattern possible)



Corridor Travel Time

Skip Stop = 63 min

Skip Stop Service

Conceptual 4-track segment or station

Service Concept Evaluation

Service Planning Goals

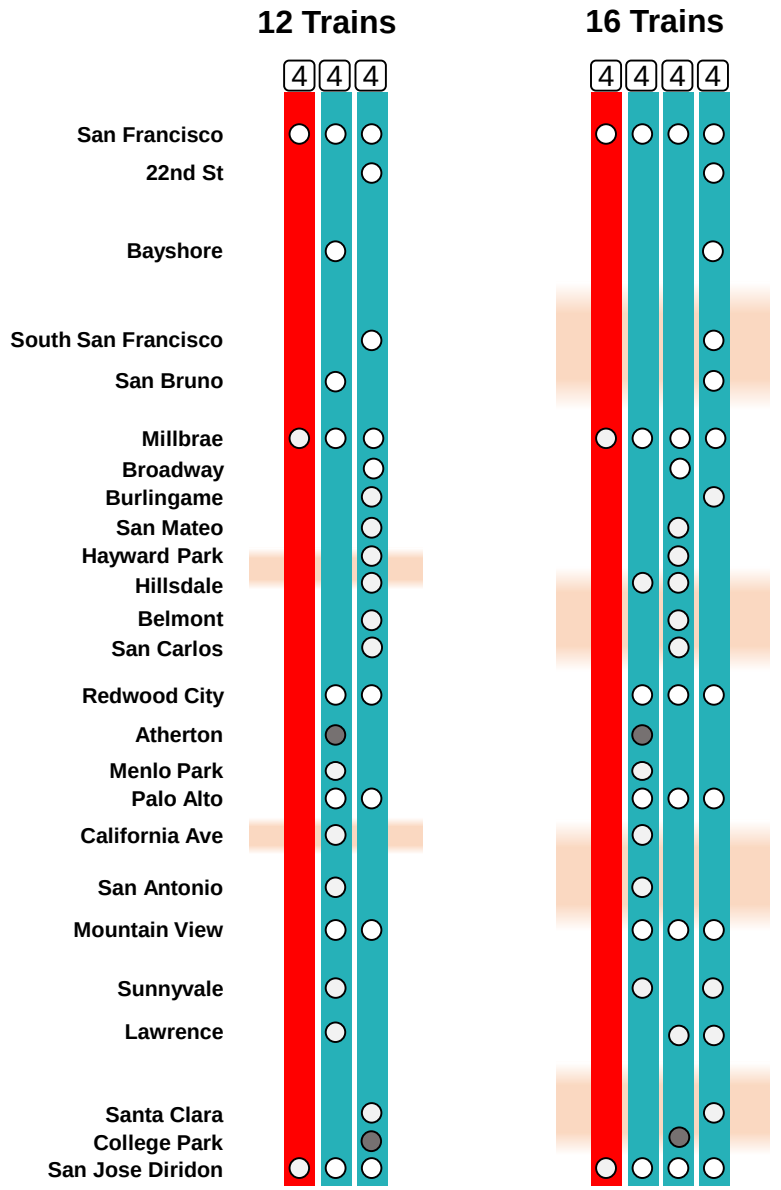
2040 Market Demand

Service Concept Development

Service Concept Evaluation

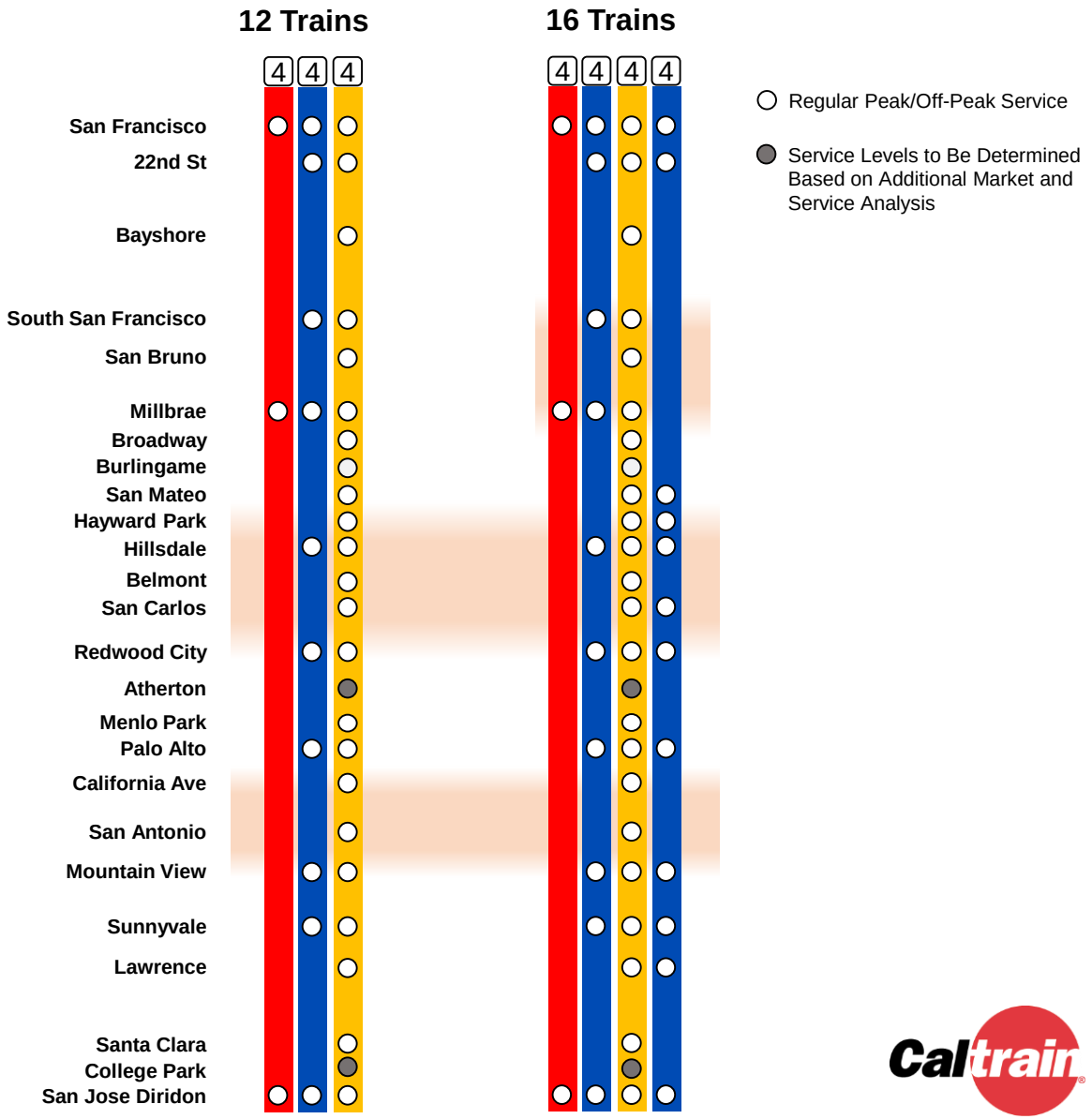
Zone Express Initial Evaluation

- Provides good coverage with all stations receiving at least 4 trains per hour with direct service to all major activity centers
- Transfers required to travel between moderate and minor activity centers in different zones – with good connection at Redwood City
- All stations get semi-express service to major activity centers, but no dedicated express train between major activity centers (~70 minute travel time)
- Some challenges with internal connectivity and legibility
- Substantial passing tracks needed to achieve 16 trains per hour



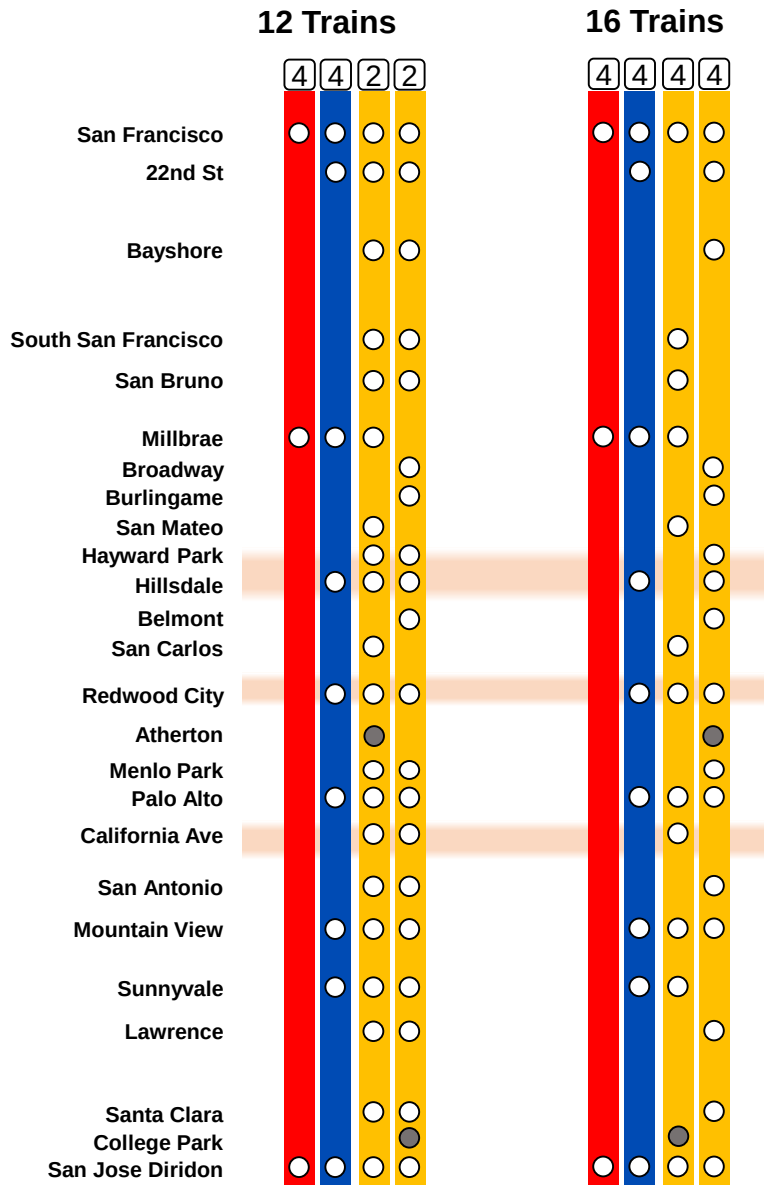
Local/Express Initial Evaluation

- Provides dedicated express train service for major activity centers achieving best trip time for the most passengers
- All local stations except Broadway receive regular 15-minute local service; most stations receive express service under 16 train operation
- Mid-Peninsula hub planned at Redwood City allows for seamless connectivity (cross platform transfer) between local and express
- Significant passing track infrastructure required



Local/Express Initial Evaluation Reduced Passing Tracks

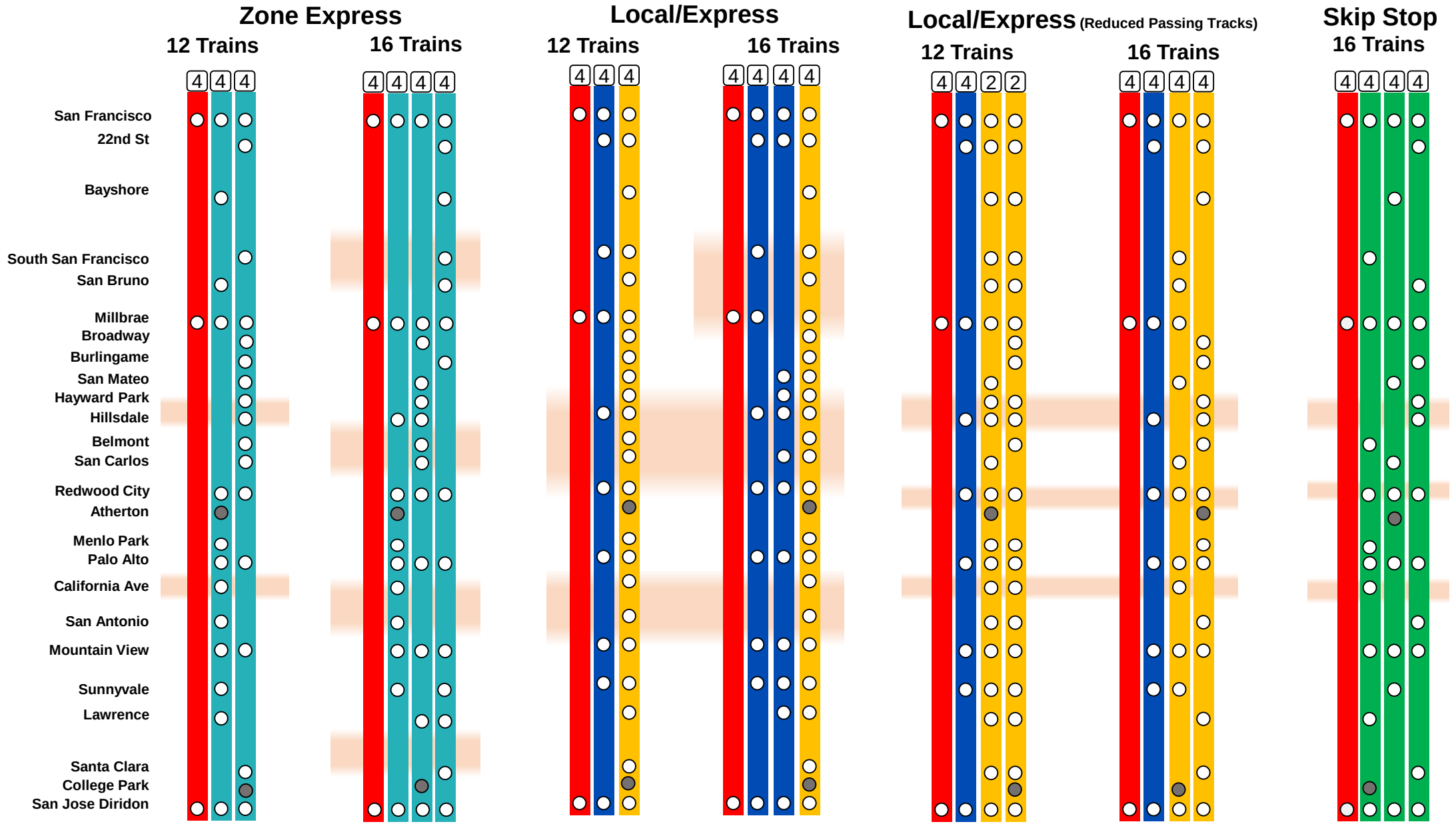
- Provides dedicated express train service for major activity centers achieving best trip time for the most passengers
- Most local stations receive regular 15-minute local service, however, some local stations receive only 30-minute service
- Mid-Peninsula hub planned at Redwood City allows for seamless connectivity (cross platform transfer) between local and express
- 16 train skip stop pattern presents challenges with internal connectivity and legibility: half of OD pairs between 22nd Street and San Carlos are not served at all
- Passing Track length minimized. Flexibility regarding location of station-overtake in north Santa Clara County



Skip Stop Initial Evaluation

- Distributes relatively fast and frequent service across most stations
- Relatively fewer miles of passing tracks needed to achieve 16 trains per hour
- Does not provide differentiated products – end to end travel times are ~70 minutes
- Significant challenges for internal connectivity and legibility – service is difficult to understand and many station origin-destination pairs are not served
- Few comparable examples in operation

Service Comparison



Grade Crossing Impacts and Grade Separation Approaches are Part of the Business Plan:

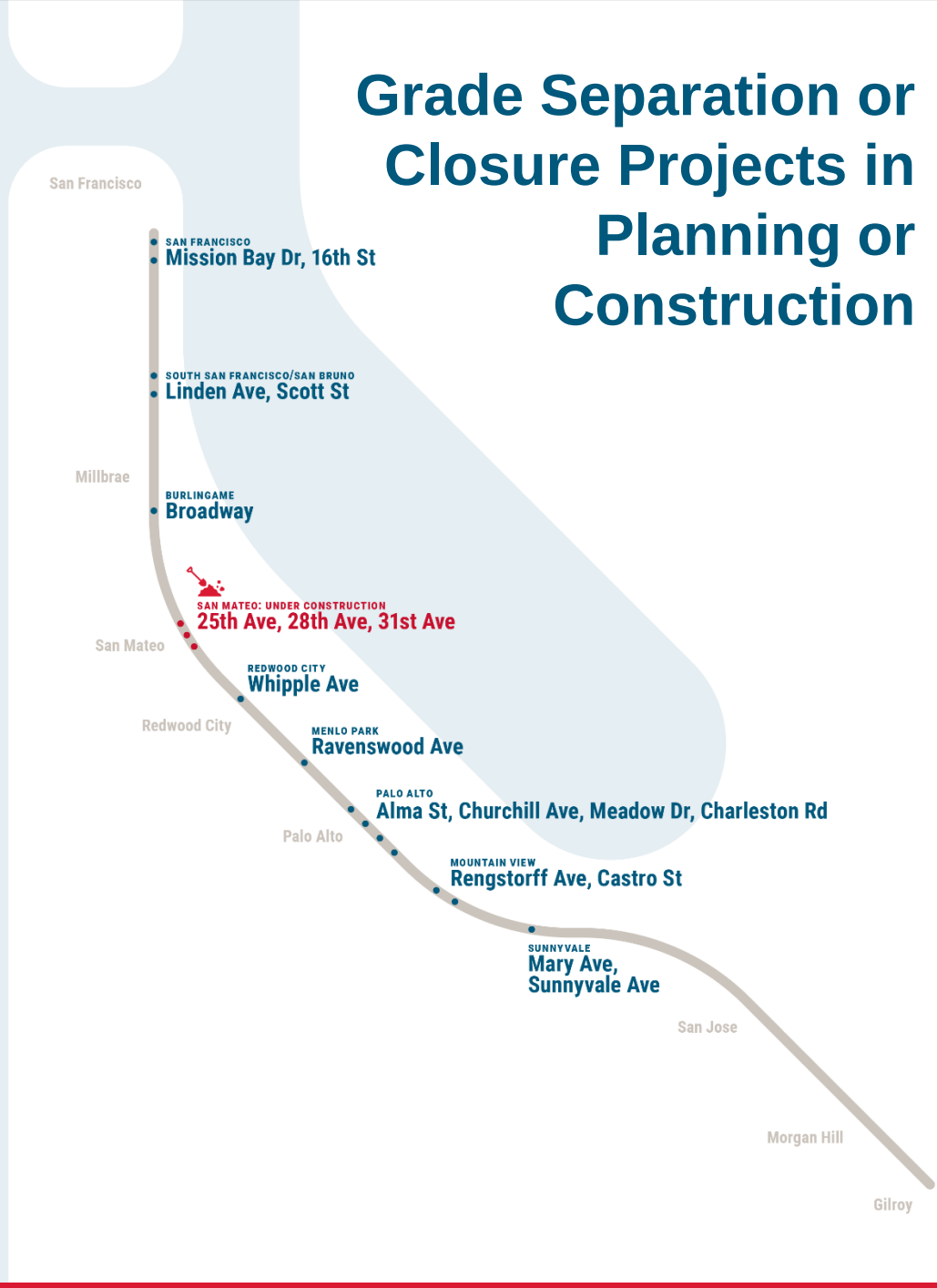
The Plan Will:

- Document how the rail/ community interface could change as the railroad and its surrounding communities grow
- Examine approaches used by national and international peer rail corridors to address at-grade crossings and grade separations
- Include a range of cost estimates for grade separations and treatments in the Business Case for both the Planned and Programed and Higher Growth Scenarios

Outcomes

- Work with the communities to identify next steps for how the corridor, not just individual projects, could be better managed to achieve both community and railroad goals. <u>This includes considering both the appetite and need for a corridor-wide approach to address at-grade crossings.</u>

Grade Separation or Closure Projects in Planning or Construction



SHARING SESSION

Do you particularly like any of the service approaches and concepts shown? Do any of them concern you? Why?

What kinds of analysis or data would help you further understand and evaluate different service concepts?

Next Steps

Process

- Refine and explore service concepts further
- Evaluate and select service concept to represent higher growth scenario within Business Plan
- Terminal analysis (San Francisco and San Jose)
- South San Jose and Gilroy Service
- All day service plans and weekend service
- Continue grade separation / grade crossing discussion through Community Interface Assesment

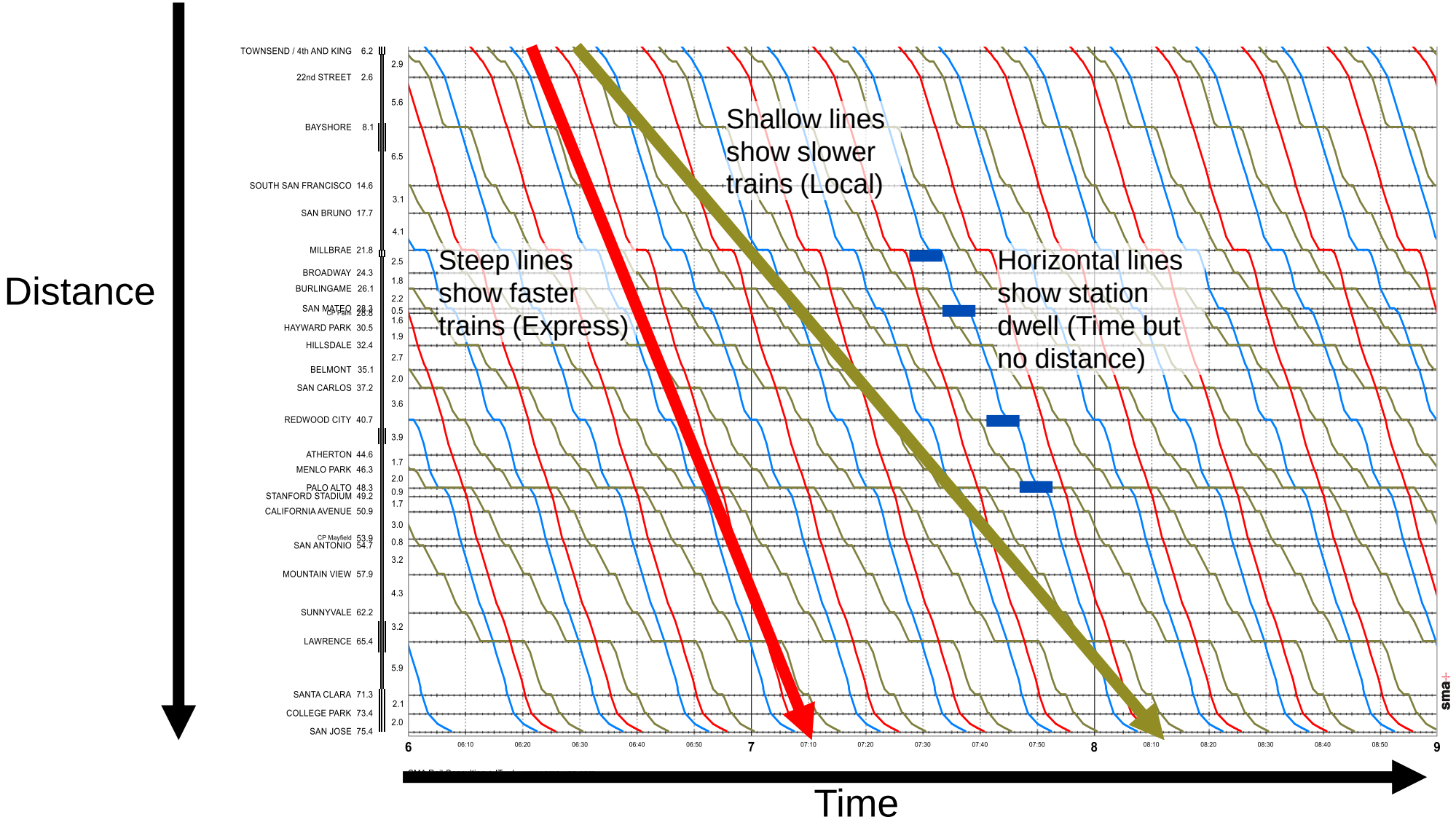
Appendix:

Land Use Details & Service Concept Stringlines

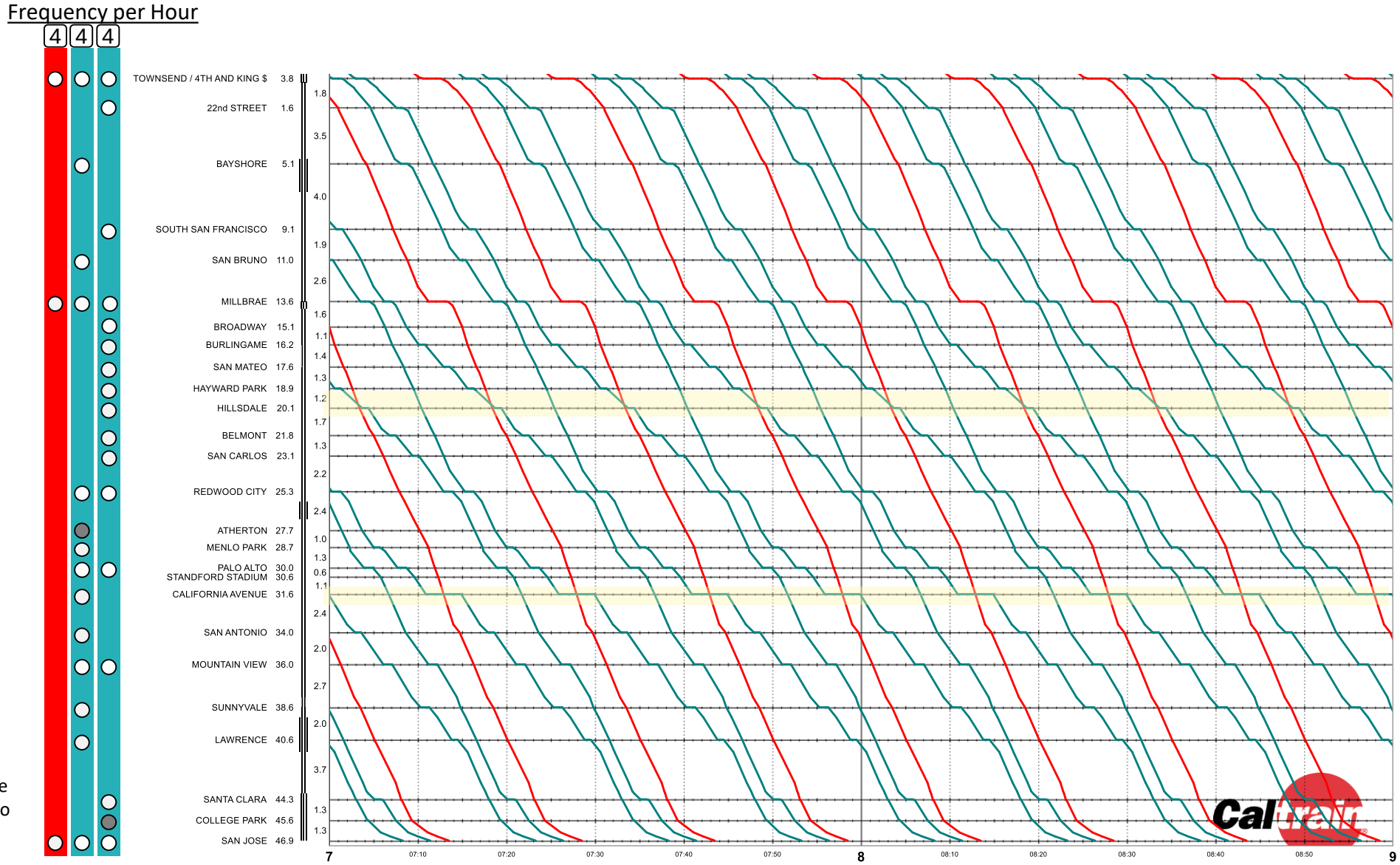
Land Use Planning Along Caltrain Corridor

Station	Major Projects Included in Forecasts (Approved or consistent with Plan Bay Area projections)	Major Projects Noted but Not Quantified in Forecasts (Not yet approved and potentially inconsistent with Plan Bay Area)
4th & King	Central SoMa Plan, Mission Bay & Mission Rock	The Hub Plan
22nd St	Pier 70, Potrero Power Plant, India Basin	
Bayshore	Hunters Point, Candlestick Point, Schlage Lock, Sierra Point buildout, Brisbane Baylands	
South SF	6 MSF of approved East of 101 developments and the Downtown Station Area Specific Plan	Other employment projects in pipeline such as Genentech Master Plan
San Bruno	Transit Corridors Plan	Bayhill Specific Plan (Youtube)
Millbrae	Station Plan	
Burlingame	Burlingame Point (Facebook)	
San Mateo	Downtown Area Plan	General Plan/Downtown Plan Update
Hayward Park	Nearby TOD projects under construction	
Hillsdale	Bay Meadows, Hillsdale Station Plan	
Belmont	General Plan Update, Belmont Village Specific Plan	
San Carlos	Meridian 25, Downtown TOD projects	
Redwood City	Downtown Precise Plan, Stanford Redwood City Campus	Facebook campus expansion in Menlo Park (Caltrain connection via Dumbarton Rail)
Menlo Park	El Camino Real Downtown Specific Plan	
Palo Alto	Stanford Hospital Expansion	Stanford General Use Permit
California Ave	Stanford Research Park redevelopment	
San Antonio	San Antonio Precise Plan	
Mountain View	El Camino Real Precise Plan, North Bayshore Precise Plan, Moffett Field redevelopment	East Whistman Specific Plan, additional Moffett Field redevelopment
Lawrence	Lawrence Station Plan, City Place	
San Jose Diridon		Google Campus, Downtown Strategy 2040
Morgan Hill	Downtown Specific Plan	
Gilroy		Station Plan

How to Read a Stringline

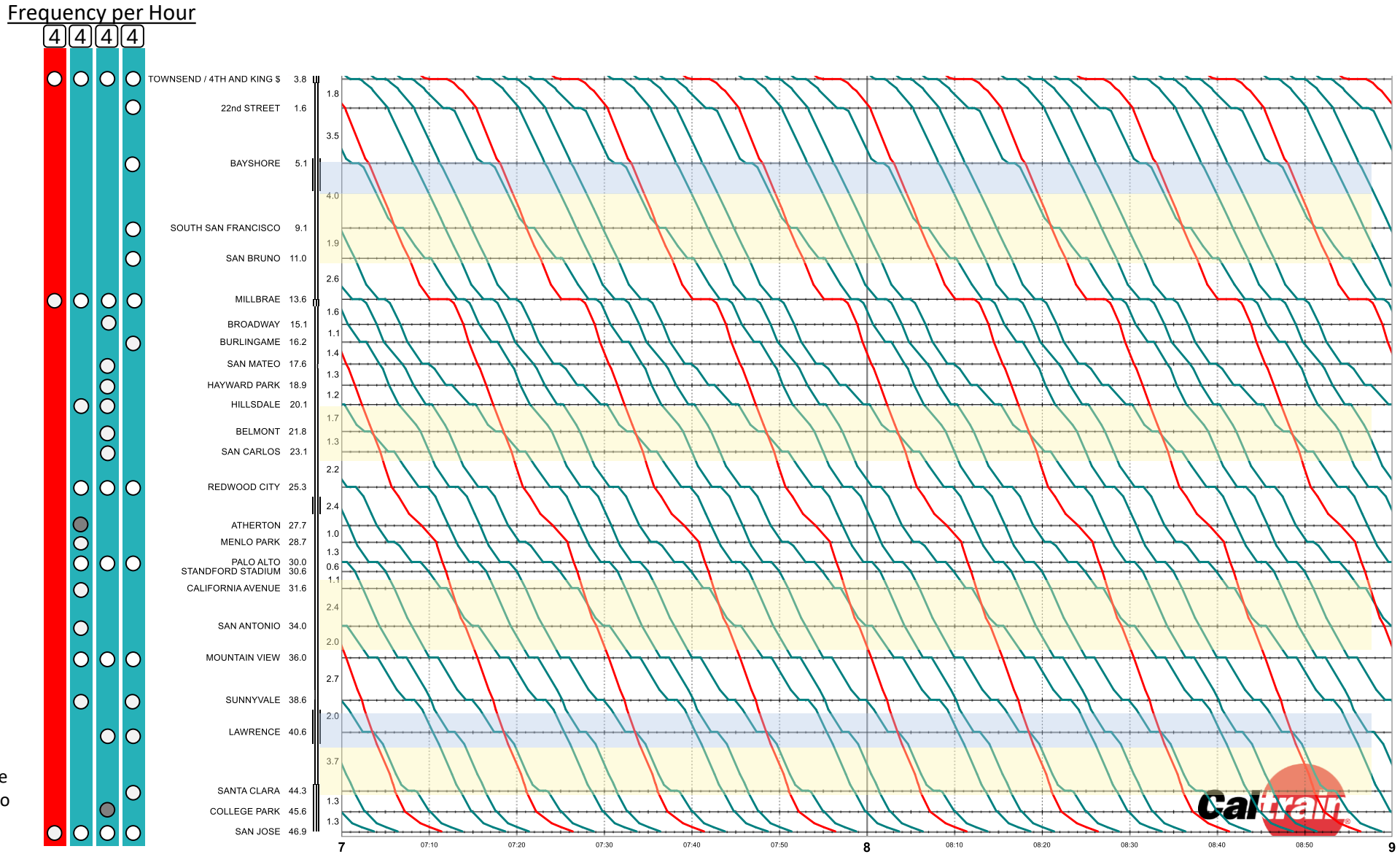


Zone Express: 12 Trains per hour



Stringlines shown in terminal areas of San Francisco and San Jose are placeholder values only and have not been conformed to terminal constraints – service levels and operations within terminal areas subject to further analysis.

Zone Express: 16 Trains per hour



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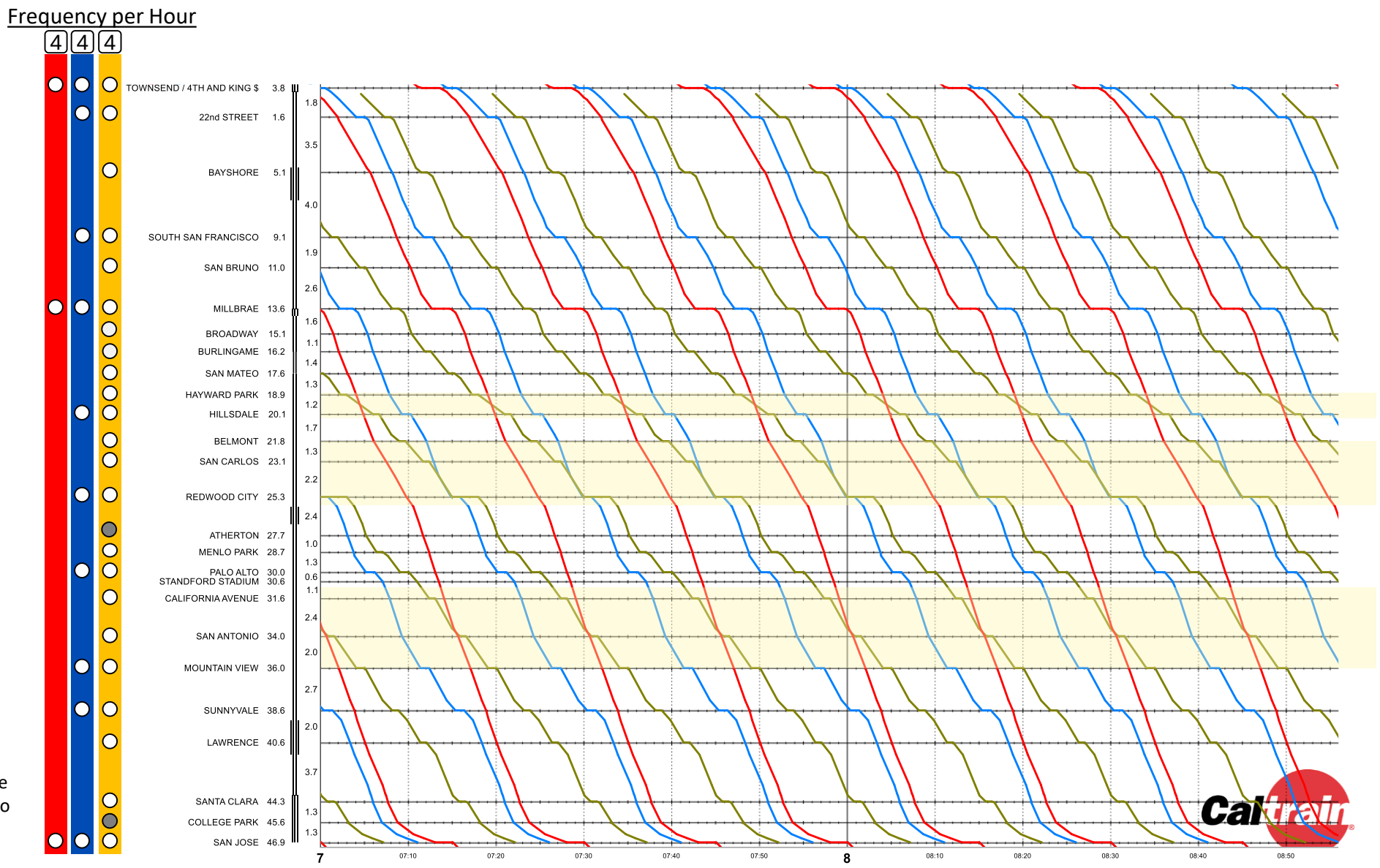
Local/Express: 12 Trains



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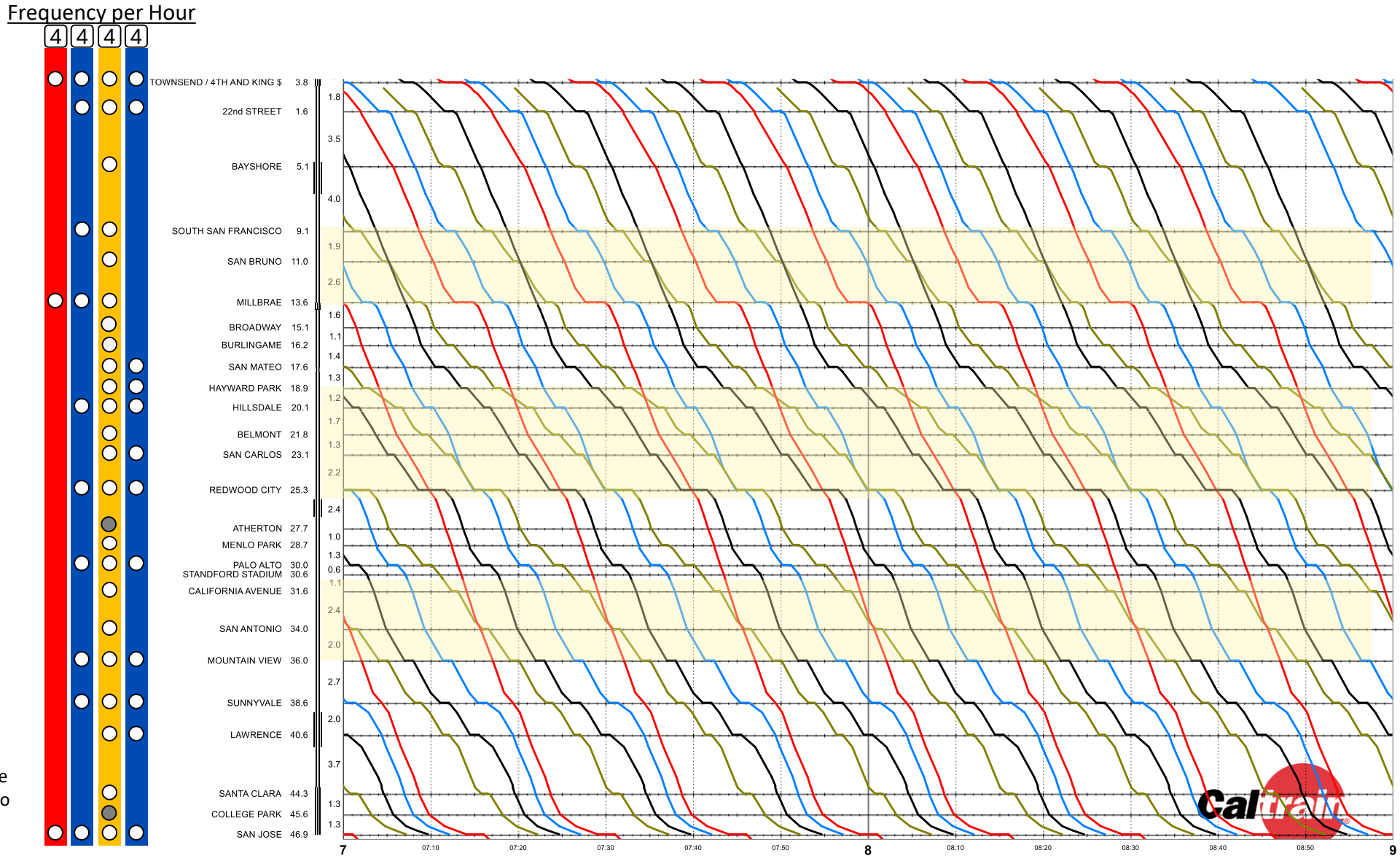
Local/Express: 16 Trains

Local + Dual Express



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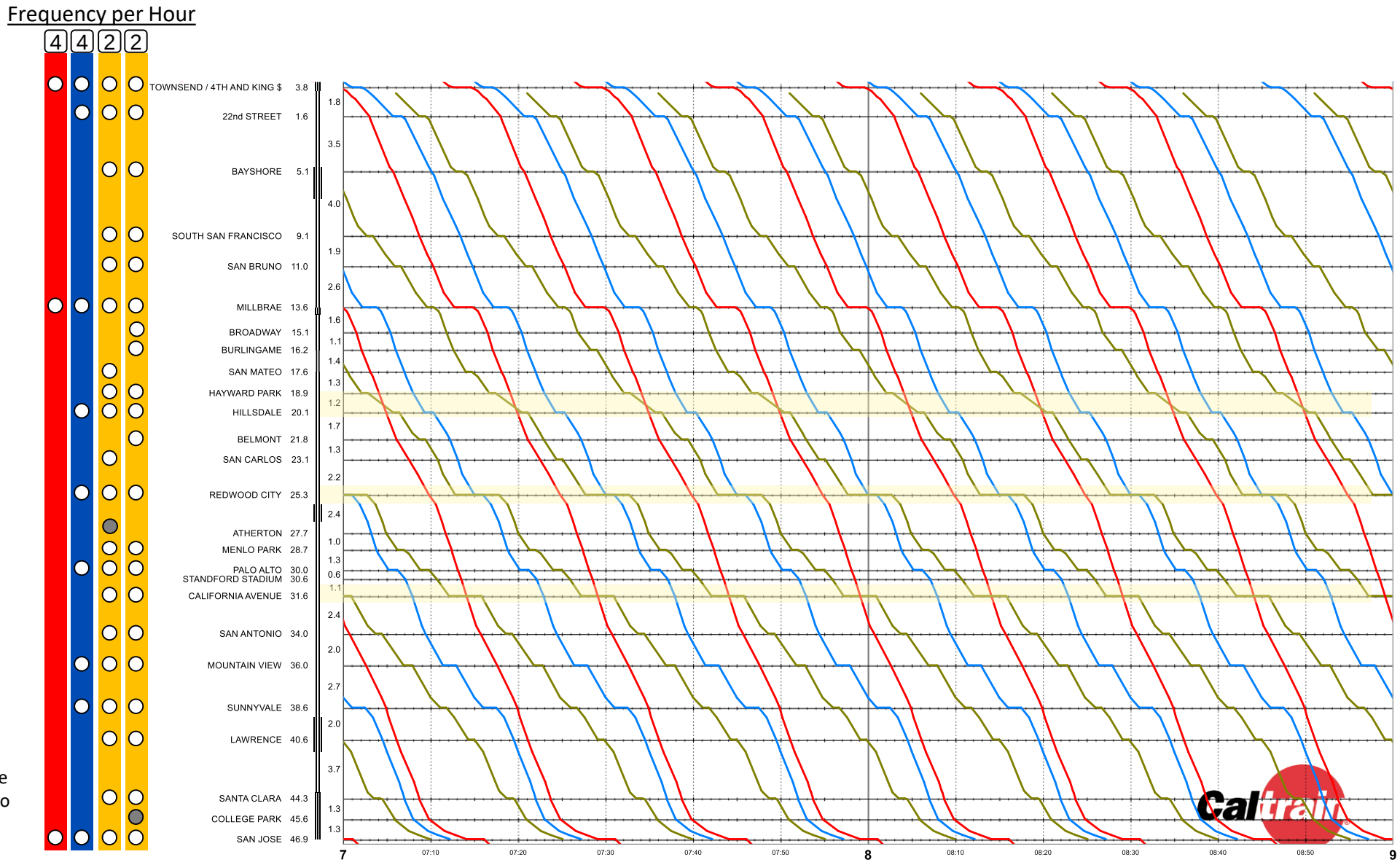
Local/Express: 12 Trains

Reduced Passing Tracks



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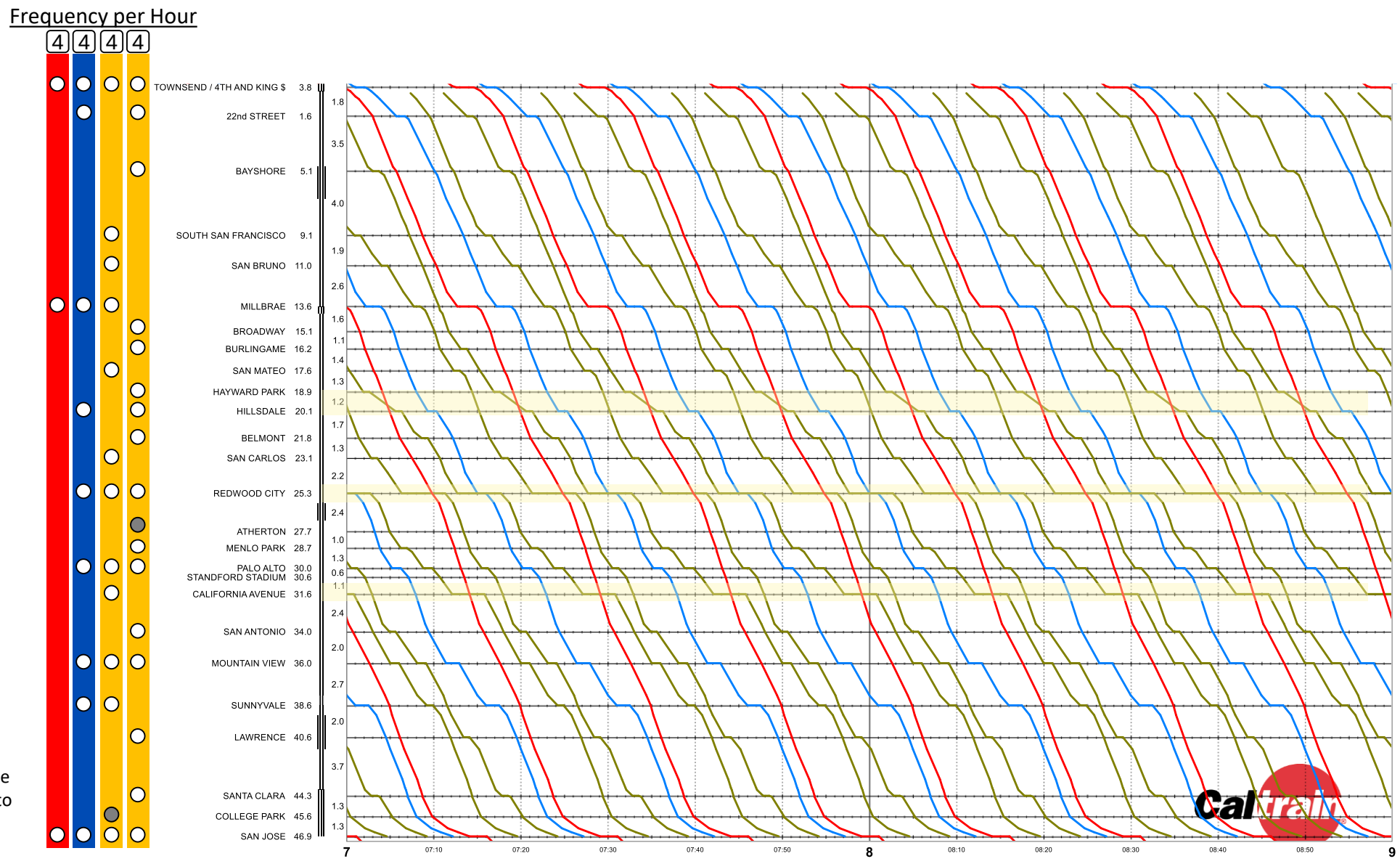
Local/Express: 16 Trains

Reduced Passing Tracks



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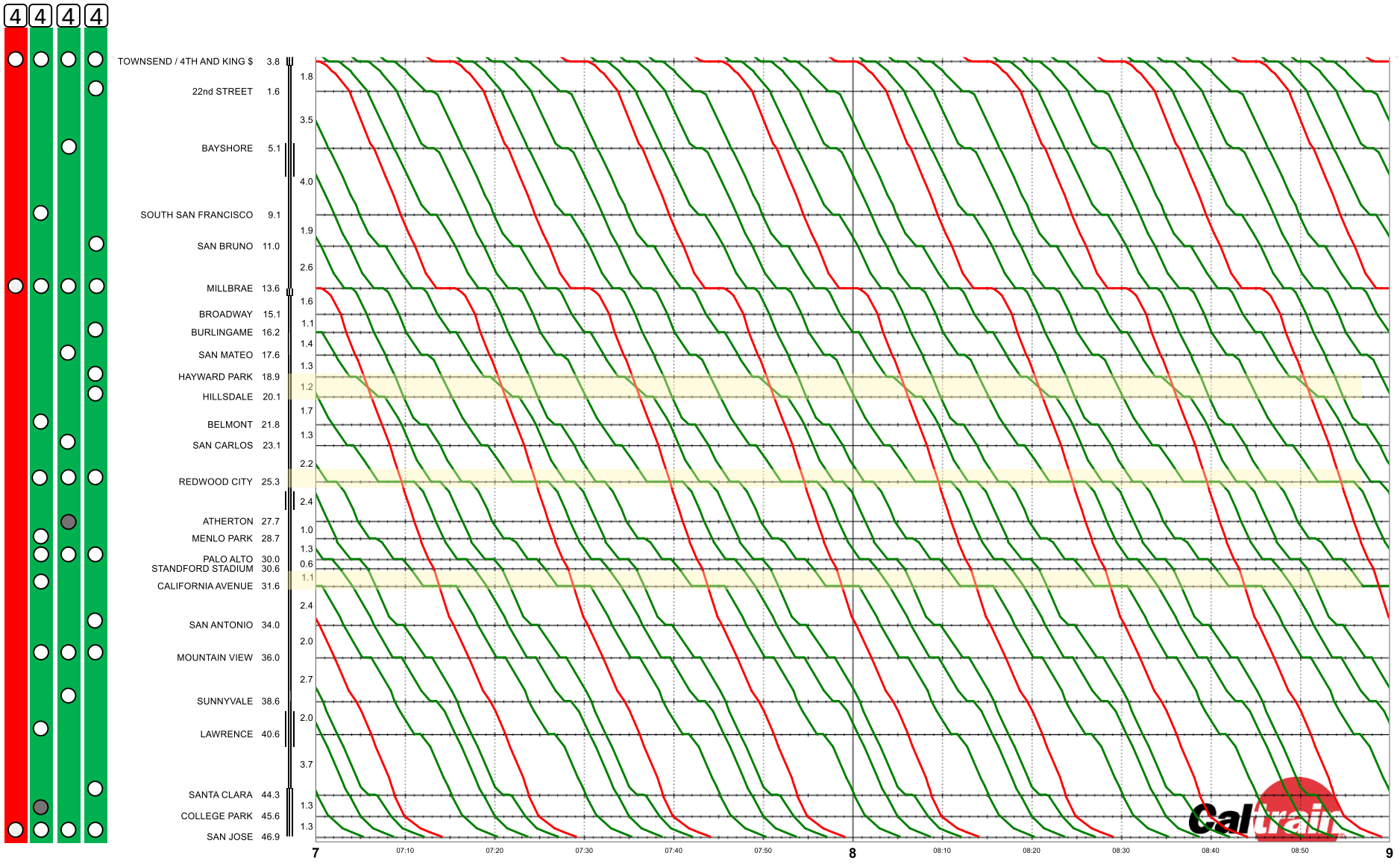
Skip Stop: 16 Trains per hour



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