

APPENDIX 2-C: OPERATIONS AND SERVICE PLAN SUMMARY

- Part 1: Operations and Service Plan Summary (February 2017)
- Part 2: San Francisco to Gilroy HSR System Requirements (August 2018)

APPENDIX 2-C PART 1: OPERATIONS AND SERVICE PLAN SUMMARY (FEBRUARY 2017)

California High-Speed Rail Authority

Statewide

Operations and Service Plan

February 2017



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ACRONYMS AND ABBREVIATIONS

AB	(California) Assembly Bill
Authority	California High-Speed Rail Authority
BMP	best management practice
C.F.R.	Code of Federal Regulations
Caltrans	California Department of Transportation
EIR	environmental impact report
EIS	environmental impact statement
Fed. Reg.	<i>Federal Register</i>
FRA	Federal Railroad Administration
HSR	high-speed rail
PMT	Program Management Team
RC	Regional Consultant
SB	(California) Senate Bill
SR	State Route
U.S.C.	United States Code

1 INTRODUCTION

This summary provides background information on the intended service and operations of the California High-Speed Train (HST) System to provide sufficient detail for the environmental assessment of proposed HST operations. Recognizing that the California system is still at a relatively early stage of the planning process, and that many operational issues remain to be resolved, this section summarizes how the system is envisioned to operate at this point in project planning.

Inspired by successes of high-speed train systems around the world, California has been planning a statewide high-speed rail line that will serve as a backbone and a needed alternative to the state’s existing transportation network. The system will interface with and complement other modes of transportation – commercial airports, mass transit, the state’s highway network, bike paths and pedestrian traffic. It will be capable of 220 mph revenue operating speed. It will interconnect with other modes of transportation and provide an environmentally friendly alternative to vehicle and air travel.

The updated phasing strategy for the California HST System will initiate revenue service between San Jose in the Silicon Valley and north of Bakersfield in the Central Valley in 2025. In the event that some additional funding can be made available this initial service may be extended to operate between San Francisco 4th and King Station, Merced and Bakersfield.

Phase 1 will be realized in 2029 with the expansion of the system to Los Angeles and Anaheim (See Table 1-1).

Proven train technologies similar to those used in other countries with established high-speed train systems (for example: Japan, France, Germany, Great Britain, Spain, Korea and China) will be used. This technology includes steel-wheel-on-steel-rail, entirely electric power, state-of-the-art safety and signaling systems, and automated train control. This technology, although new to North America, was introduced in Japan in 1964, France in 1981, and in many other countries within the past two decades.

The HST will operate primarily on exclusive (dedicated) track with portions of the route shared with other existing passenger rail operations. The route (alignment) will be constructed either atgrade, in an open trench, in a tunnel, or on an elevated guideway, depending on the terrain, physical constraints, environmental impacts and community input along each section. The system will predominately be within, or adjacent to, existing rail or highway right-of-way to reduce potential environmental impacts and minimize land acquisition.

Table 1-1 Summary of Phased Implementation

Section	Length (Approx.)	Endpoints	Service Description	Planning Schedule
Valley to Valley	250 miles	San Jose and north of Bakersfield	<ul style="list-style-type: none"> ▪ One-seat ride from San Jose to north of Bakersfield ▪ Begins with construction of up to 130 miles of high-speed rail track and structures in Central Valley. ▪ Private sector operator. ▪ Ridership and revenues sufficient to attract private capital for expansion. ▪ Connects with enhanced regional/local rail for blended operations with common ticketing. 	2025

Section	Length (Approx.)	Endpoints	Service Description	Planning Schedule
Valley to Valley (extended)	300 miles	San Francisco to Bakersfield and Merced	<ul style="list-style-type: none"> ▪ One-seat ride between San Francisco and Bakersfield and Merced ▪ Shared use of electrified/upgraded Caltrain corridor between San Jose and San Francisco 4th and King station. 	2025
Phase 1	500 miles	San Francisco to Los Angeles/Anaheim	<ul style="list-style-type: none"> ▪ One-seat ride between San Francisco and Los Angeles/Anaheim.¹ ▪ Dedicated high-speed rail infrastructure between San Jose and Burbank Station. ▪ Shared use of electrified/upgraded Caltrain corridor between San Jose and San Francisco Transbay Transit Center, and between Burbank and Anaheim ▪ Upgraded Metrolink corridor from LA to Anaheim, including remodeled Los Angeles Union Station (delivered by the Link US program) 	2029

¹ One-seat ride means that passengers do not need to switch trains, even if the train operates over two systems (e.g., moving north on dedicated high-speed rail infrastructure and then moving onto Caltrain tracks at San Jose, assuming electrification of Caltrain corridor by 2019 as proposed by Caltrain)

2 SERVICE PLAN OVERVIEW

2.1 Implementation Phasing

Valley to Valley (V2V) - The implementation of the High-Speed Rail System will be accomplished in phases beginning with an initial section that extends from San Jose in the Silicon Valley to a temporary terminal north of Bakersfield in the Central Valley. Expected to be completed by 2025, this 250-mile section will support the operation of 44 train runs a day.

Valley to Valley extended (V2VE) – this option, which is subject to securing additional funding, will see the system expanded north to San Francisco and south into Bakersfield. This 300-mile system is also expected to operate at a level of 44 train runs per day with additional service between San Jose and Merced.

Phase 1 – The system will expand to 500 miles and include service between San Francisco to Anaheim at a level of 176 revenue service train runs a day.

3 SERVICE PLANS

Concept level rail operations and service plans have been developed to serve several purposes:

- Confirm the level of service assumptions (travel times and service frequencies between station pairs) used to develop the estimates of system ridership and revenue.
- Validate the operational feasibility of the desired level of service at a conceptual level.
- Identify operable patterns of train service, particularly the general requirements for non-stop or limited-stop trains to pass slower trains that need to make a greater number of (local) stops along the route (i.e., the locations and frequencies of occurrence of these “overtakes” at various times of day).
- Provide a basis for an order of magnitude estimate of the number of train sets and overall rolling stock fleet requirements for the full build-out.
- Provide a basis for estimating platform track and storage track capacity to support operations at the end terminal stations.
- Provide a basis for sizing train storage and maintenance facilities throughout the HST System.
- Provide a basis for planning passenger-handling operations at HST stations, which can be used to help size and configure station facilities.

The HST System ridership and revenue estimates are used in developing the operations and service plans so the level of service that would be provided at each station is generally equivalent to the level of service assumed in developing the ridership and revenue estimates for the HST System. Weekday ridership demand is assumed to reach peak levels during a three-hour period in the morning and again in the afternoon. Train service density would be greatest during these periods, reverting to a slightly lower level of service during the remainder of the day.

Currently, the proposed mix of services would offer regular clock-face patterns, with each service type leaving passenger stations at the same time each hour, with relatively limited exceptions. Slightly more service is assumed during the three hour peak periods in the morning and late afternoon than during off-peak hours, consistent with expected ridership peaking.

Trains would run in diverse patterns between various terminals. Three basic service types are envisioned:

- Express trains, which would serve major stations only, providing fast travel times.
- Limited-stop trains, which would stop at selected stops along a route to provide faster service between stations served.
- All-stop trains, which would focus on regional service and connection from/to faster trains.

In early phases of revenue service, the service is generally structured with all-stop trains. As the system expands, limited-stop and express trains are introduced. In Phase 1, the vast majority of trains would provide express services or limited-stop service and offer a relatively fast run time between the largest metropolitan areas while connecting various intermediate stations by all-stop service. Stations with higher ridership demand potential would generally be served by more trains than those with lower estimated ridership demand.

The service plan provides direct train service between most station pairs at least once per hour. Certain routes may not always be served directly, and some passengers would need to transfer from one train to another at an intermediate station, such as Fresno Station and Los Angeles Union Station, to reach their final destination.

These service plans provide a useful initial estimate of the level of service that matches projected long-range demand on the HST System. As the HST System is implemented and both the operating plan and the ridership estimates are refined, it will be possible to make informed benefit

and cost tradeoffs to develop the most appropriate mix of limited, express and all-stop services, which will affect the trip times between stations and the frequency of service offered at each station for each route.

3.1 Valley to Valley and Valley to Valley Extended (2025)

Both of these scenarios for the train service would include trains operating over a subset of the routes listed later for the Phase 1 network. Figure 3-1 provides an illustration of the types of service and the number of trains of each type of stopping patterns that would operate under the V2VE option in the year 2025. If only V2V were adopted, then the service would start at San Jose and terminate at a temporary station just north of Bakersfield. The service level for both would be limited to one train per hour in each direction throughout the day with a second train per hour during the peak periods. A service diagram can be found below for illustrative purposes only.

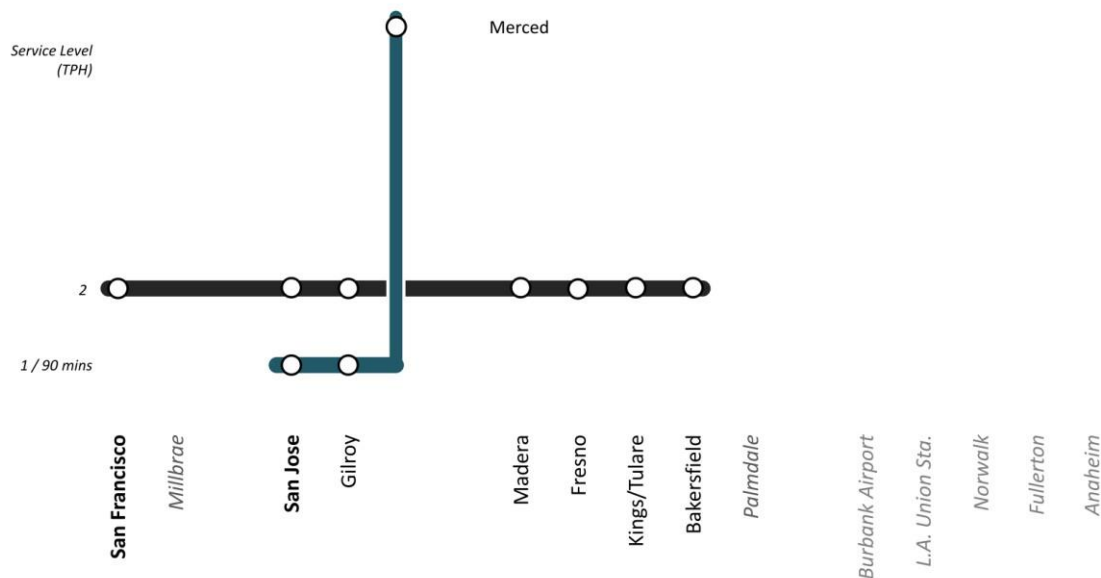


Figure 3-1 Valley to Valley Extended Train Stopping Patterns (2025: Peak Period Service)

3.2 Phase 1 (2029)

The service plan concept for Phase 1 estimates that the main HST line through the Central Valley would have eight trains per hour in each direction during the peaks, and five trains per hour during the off-peaks. Due to capacity constraint coming from the shared-use operations between Caltrain regional rail service and the high-speed rail service, the level of high-speed rail service along the Peninsula Corridor would be limited at four trains per hour in each direction throughout the day.

In the peak periods, the base level of service would include:

- Two trains per hour between San Francisco and Los Angeles
- Two trains per hour between San Francisco and Anaheim
- Two trains per hour between San Jose and Los Angeles
- One train per hour between Merced and Los Angeles
- One train per hour between Merced and Anaheim

Trains between the same terminal stations would have varying end-to-end stopping patterns. For example, one of the San Francisco to Anaheim trains would be all-stop and the other would be limited stop.

During off-peak periods, the base level of service would include three trains per hour between San Francisco and Los Angeles, one train per hour between San Francisco and Anaheim, and one train per hour between Merced and Anaheim in each direction.

Figure 3-2 shows potential stopping patterns for Phase 1, for illustrative purposes only.

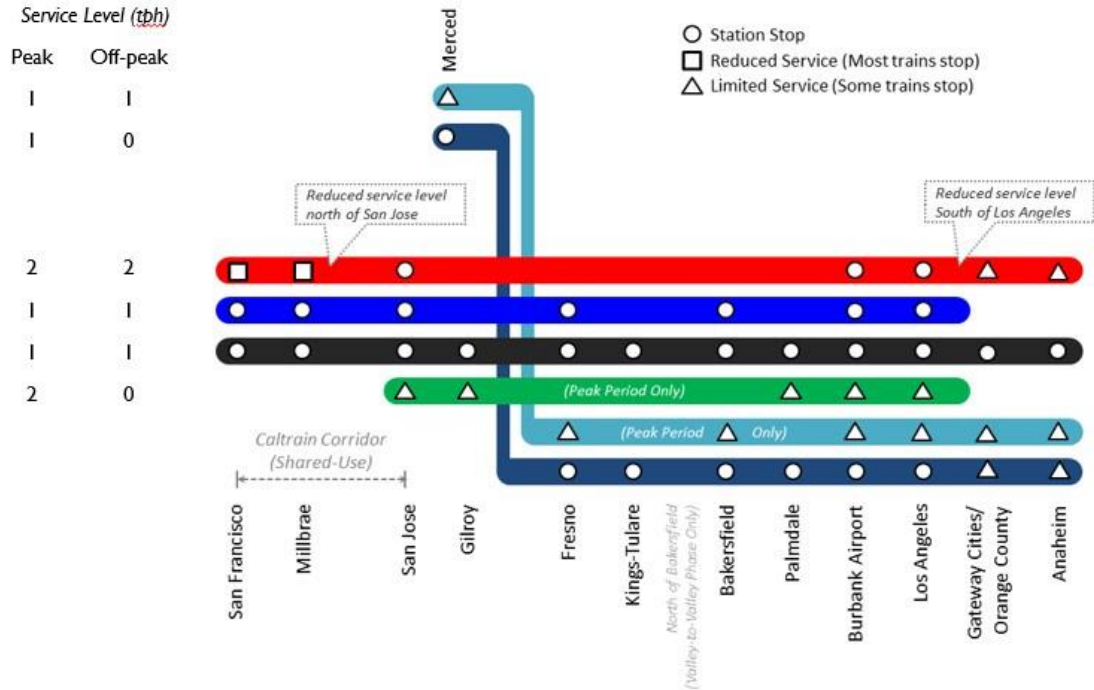


Figure 3-2 Phase 1 Train Stopping Patterns (2029)

4 PASSENGER STATION OPERATIONS

The Phase 1 service plan encompasses 13 passenger stations, including eight intermediate stations and five terminal stations. The V2V service plan (expected to be operational in 2025), envisions three intermediate and two terminal stations. The V2VE service plan, if adopted, envisions five intermediate stations and three terminal stations.

Station platforms are assumed to be 800 feet long. In accordance with Code of Federal Regulations (CFR) regulations that require that platform design meet the Americans with Disabilities Act (ADA) Accessibility Guidelines, the HST platforms will be designed to allow for level boarding.

4.1 Intermediate Stations and Platform Tracks

All the intermediate stations in the exclusive, dedicated sections of the high speed system incorporate platform tracks for stopping trains. Stations are spaced about 50 miles apart in rural areas and approximately 15 miles apart in metropolitan areas, with overall average spacing about 30 miles.

Because the Los Angeles high speed rail station is both a terminal station and intermediate station in Phase 1, and a high-volume station, it has a special layout that incorporates intermediate and terminal station features. Full details of the layout of Los Angeles Union Station are still in development by the Link US program being led by Metro in which HSR is an active partner.

The typical intermediate station will have the configuration shown in Figure 4-1 and Figure 4-2, with platform tracks on the outside flanked by side platforms. The platforms will be high-level, tangent and will cover the full length of an 820 foot train, permitting level boarding through all train doors.

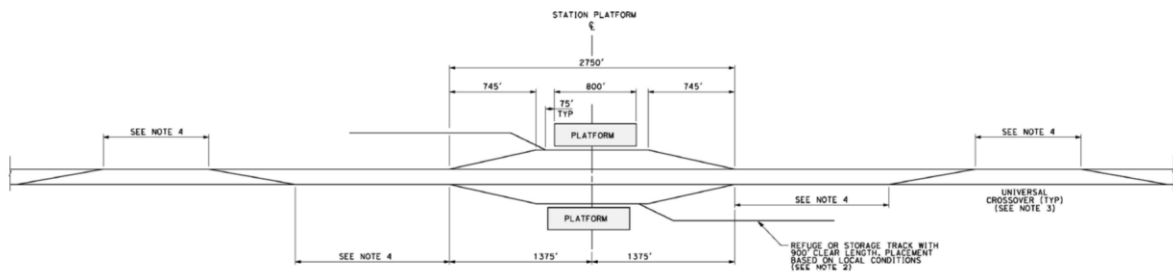
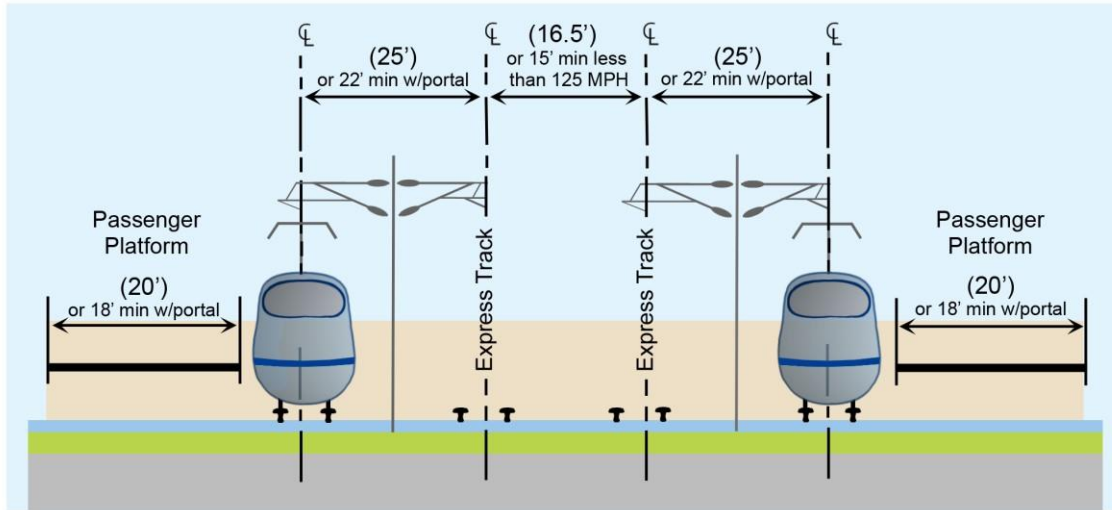


Figure 4-1 Intermediate Station Typical Configuration

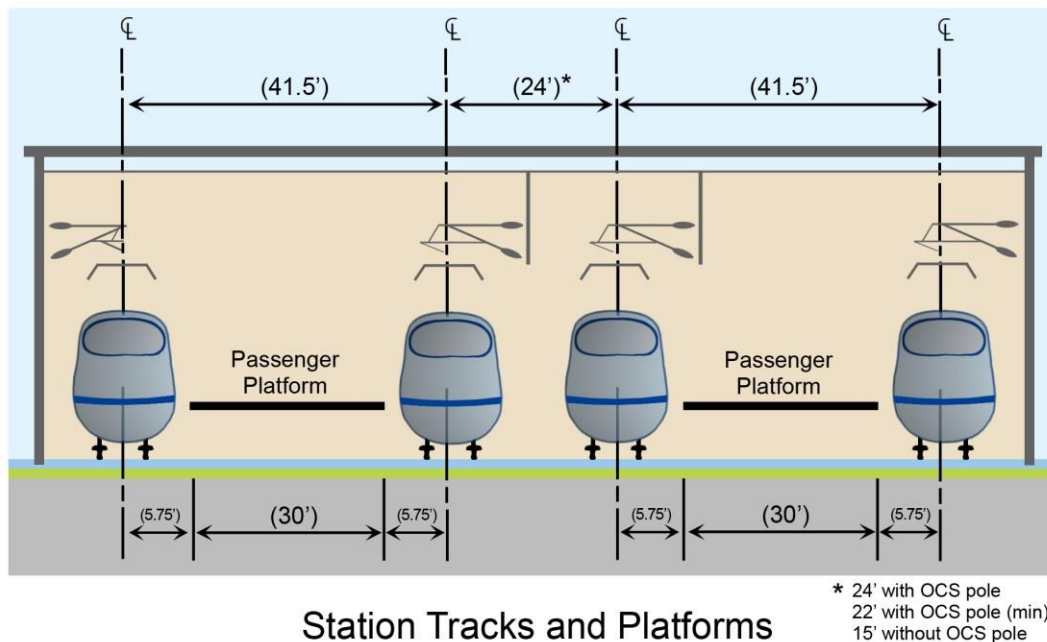


Station Tracks and Platforms

Figure 4-2 Intermediate Station Typical Cross-Section

4.2 Terminal Stations

Terminal stations are envisioned to have island platforms serving tracks on both sides and be able to accommodate train cleaning, restocking with on board food service, mandatory train inspection and as-needed maintenance and repair of trainset components – along with the alighting and boarding of passengers. The track and platform configurations at terminal stations vary based on the level of projected train service, local physical constraints, and requirements for other (non-HST) train services that would be located adjacent to the HST facilities. Figure 4-3 and Figure 4-4 show typical configurations for a four-track terminal and six-track terminal.



Station Tracks and Platforms

Figure 4-3 Terminal Station—4 Track Terminal and 2 Island Platforms

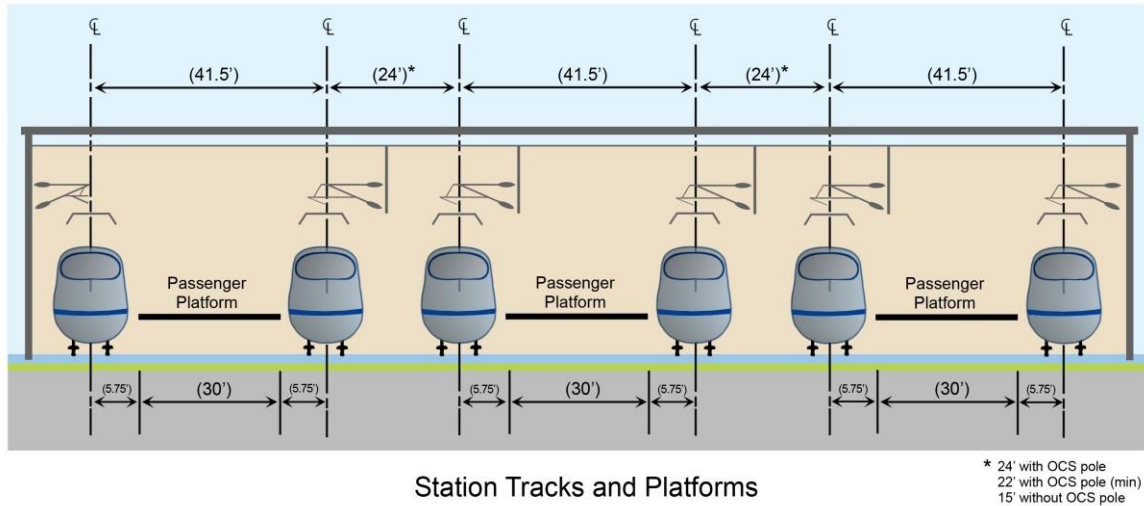


Figure 4-4 Terminal Station—6 Track Terminal and 3 Island Platforms

4.2.1 Passenger Boarding

There are several different ways in which passenger boarding could be managed at HST terminal stations. The HST project has not finalized the preferred methods for passenger-handling system wide, and the HST sponsors and operator likely will want consistent passenger handling practices across the entire system. Passenger-handling requirements affect the design and configuration of the physical facilities used for passenger-processing, waiting, queuing and horizontal and vertical circulation.

Examples of potential variations in passenger-handling procedures and required facilities encompass the following:

Advance staging of boarding passengers

- Retain all boarding passengers at concourse level until cleaning/servicing is substantially complete and the train is ready for boarding
- Permit boarding passengers to descend to platform level as soon as the load of detraining passengers has cleared the platform (passengers and service personnel and equipment would occupy the platform level simultaneously)

Number and location of boarding concourse points

- Board from a single concourse location
- Board from dual locations
- Board from multiple locations spread along a mezzanine or longitudinal concourse situated above or below the platform level, with multiple vertical circulation connections to the platforms

Reserved seat policy

- Open seating, where passengers select the car that they will board

Reserved seating (similar to most European and Asian high-speed rail systems), where passengers are assigned to a seat in a particular car, and where the time required to board the train can be minimized by pre-positioning passengers either on the platform or at concourse level close to where their seat will be located.

These options have differing implications in terms of required facilities, the configuration of concourse and vertical circulation elements, and the station operating costs associated with managing the boarding process.

4.2.2 Train Cleaning and Servicing

At terminal stations, train servicing would be done using the passenger platforms. Because of space constraints at the proposed terminal sites, dedicated service platforms are not envisioned. To maximize passenger safety, servicing operations efficiency, and achieve predictable layover (train parking) times, normal operating procedures would plan for providing temporal separation between the passenger unloading and loading processes and train servicing activities at the terminal platforms.

To attract and keep a dedicated passenger clientele it is important to establish and maintain a cleanliness standard aboard the train consists. This service is accomplished by cleaning techniques implemented at selected times in a service day. Two types of cleaning are envisaged.

- “Normal” (Lay-up) Cleaning – This service is performed at a train storage and maintenance facility, and is generally done when a train is parked for a sufficient time to receive a thorough interior cleaning of the passenger areas to include seats and bathrooms. It is usually scheduled daily and is completed prior to a train entering revenue service in the morning. All trash is removed, seats and floors cleaned, and bathrooms sanitized.
- “Light” (Pick-up) Cleaning – When a train turns around (i.e. the rear end of the train arriving at the station becomes the front end of the train departing) in a terminal station or on a storage track with insufficient opportunity for a full normal cleaning, this service is performed to return the interior to an acceptable condition.

Cleaning toilets (and emptying the “holding” tanks) would occur during the overnight layup period at maintenance facilities and would not occur in the terminals during the turnaround time.

4.2.3 Train Layover Times at Terminal

Because the terminals are stub-ended, all HST trains will change directions (turnaround with rear end of the arriving train becoming the front end of the departing train) at terminal stations. Three types of train turnaround will occur in terminal stations:

- Revenue to Non-Revenue: Revenue trains (with passengers) arrive, with the equipment turning around and going to the maintenance facility for storage or servicing, without passengers.
- Non-Revenue to Revenue: Trains enter the terminal from the maintenance facility (without passengers), departing passengers board (the train), and the train departs as a revenue train (with passengers).
- Revenue to Revenue: Revenue trains (with passengers) arrive and passengers unload, the train would park at the platform while it is inspected, cleaned and restocked with bathroom and food service supplies, departing passengers board the train, and the train departs as a revenue train (with passengers).

Estimating the time required to carry out the various terminal turnaround train servicing and passenger processing functions, and identifying which functions can proceed in parallel with each other and which depend upon the prior completion of other activities, allows definition of a “critical path” of activities that governs the minimum time necessary between an inbound train arrival and the subsequent outbound train departure. The required sequence that must be followed for four basic processes that occur during the turnaround layover period are as follows:

- Passenger alighting and boarding
- Re-stocking of food and beverage service items
- Coach cleaning and re-stocking of bathroom supplies (critical path item)

- Train safety system pre-departure preparation
- In addition, minor equipment repairs that can be accomplished during the layover (parking) period will be addressed.

Facilities would need to be provided at the terminals to support the food service provisioning (commissary), coach cleaning and railroad mechanical department (equipment maintenance and repair). These facilities would need to be located in proximity to the HST platforms, to minimize the time required to access a train when it arrives at the terminal. Direct service elevator access would be required between these facilities and the HST platforms, separate from the elevators and access points used by passengers.

The HST scheduled terminal station turnaround time is composed of four primary “critical path” factors: Passenger alighting, interior cleaning, passenger boarding, and a “Recovery Time Factor.” The following table summarizes HST assumptions for the minimum exception and minimum standard scheduled turnaround times (based on an 820 foot train).

Table 4-1 Time Required for Terminal Layover Activities (HST Planning Assumptions, Revenue Train to Revenue Train)²

Critical Path Activity	Minimum Exception	Minimum Standard
Passenger Alighting	5 minutes	5 minutes
Cleaning, Restocking, Servicing & Provisioning	5 minutes	10 minutes
Passenger Boarding “Window”	5 minutes	5 minutes
Total Scheduled Turnaround Time Assumption	15 minutes	20 minutes

² Train safety system preparations can be accommodated within time windows available for alighting, cleaning and boarding.

5 ROLLING STOCK STORAGE AND MAINTENANCE

5.1 Fleet Requirements

In 2040, 78 train sets will be required to operate the 176 daily revenue service train runs envisioned for the full build revenue service plan. Each train set is approximately 650 feet long and seats approximately 500 passengers in the initial formation. The train could be potentially extended to 820 feet long and seats approximately 650 passengers.

Table 5-1 Horizon Year 2040 (Phase 1) Service Plan. Revenue Train Sets Required at Each Terminal to Start Weekday Morning Train Service.

Terminal	Total Single Sets
San Francisco – Transbay	13
Mid-Peninsula (San Jose and Gilroy)	14
Central Valley (Merced, Fresno, and Bakersfield)	13
Los Angeles Basin (Palmdale, Burbank Airport, Los Angeles Union Station, and Anaheim)	31
Total Sets Required	71

The Horizon Year 2040 operations and service plan envisions the need for 71 revenue train sets. Also as indicated in Table 5-2, the estimated number of trainsets along with an allowance for spare train sets for maintenance and repair substitute and hot stand-by trainsets, and extra trainsets to accommodate higher demand on peak demand days, resulting in an overall fleet estimate of 78 total units. The 10% total spare ratio is the mid-range of spare ratios for U.S. and international intercity and high-speed rail fleets. The estimated fleet requirement numbers will be modified as the operating plan, demand projections, and maintenance plans are refined.

Table 5-2 Horizon Year 2040 (Phase 1) Train Fleet Requirements

Trainset Description	Trainsets Required
For Single-set Trains	71
For Double-set Trains	0
Subtotal Revenue Requirement	0
Hot Stand-by	2
Extra Trainsets for Peak Demand Days	2
Spare Equipment (Assume 10%)	3
Total Sets Required	78

5.2 Train Storage and Maintenance Facilities

Train storage yard facilities should be located as close as physically possible to the terminal stations.

Generally, the terminal stations are in heavily urbanized areas that do not have land available immediately adjacent to the terminal for new train storage yards. As a result, trains that are entering or leaving service at a terminal station will have to operate as non-revenue or “deadhead” train movements to and from the storage yards.

The overnight layup facilities are the basic facility at each of the terminal locations that provide overnight storage (parking) for the trainsets and daily inspections and cleaning. Layup facilities would be located close to Gilroy Station but be without a heavy maintenance capability. Yards including a periodic inspection facility (shop) would be located in northern California along the Peninsula Corridor at Brisbane near San Francisco and one in southern California, near Los Angeles Union Station. One Heavy Maintenance Facility (HMF) will be located in the center of the statewide system to provide all of the overhauls and component refurbishment capability. An example of a typical concept configuration for an overnight storage facility equipped with a shop to perform periodic inspections is shown in Figure 5-1.

The storage capacity of each facility is based on the number of trains estimated in the Full Build-Out Operations and Service Plan and is summarized in Table 5-3 below.

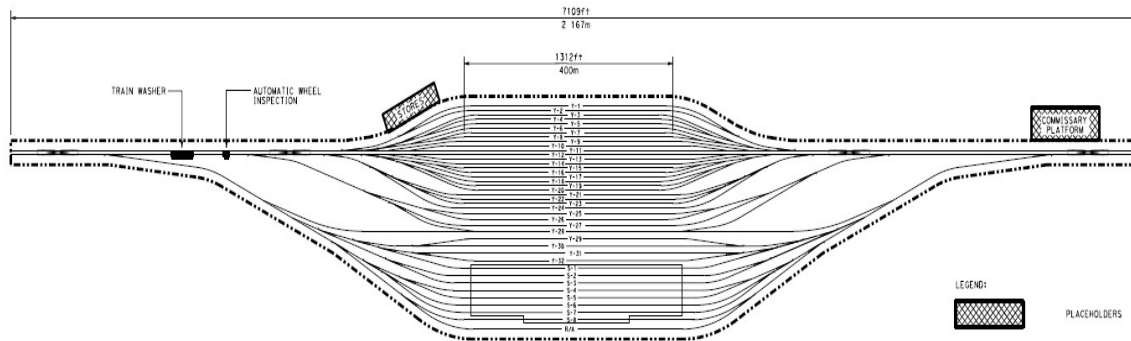


Figure 5-1 Example of Typical Concept Configuration for Overnight Storage Yard with Shop

Table 5-3 Phase 1 Blended Service (2040) Storage/Layup Track Requirements

Location	Total Trains to be laid up at facility	Train capacity at each facility*
Brisbane	14	14-18
Gilroy	13	13-16
HMF	23	23-27
Southern California	28	28-35
Total	78	78-96

*Excess capacity will allow flexibility to move trains around in order to meet actual level of demand

5.3 Rolling Stock Maintenance Program

Consistent with international methods, the California high-speed train system is planned to provide five different levels of train maintenance activity:

- Level 1 – In-Service Monitoring: daily testing and diagnostics of certain safety sensitive apparatus on the train in addition to automatic on-board and on-ground monitoring devices.
- Level 2 – In-Service Examinations: inspections, tests, verifications and “quick” replacement of certain components on the train. Examples include inspection and maintenance tasks associated with the train’s running gear, bogies, underbody elements and pantographs.
- Level 3 – Periodic Inspections: part of planned preventive maintenance program requiring specialized equipment and facilities. Examples include: a) examination of interior fittings and all parts of the train in the immediate environment of the passengers, b) in depth inspection of axles and underbody components, critical to train safety by identifying and repairing any

condition in the running gear and connecting components, c) wheel condition diagnostics and re-profiling (wheel truing).

- Level 4 – Overhauls (HMF only): part of the planned life cycle maintenance program requiring a specialized heavy maintenance shop with specific heavy duty equipment. Activities include the complete overhaul of train components replaced during Level I, II and III. In addition, a full complement of heavy maintenance is completed on each trainset every 7 to 10 years (30 days per trainset) as well as mid-life overhauls which are performed on each trainset every 15 to 20 years (45 days per trainset).
- Level 5 – Rolling Stock Modifications & Accident Repair (HMF only): Activities to support installation of a major modification to the design of the trainset for purposes of improving safety, reliability and passenger comfort. In addition, this category includes repair to a trainset which has “suffered” significant damage.

The frequency with which these maintenance procedures are performed varies by level. To minimize cost, maximize flexibility and to address all of the levels of maintenance and inspections, these maintenance functions will be undertaken at a relatively small number of facilities spread across the HST network. The locations at which maintenance will occur can be broken into three groups:

- Overnight Layup Facility – Provides Levels 1 and 2 maintenance and inspections
- Periodic Inspection Facility – Provides Levels 1 to 3 maintenance and inspections
- Heavy Maintenance Facility – Provides Levels 1 to 5 maintenance and inspection, including overhauls and component refurbishment.

5.4 Facility Site Location Criteria

It is important that each of these facilities be located immediately adjacent to the HST main line tracks and connected directly to them with a 110 mph turnout (switch) and two connecting tracks (i.e., “double track”) of approximately 3,696 feet on both ends of each facility. The connecting tracks will transition to become the slow speed (15 mph) lead tracks within each facility.

In addition to proximity and connectivity to the HST System main line tracks, the site of the Light Maintenance facilities should be such that the distance between the light maintenance facility and the Terminal Stations is minimized. The preferred distance is up to 1.5 miles, an acceptable distance is from 1.5 to 3.0 miles and anything further than 3.0 miles would be considered as an exception. Light Maintenance Facilities (LMF) are required for the terminus stations or end points of the system at San Francisco, Los Angeles, Anaheim and Merced for Phase 1, with additional LMFs at San Diego and Sacramento for the Full Build-Out. In addition, consideration is being given to a possible combined LMF for Los Angeles and Anaheim.

The desirable site for the Heavy Maintenance Facility (HMF) is that it be located centrally on the HST System between Merced and Bakersfield. The section between Merced and Bakersfield is in the “central part” of the system, is part of the trunk line (Anaheim-San Francisco), and has the ability to include a high-speed test track. No other part of the system meets these criteria. The required length of this test track is based upon current high-speed train manufacturers’ recommendations for testing and commissioning which includes a protocol for sustained running for ten minutes up to 250 mph. Train operations at these speeds require straight alignment of approximately 80 to 105 miles.

5.5 Estimated Site Requirements

Based on a conceptual rendering of these facilities they would require the following land parcel “footprints” range (depending on the shape of the land parcel), inclusive of buildings, outdoor service areas, storage, roadways and parking:

- Merced to Bakersfield Heavy Maintenance Facility Concept, 169 +/- Acres

- Los Angeles Storage Yard and Maintenance Facility Concept, 100 +/- Acres
- Brisbane Storage Yard and Maintenance Facility Concept, 100 +/- Acres
- San Jose/Gilroy Storage Yard and Maintenance Facility Concept, 42 +/- Acres

5.6 Commissioning of Rolling Stock

In addition to the in-service maintenance regimen, the HMF is assumed to be used during the pre-revenue service period (from 2020) for the assembly, testing, acceptance, and commissioning of the HST System new rolling stock fleet. Implementation of the testing, acceptance and commissioning activity would also require a main line test track between 80 and 105 miles in length connected directly to the HMF. The HMF would also be used for decommissioning or retirement of equipment from the system to make way for the next generation of rolling stock.

6 TRAIN DISPATCHING AND CONTROL

6.1 Operations Control Center

A train operations control center will be located in the Central Valley area. Space for employee parking, pedestrian access/egress and appropriate bathroom and lunchroom facilities has been accounted for. However, the operations control center can be located at any place along the system.

6.2 Communications with HST Stations

HST trains will be dispatched and controlled from a central control facility remote from the individual stations and terminals. A direct communications link will exist between the central control facility and the Terminal Operations Center or HST Passenger Services office at each HST station and terminal, to enable station staff of the HST System Operator (and the Terminal Operator, at facilities where the terminal is managed by a third party) to monitor the status of train operations on the rail network and respond to any unusual conditions that may arise.

APPENDIX 2-C PART 2: SAN FRANCISCO TO GILROY HSR SYSTEM REQUIREMENTS (AUGUST 2018)

California High-Speed Rail Authority

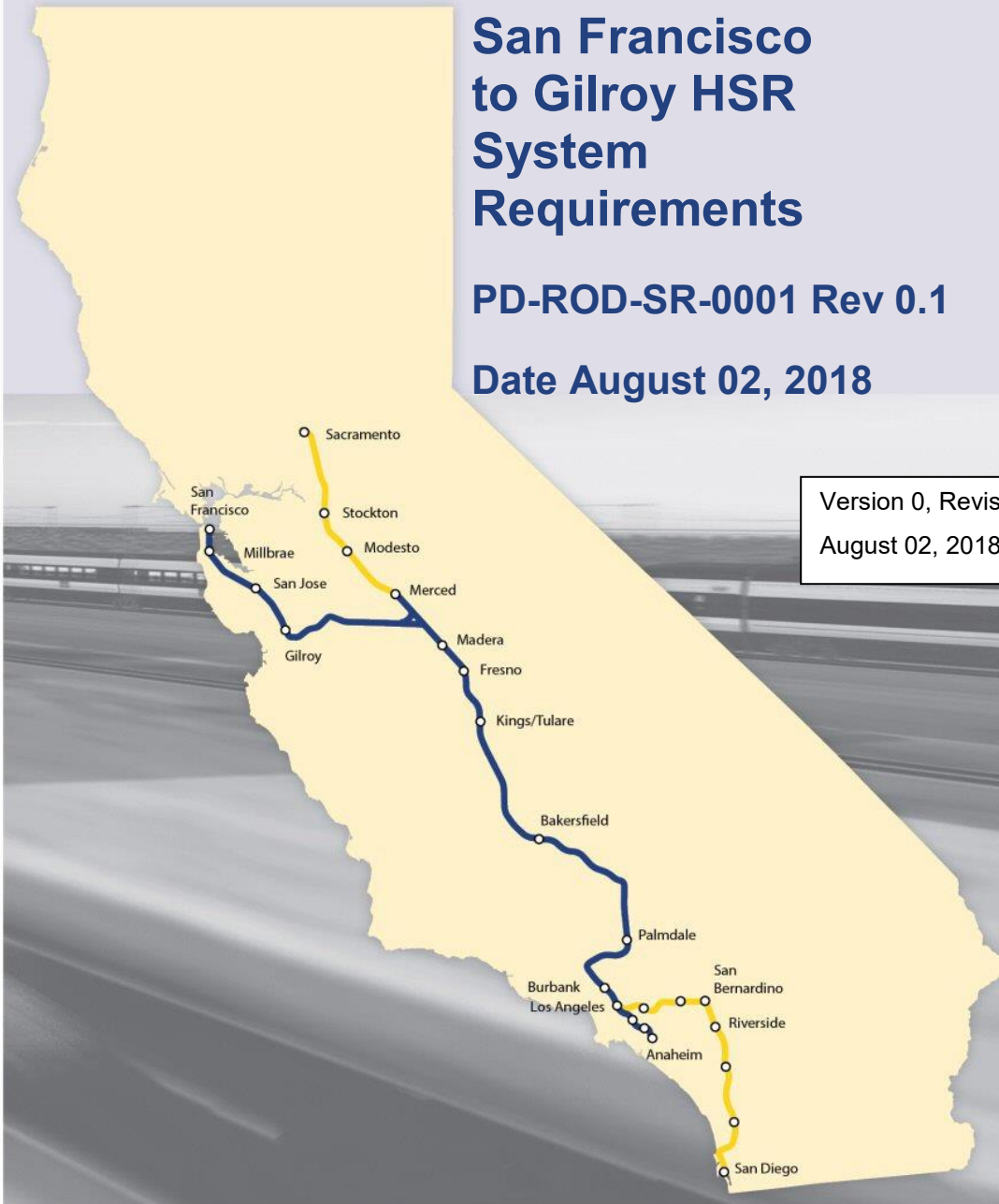
Rail Operations and Delivery Branch

San Francisco to Gilroy HSR System Requirements

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California High-Speed Rail System



Rail Operations and Delivery Branch San Francisco to Gilroy HSR System Requirements

Prepared by: Tony Hargitay _____ 08-02-2018
Date

Checked by: Simon Whitehorn _____ 08-02-2018
Date

Approved by: John Popoff  _____ 8/9/18
Date

Released by: Wes Burns [\[Signature\]](#) _____
Date

Revision	Date	Doc Number / Description
A	07-03-2018	Initial early DRAFT for information awaiting formal issue.
0	07-07-2018	Initial ISSUE
0.1	08-02-2018	Updated clarify and to reflect comments received.

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2 ABBREVIATIONS AND ACRONYM

ACE	Altamont Corridor Express
ATC	Automatic Train Control
Authority	California High-Speed Rail Authority
CEMOF	Central Equipment & Maintenance Facility - Caltrain
CP	Control Point
CPUC	California Public Utilities Commission
FCC	Federal Communications Commission
FJ	San Francisco to CP Lick
FRA	Federal Railroad Authority
HSR	High-Speed Rail
JM	San Jose to Merced
LMF	Light Maintenance Facility
MAS	Maximum Allowable Speed / Operating Speed
MOWF	Maintenance-of-Way Facility
MP	Mile Post
MPH	Miles Per Hour
MTx	Main Track x
NTD	Notice to Designers
OCS	Overhead Catenary System
PS	Paralleling Site
ROW	Right-of-Way
SWS	Switching Site
TAMC	Transportation Agency for Monterey County
TOR	Top-of-Rail
TOWAIR	The FCC communications antenna tool.
TPSS	Traction Power Sub-Station
UPRR	Union Pacific Railroad
VTA	Valley Transit Authority

3 INTRODUCTION

3.1 Objectives

These requirements specify the Rail and Operations Delivery Branch (Rail Group) infrastructure requirements to meet the operational requirements of High-Speed Rail services between San Francisco and Gilroy and beyond as per the Authority 2018 Business Plan.

The requirements within this document are intended to describe a blended operations, overhead line electrified railroad, contained within the existing ROW, between San Francisco and Gilroy with a MAS of 110 mph.

These requirements are intended as guidance to the Northern California regional team and Consultants to facilitate the environmental clearance process.

Any changes or deviations from these requirements shall be documented and agreed with the Rail Group.

3.2 Scope and Applicability

This document and the requirements contained within it form the highest level of Rail Group requirements.

In order of precedence requirements shall be managed as follows;

1. San Francisco to CP Lick;
 - a. HSR Design Standards;
 - b. Caltrain Design Standards; then
 - c. Sub-consultant generated options.
2. CP Lick to South of Gilroy;
 - a. UPRR Standards
 - b. HSR Design Standards;
 - c. Caltrain Design Standards; then
 - d. Sub-consultant generated options.

When the development of the project moves through the order of precedent listed above and referenced standards change due to local circumstances, the Rail Group shall be notified and shall agree a course of action prior to the development work progressing.

It is permissible to have multiple variations on the application of applicable standards used as the design moves along the alignment to suit local circumstances providing the proposal is coherent and compliant.

For the tracks between San Francisco and San Jose it is noted that there is prior agreement to amendments to the Caltrain Design Criteria for Track as detailed in the HNTB Submittal Memo from Kim Franchi, Subject 'San Francisco – San Jose (FJ) Basis of Design (Track)' dated 04/25/2018.

4 OPERATIONAL REQUIREMENTS

DRAFT – Operational Planning Analysis REVISED– San Francisco to Gilroy as per memo from Paul Hebditch to Frank Vacca dated July 27, 2018 applies. Revisions to this memo are to clarify points made in the original and to provide operational context. See Appendix 1,

4.1 2027 Peninsula Service

1. San Francisco – San Jose
 - a. San Francisco 4th & King temporary Station platform lengths in accordance with Rail Systems Directive 2017-03-06-01 Rev 4a dated 1/29/2018;
 - b. Grade separated rail access to Brisbane LMF;
 - c. All at-grade crossings converted to four quadrant gates with channelization to permit operations up to 110 mph;
 - d. No additional grade separations by HSR;
 - e. Hold-out rule eliminated at College Park, Broadway and Atherton;
 - f. MAS shall be 79 mph;
 - g. No changes to CEMOF;
 - h. San Jose Diridon Station at-grade (as described in directive);
 - i. Two High-Level HSR Platforms with four adjacent tracks;
 - ii. 1,400' between fouling points of switches at both ends;
 - i. Track configuration from CP Coast to Diridon;
 - i. Two electrified tracks;
 - ii. Two non-electrified tracks;
 - j. Completely access controlled ROW using fences, trespass guards and quad-gates.
2. San Jose – Gilroy
 - a. At-Grade within existing ROW;
 - b. One non-electrified track (MT1), two electrified tracks (MT2 and MT3);
 - c. San Jose Diridon Station at-grade;
 - i. Two High-Level HSR Platforms with four adjacent tracks;
 - ii. 1,400' between fouling points of switches at both ends;
 - d. Tamien Station;
 - i. No change to station layout or platforms;
 - ii. Two electrified sidings located south of Tamien Station (min 700' long);
 - e. Michael Yard;
 - i. Stabling for minimum of four 7-Car trainsets (7-car max length = 675');
 - ii. Non-electrified;
 - iii. The two long Michael Yard tracks shall be double ended from MT1;
 - f. Southbound 50 mph crossovers for connecting MT1 to MT2 - These may be located in a suitable location north of Blossom Hill Station;
 - g. Quarry siding;
 - i. Access from MT3 from south as per existing access;
 - ii. To enable access to the Quarry from MT1, 30 mph crossovers shall be provided between MT1 and MT2 and MT2 and MT3;
 - h. Coyote;
 - i. One non-electrified siding at Coyote (min 2,500' long). This may extend up to 4000' if achievable within the existing ROW.

- i. Gilroy at-grade station;
 - i. As detailed in 'Rail Systems Directive 2017-03-06-01 Rev 4a dated 1/29/2018', two high-level platforms shall be provided and they shall be the maximum length that can be provided within platform track;
 - ii. Two low level platforms minimum length 600' each;
 - iii. Three electrified storage tracks (to replicate existing length);
 - iv. 'TAMC' track shall tie into MT1 south of the station;
 - v. Relocate the storage tracks to the 2033 location per direction from the Rail Group on 6/15/2018. See Appendix 2;
 - vi. Northbound 50 mph crossovers for connecting MT2 to MT1;
- j. Gilroy MOWF. Two options to be considered;
 - i. South of Gilroy (no Gilroy LMF) - for early operations in 2027, HSR trains may use UPRR tracks to gain access to the MOWF from the North; and
 - ii. Adjacent to Gilroy Station - use existing land within the Gilroy station area.
- k. These options shall allow;
 - i. Rail access from UPRR tracks for delivery of construction and maintenance materials;
 - ii. Laydown areas for storage of construction and maintenance materials;
 - iii. Stabling for railway equipment;
- l. All at-grade crossings converted to four-quadrant gates with channelization (or closed) to allow operation to 110 mph;
- m. No new HSR grade separations;
- n. Reconfigure VTA/Caltrain stations at San Martin, Morgan Hill, Blossom Hill and Capitol to be accessed from MT2 and MT3; and
- o. Completely access controlled ROW using fences, trespass guards and quad-gates.

4.2 2029 Valley to Valley Service

- 1. San Francisco – San Jose
 - a. No changes required to infrastructure provided for 2027 operations.
- 2. San Jose – Gilroy
 - a. Reconfiguration of Gilroy station and connecting tracks southward to connect with dedicated HSR alignment and provision of bypass tracks;
 - b. 1,400' minimum distance between points of switch of the Gilroy platform tracks;
 - c. HSR northern access to MOWF shall not utilize UPRR tracks as a permanent condition but may cross UPRR tracks; and
 - d. MOWF shall have direct access to HSR Mainline tracks as well as connection to the existing freight railroad in order to facilitate access for delivery of materials and equipment.

4.3 2033 Phase One

1. San Francisco – San Jose;
 - a. Increase MAS to 110 mph;
 - b. Upgrade of signaling system (Note; all upgrades to signaling system in FJ segment by Caltrain not HSR); and
 - c. Add HSR Millbrae Station.

2. San Jose – Gilroy
 - a. No changes 2029 operations.

5 INFRASTRUCTURE REQUIREMENTS – SAN JOSE – GILROY

5.1 Outline

1. All connections to freight branch lines and local industry shall be retained with connection to MT1.
2. 101 Freeway - HSR and UPRR tracks to pass through existing under-bridge.

5.2 Right-of-Way

1. The Regional team are responsible for determining;
 - a. ROW boundaries, including for earthworks;
 - b. Provision of access roads and gates;
 - c. Roadway modifications;
 - d. Pedestrian overpasses;
 - e. Grade crossings;
 - f. System sites;
 - g. Utility mitigation; and
 - h. Associated environmental clearance.

5.3 Track

1. Two electrified tracks, MAS of 110 mph;
2. One non-electrified track, MAS of 79 mph;
3. Track spacing shall be as follows;
 - a. Alignment shall be designed to fit, where possible, within existing ROW, based on;
 - b. MT1 to MT2 – 20' between track centers; and
 - c. MT2 to MT3 – 20' between track centers;
4. Where alignment, ROW or physical features prevent the above requirements from being achieved, the order of preference of track spacings shall be as follows;
 - a. Reduce MT2 - MT3 spacing to 15' minimum;
 - b. Reduce MT1 – MT2 spacing to 18' minimum; then
 - c. Additional land take.
5. There shall be 10' 8" minimum horizontal clearance between track centerline and the perpendicular face of any vertical obstruction.
6. All reductions in track spacing from those described in 5.3-2 a & b above shall be documented and approved by the Rail Group prior to design progressing; then

5.4 OCS

1. Electrification to terminate immediately north of 'East 10th Street' Grade Crossing unless the Gilroy storage tracks are relocated south of the crossing.
2. Clearance between the centerline of any track and the face of OCS structures shall be a minimum of 15'; and
3. The preliminary placement of portal structures is to be agreed with the Rail Group on completion of track alignment design.

5.5 Minimum Vertical Clearance

1. The minimum vertical clearances measured from top of rail (TOR) shall be 27'.

5.6 HSR Stations

1. In accordance with Engineering Directive Letter '2017-03-06-01 Rev 4', HSR Platform tracks shall be designed to allow 1,400' clear track from the fouling points of switch along adjacent lines; and
2. High-level platform face shall be as long as possible up to 1,400', but with a minimum length of 800'.

5.7 Caltrain Stations

1. There shall be no requirement for passing tracks to be provided at stations between San Jose and Gilroy;
2. Low level platforms shall be provided between the two electrified tracks for use by Caltrain and shall be provided to meet the 'Caltrain Design Criteria, Chapter 3 – Stations and Facilities';
3. Passenger access and egress shall be provided by pedestrian overpasses or underpasses and ramps to the platforms;
4. Pedestrian grade crossings shall not be allowed at station locations except at existing road / vehicle grade crossing;
5. Caltrain platform lengths shall be environmentally cleared for 700' ; and
6. A three-track gantry with OCS poles located outside the tracks is preferred. If site conditions require the use of OCS poles located in the middle of the platform, this shall be approved by the Rail Group prior to proceeding with design.

5.8 Grade Crossings

1. All at-grade road crossings shall be closed or converted to four-quadrant gates with channelization;
2. Where existing grade crossings have gates across adjacent pedestrian crossings these shall be provided;
3. At-grade pedestrian only crossings shall be closed and/or replaced with grade separated crossings;
4. The Rail Group shall take the lead role in coordinating with FRA/CPUC regarding requirements for at-grade crossings in this corridor;
5. The Regional team shall be responsible for environmental clearance of four-quadrant gates with channelization, or closing of grade crossings as applicable;
6. The Regional team shall be responsible for analysis of roadway impacts and modifications;
7. The Regional team shall be responsible for grade crossing gate downtime analysis;
8. The Regional team shall be responsible for all interfaces with local authorities, and Caltrans, with regards to modified road layouts associated with grade crossing modifications; and
9. The Regional team shall be responsible for environmental clearance of land associated with four-quadrant gate operational equipment located at each grade crossing.

5.9 Utilities

1. The Regional team shall be responsible for the identification and proposed relocation of all existing utilities including any required ROW impacts.
2. Opportunities for shared use of cable ducts shall be referred to the Rail Group on a case by case basis.

6 SYSTEM SITE CRITERIA

6.1 Traction Power

1. Site locations
 - a. TPS locations shall be arranged, TPSS – PS(x) – SWS – PS(y) – TPSS, with x & y indicating the number of PS locations based on the distances involved;
 - b. Distances between TPSS locations shall be approx. 30miles \pm 20%;
 - c. Distances between TPSS and SWS shall be approx. 15miles \pm 25%;
 - d. Distances between TPSS and PS, SWS and PS, PS and PS shall be approx. 5miles +50% / -10%;
 - e. If any greater variance in distances is required, this shall be agreed with the Rail Group;
 - f. TPSS locations shall be located adjacent to or near existing PG&E 115kV/230kV transmission lines or switching stations wherever possible;
 - g. The Caltrain facilities 'TPSS 2', located at approx. MP46 and 'PS-7', located at approx. MP49, near Michael Yard, shall be assumed to be fixed points;
 - h. 'TPSS 5' east of the Pacheco Pass tunnel and west of Interstate 5 shall be assumed to be a fixed point; and
 - i. For staging purposes, the site of 'TPSS 4' shall be on the portion of the ROW between San Jose and Gilroy that is assumed to be electrified in the initial stage so power can be supplied to the railroad operating in 2027;
2. Sites are to be sized;
 - a. Paralleling Station (PS) 120'x80';
 - b. Switching Station (SWS) 160'x90';
 - c. Traction Power Sub Station (TPSS) 200'x160'; and
 - d. Any variance to these sizes shall to be agreed with the Rail Group prior to progressing;
3. Paved access;
 - a. To be provided to facilitate both construction and ongoing emergency and maintenance access; and
 - b. Parking at the system sites shall be in addition to the system facility size and as follows:
 - i. Two parking spaces shall be provided at each TPSS location; and
 - ii. Two parking spaces shall be provided at each PS or SWS location.
4. Phase breaks;
 - a. Shall be positioned at TPSS and SWS locations; and
 - b. The track gradient at phase break locations shall not exceed 0.6% for 4,000' (centred at the phase break location).

6.2 Communications / Radio Sites

1. System radio sites may be co-located with traction tower facilities;
2. Stand-alone radio sites shall be 40' by 25' (Per NTD 6);
3. System radio sites shall be 20' by 15' (when located as part of the combined system site);
4. System radio sites shall be cleared for the installation of radio masts up to 190' in height from ground level (NTD 6);
5. Suitability of all radio towers shall be investigated via FCC's TOWAIR tool (Per NTD 9); and
6. A single parking space shall be provided at each Stand-alone radio site location.

6.3 Automatic Train Control (ATC)

1. ATC system sites shall be located adjacent to where electrified tracks have interlockings.
2. ATC sites shall be 70'x 35'
3. Environmental clearance for ATC system sites shall be undertaken at;
 - a. Tamien Station;
 - b. Michael Yard;
 - c. Capitol Station;
 - d. Morgan Hill Station;
 - e. San Martin Station;
 - f. Gilroy Station; and
 - g. Other locations where required.
4. An access road and one parking space shall be provided at each ATC location.

6.4 Positive Train Control

1. Environmental clearance for PTC system sites shall be undertaken where non-electrified tracks have interlockings at;
 - a. Gilroy Station;
 - b. Coyote Siding;
 - c. Capitol Station;
 - d. Michael Yard; and
 - e. Other locations where required.
2. PTC system sites shall be 20' x 30'; and
3. One parking space for a single pick-up truck shall be provided at each location.

6.5 Grade Crossings

1. Each grade crossing shall require a 10' by 10' flat level area located at one corner of the grade crossing for the erection of an 8' x 8' x 8' equipment cubicle;
2. The location of the cubicle shall not obscure visibility to either road users, pedestrians or train operators / engineers;
3. One parking space for a single pick-up truck shall be provided at each location;
4. The area shall be safely accessible for maintenance; and
5. Barriers shall be provided across sidewalks to prevent pedestrian access to the ROW when the grade crossing gates are down.



Fig 1 – Typical quad-gate equipment layout.

7 APPENDIX 1



Memorandum

DATE: July 27, 2018
TO: Frank Vacca, Director, Rail Group
FROM: Paul Hebditch, Lead Operations Planner, Rail Group
CC: Rebecca Kohlstrand, John Popoff, Simon Whitehorn, Boris Lipkin
SUBJECT: DRAFT – Operational Planning Analysis – San Francisco to Gilroy – REVISED

Purpose

This memo provides information pertaining to the operational planning analysis that has been undertaken to determine a schedule that may be operated once high-speed rail services commence operation between San Francisco and Gilroy as detailed in the California High-Speed Rail Authority (the Authority) 2018 Business Plan.

The memo includes an illustrative schedule¹ showing a two-hour peak period service plan for full Phase 1 operations commencing in 2033. The Authority do not currently anticipate an increase in the level of high-speed train operations between San Francisco and San Jose beyond that shown for full Phase 1.

The memo also describes the key track and system infrastructure parameters required to support the illustrative schedule.

Train service planning

The Authority and Caltrain have been meeting on a regular basis for several years to develop options for blended operations. The most recent work has been developed through joint working led by an independent rail timetabling consultancy.

¹ The schedule is illustrative as there may be variations in stopping patterns and trip times based upon refinements in information in some areas – e.g. market demand, trainsets, signal system, etc.



The working group has agreed upon the assumptions and parameters referred to below and used modern timetabling modelling software to refine its outcomes.

Caltrain and their tenants

Following the Peninsula Corridor Electrification Program, Caltrain will increase their peak train service frequency to 6 trains per hour per direction (tphpd) between San Francisco and San Jose. It is this level of service that has been used in development of the service plans for all phases of high-speed train operation ramp-up. Based upon input from Caltrain, some stopping patterns have been changed to better meet expected market demand.²

Caltrain also currently operate three trains from Gilroy to San Jose in the morning peak and three trains from San Jose to Gilroy in the evening peak. All these services stop at all the intermediate stations. Once the Authority have completed the upgrade and electrification of two tracks in the current Union Pacific Rail Road (UPRR) right-of-way between CP Lick and Gilroy, there will be 12 train slots per hour per direction available for electric trains. Eight of these will be utilized by high-speed electric train services running non-stop between San Jose and Gilroy.

The remaining four train slots will be available for electric trainsets to operate to provide services between San Jose and Gilroy. These train slots will reduce journey time between San Jose and Gilroy by 27 minutes over today's service but, will only be able to call at 3 of the 5 intermediate stops. Therefore, to provide the same level of service as today will require 6 skip-stop trains to operate.

Capitol Corridor services operate between CP Coast and San Jose. Provision for up to 2 tphpd have been included in the assessment of platform capacity at San Jose station.

Altamont Corridor Express (ACE) services operate between CP Coast and Michael Yard at Tamien. Provision for up to 4 tphpd has been included in the assessment of platform capacity at San Jose station and of track capacity south of San Jose on the non-electrified tracks.

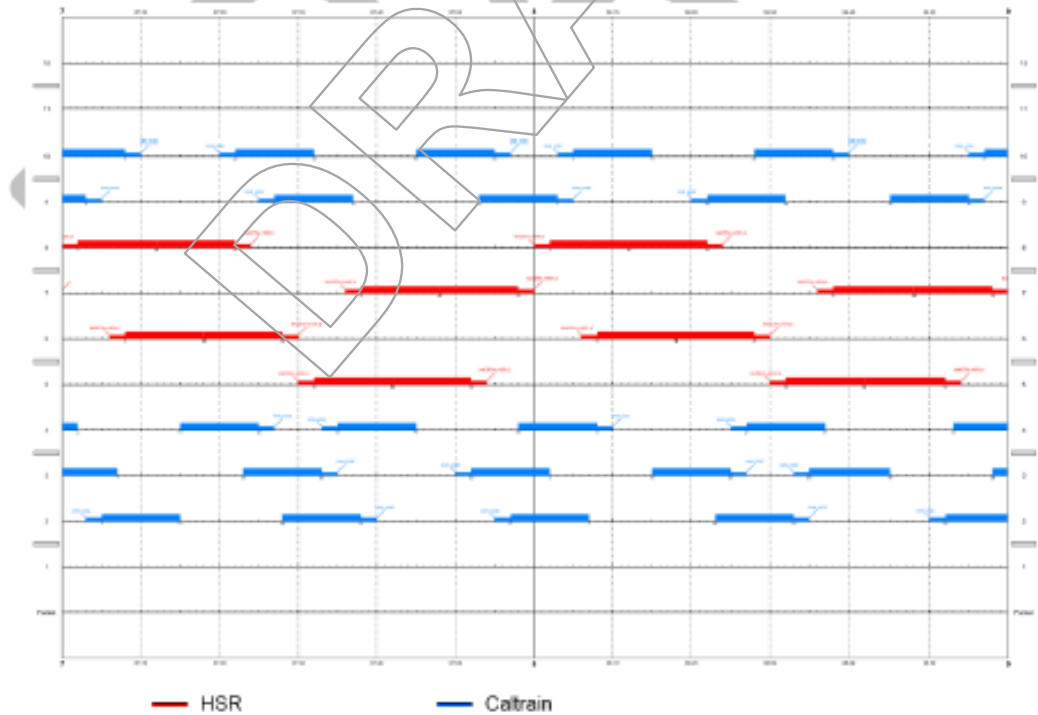
² Full details of market demand and stopping patterns will be in Caltrain's Business Plan due for publication in Q1 2019.

San Francisco – 4th and King Station

The illustrative schedule that has been developed can be accommodated in the existing layout at San Francisco 4th and King station. Proposed platform allocations are:

Platform	Track(s)	Platform height	Service(s)
1	1	Low level	Caltrain
	2	Low level	
2	3	Low level	Caltrain
	4	Low level	Caltrain
3	5	High level	High-speed
	6	High level	High-speed
4	7	High level	High-speed
	8	High level	High-speed
5	9	Low level	Caltrain
	10	Low level	Caltrain
6	11	Low level	
	12	Low level	

The diagram below shows station working in the peak hours 0700-0900:



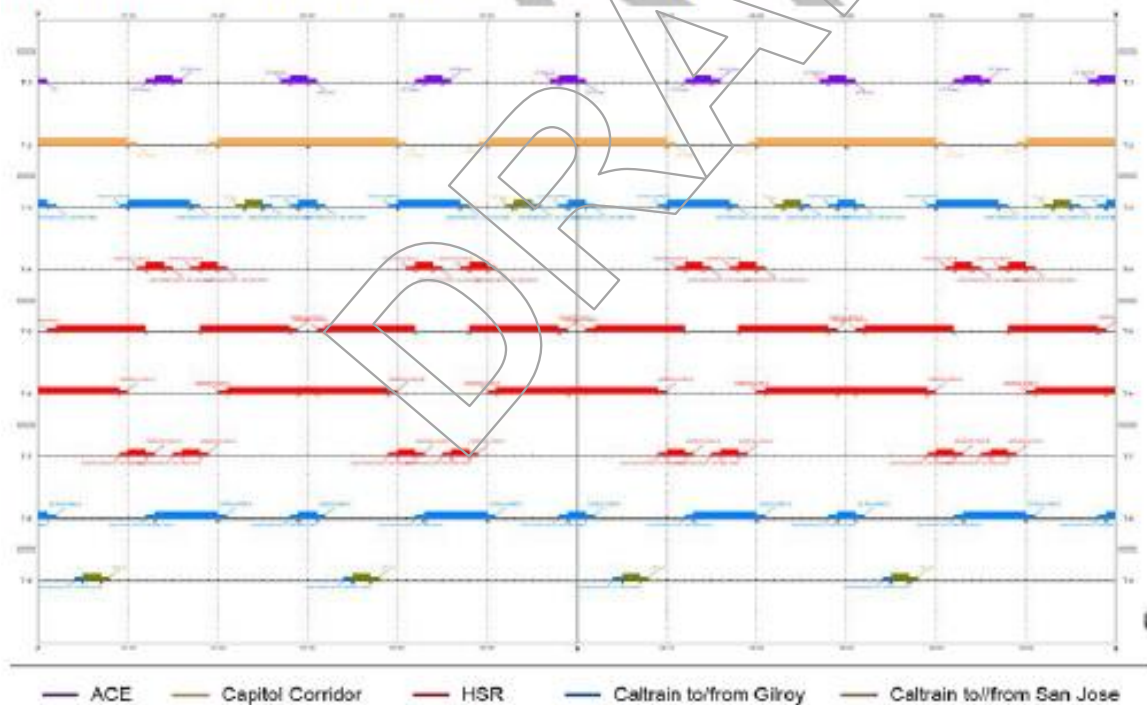
This proposal maintains Caltrain’s ability to undertake their non-revenue activities in the station area.

San Jose Diridon Station – platform arrangements

The illustrative schedule that has been developed can be accommodated in the existing layout at San Jose Diridon station together with the needs of Caltrain’s tenants. Platform allocations are:

Platform	Track(s)	Platform height	Service(s)
1	1	Low level	ACE and UPRR
2	2	Low level	Capitol Corridor
	3	Low level	Caltrain northbound
3	4	High level	HSR northbound thru
	5	High level	HSR San Jose – LAUS
4	6	High level	HSR San Jose – LAUS
	7	High level	HSR southbound thru
5	8	Low level	Caltrain southbound
	9	Low level	Caltrain southbound

The diagram below shows station working in the peak hours 0700-0900:



Requirements and service plans, Phase 1, 2033

Operating parameters

Signal headways:	3 mins
Dwell times:	High-speed rail, 2 mins Caltrain, 1 min at major stations, 45 secs at minor stations
Train turnaround time:	20 mins for all operators
Trainsets:	High-speed rail, generic high-speed trainset Caltrain, Stadler KISS electric multiple units
Recovery time (pad):	10% distributed across the schedule

Infrastructure parameters

Tracks:	Two track railway with maximum available speed (MAS) up to 110mph ³
Traction power:	Overhead 25kV catenary system
Passing locations (existing):	Bayshore, Lawrence
Passing locations (new):	Millbrae
High-speed stations:	San Francisco 4 th and King ⁴ – 2 platforms, 4 tracks Millbrae – 1 platform, 2 tracks San Jose – 2 platforms, 4 tracks Gilroy - 2 platforms, 2 tracks

Peak⁵(off peak) operations

High-speed rail plans to operate:

- 4 (3) tphpd between San Francisco and southern California
 - all trains will call San Jose
 - 2 (2) tphpd will call at Millbrae
 - 1 (1) tphpd will call at Gilroy
- 3 (0) tphpd between San Jose and southern California
 - 1 (0) tphpd will call at Gilroy
- 1 (1) tphpd between San Jose and Merced, calling at Gilroy

³ Note that from CP Coast to San Jose Diridon station two non-electrified tracks are required for UPRR, ACE and Capitol Corridor services

⁴ Upon completion of the Downtown extension high-speed services will operate to/from the Salesforce Transit Center

⁵ Peak hours are 0600-0900 and 1600-1900

Illustrative Timetable – San Jose to Gilroy – 2033, 2040: Skip-Stop

Train/Type	SS-1	HSR	SS-2	HSR	SS-3	HSR	SS-1	HSR	SS-2	HSR	SS-3	HSR
SAN FRANCISCO / 4th AND KING	6:03	6:22	6:06	6:23	6:25	6:28	6:33	6:33	6:38	6:52	6:56	6:58
22nd STREET	6:07						6:37					
BAYSHORE					6:36						7:05	
SOUTH SAN FRANCISCO			6:18						6:48			
SAN BRUNO	6:16						6:46					
MILLBRAE	6:20	6:37	6:23		6:44		6:50		6:53	7:07	7:14	
BROADWAY					6:47						7:17	
BURLINGAME			6:27						6:57			
SAN MATEO	6:24		6:30				6:54		7:00			
HAYWARD PARK					6:52						7:22	
HILLSDALE			6:33		6:54				7:03		7:24	
BELMONT	6:30						7:00					
SAN CARLOS	6:33				6:58		7:03				7:28	
REDWOOD CITY			6:39		7:02				7:09		7:32	
ATHERTON			6:42						7:12			
MENLO PARK	6:39		6:45				7:09		7:15			
PALO ALTO	6:41		6:48		7:07		7:11		7:18		7:37	
STANDFORD STADIUM												
CALIFORNIA AVENUE	6:44				7:10		7:14				7:40	
SAN ANTONIO	6:48						7:18					
MOUNTAIN VIEW	6:51		6:56		7:15		7:21		7:25		7:45	
SUNNYVALE					7:19						7:49	
LAWRENCE			7:04						7:34			
SANTA CLARA	6:59						7:29					
COLLEGE PARK												
SAN JOSE - ARR	7:06		7:13		7:29		7:35		7:43		7:69	7:46
SAN JOSE - DEP	7:07	7:09	7:20		7:31		7:37		7:50		8:01	7:58
TAMMEN			7:24		7:36				7:54		8:05	
CAPITOL (HSR)			7:29						7:59			
BLOSSOM HILL (HSR)					7:42						8:12	
MORGAN HILL (HSR)			7:40						8:10			
SAN MARTIN (HSR)					7:54						8:24	
GILROY (HSR)		7:31	7:48		7:59		7:50		8:18		8:29	
				7:41			8:01			8:05		8:11
												8:20

Illustrative Timetable – San Jose to Gilroy – 2033, 2040: Skip-Stop

Train/pe	SS-1	HSR	SS-2	HSR	SS-3	HSR	SS-1	HSR	SS-2	HSR	SS-3	HSR	SS-1	HSR	SS-2	HSR	SS-3	HSR		
SAN FRANCISCO / 4th AND KING	7:03		7:06		7:25		7:33		7:38		7:56		7:56		7:56		7:56		7:58	
22nd STREET	7:07						7:37										8:05			
BAYSHORE					7:36															
SOUTH SAN FRANCISCO			7:18						7:48											
SAN BRUNO	7:16						7:46													
MILLBRAE	7:20		7:23		7:44		7:50		7:53		8:14				8:07		8:14			
BROADWAY					7:47												8:17			
BURLINGAME			7:37						7:57											
SAN MATEO	7:24		7:30				7:54		8:00											
HAYWARD PARK					7:52												8:22			
HILLSDALE			7:33		7:54				8:03								8:24			
BELMONT	7:30						8:00													
SAN CARLOS	7:33				7:58		8:03										8:28			
REDWOOD CITY			7:35		8:02				8:09								8:32			
ATHERTON			7:42						8:12											
MENLO PARK	7:39		7:46				8:09		8:15											
PALO ALTO	7:41		7:48		8:07		8:11		8:18								8:37			
STANDFORD STADIUM																				
CALIFORNIA AVENUE	7:44				8:36		8:14				8:40									
SAN ANTONIO	7:48						8:18													
MOUNTAIN VIEW	7:51		7:56		8:15		8:21		8:25								8:45			
SUNNYVALE					8:19												8:49			
LAWRENCE			8:04				8:29		8:34											
SANTA CLARA	7:59																			
COLLEGE PARK																				
SAN JOSE - ARR	8:06		8:13		8:29		8:36		8:43		8:59		8:40		8:40		8:59		8:45	
SAN JOSE - DEP	8:07		8:20		8:31		8:37		8:50		9:01		8:42		8:42		9:01		8:48	
TAMEN			8:24		8:35				8:54		9:05									
CAPITOL (HSR)			8:29						8:59											
BLOSSOM HILL (HSR)					8:42												9:12			
MORGAN HILL (HSR)			8:40						9:10											
SAN MARTIN (HSR)					8:54												9:24			
GILROY (HSR)			8:48		8:59		9:01		9:18		9:29		9:05		9:05		9:29		9:11	
					8:36		8:50		8:41		8:50		9:01		9:18		9:29		9:11	
					8:36		8:50		8:41		8:50		9:01		9:18		9:29		9:11	

Illustrative Timetable – San Jose to Gilroy – 2033, 2040: Skip-Stop

Train/pe	SS-3	HSR	HSR	SS-2	HSR	HSR	SS-1	HSR	SS-3	HSR	HSR	SS-2	HSR	HSR	SS-1
GILROY (HSR)	6:31	6:40	6:48	6:42	6:54	6:59			6:01	6:10	6:18	6:12	6:24	6:29	SS-1
SAN MARTIN (HSR)	6:37								6:07						
MORGAN HILL (HSR)				6:51								6:21			
BLOSSOM HILL (HSR)	6:49								6:19						
CAPITOL (HSR)				6:02								6:32			
TAMMEN	6:56			6:07					6:26			6:37			
SAN JOSE - ARR	6:59	6:02	6:12	6:10	6:18	6:21	6:23	6:32	6:29	6:42	6:48	6:40	6:51	6:53	
SAN JOSE - DEP	6:01	6:14	6:20	6:17	6:20		6:25	6:31	6:31	6:44	6:50	6:47	6:56	6:56	
COLLEGE PARK															
SANTA CLARA							6:31								7:01
LAWRENCE				6:37								7:00			
SUNNYVALE	6:11								6:41						
MOUNTAIN VIEW	6:16			6:36			6:39	6:45	6:45			7:06			7:09
SAN ANTONIO							6:42								7:12
CALIFORNIA AVENUE	6:19						6:45	6:49							7:16
STANDFORD STADIUM															
PALO ALTO	6:23			6:42	6:49	6:53	6:49	6:53				7:12			7:19
MENLO PARK				6:46	6:51	6:51	6:51	6:51				7:16			7:21
ATHERTON				6:48	6:51	6:51						7:18			
REDWOOD CITY	6:28			6:51	6:51	6:51			6:58			7:21			
SAN CARLOS	6:31						6:57	7:01							7:27
BELMONT							7:00	7:06							7:30
HILLSDALE	6:36			6:57	7:00	7:06			7:06			7:27			
HAYWARD PARK	6:38								7:08						
SAN MATEO				7:00	7:03	7:03	7:06	7:06				7:30			7:36
BIURLINGAME				7:03	7:03	7:03						7:33			
BROADWAY	6:43								7:13						
MILLBRAE	6:46			7:07	6:54	6:54	7:10	7:16				7:37	7:24		7:40
SAN BRUNO							7:14								7:44
SOUTH SAN FRANCISCO				7:12								7:42			
BAYSHORE	6:58								7:28						
22nd STREET							7:23								
SAN FRANCISCO / 4th AND KING	7:05		7:02	7:22	7:08		7:27	7:35		7:32	7:38	7:52	7:38		7:57

Illustrative Timetable – San Jose to Gilroy – 2033, 2040: Skip-Stop

Train/pc	SS-3	HSR	HSR	SS-2	HSR	HSR	SS-1	HSR	SS-3	HSR	HSR	SS-2	HSR	HSR	SS-1	SS-1	SS-2	HSR	SS-1	
GILROY (HSR)	6:31	6:40	6:48	6:42	6:54	6:59	7:01	7:10	7:18	7:24	7:29	7:12	7:18	7:24	7:29	SS-1				
SAN MARTINI (HSR)	6:37						7:07													
MORGAN HILL (HSR)				6:51								7:21					7:21			
BLOSSOM HILL (HSR)	6:49						7:19													
CAPITOL (HSR)				7:02													7:32			
TAMMEN	6:56			7:07			7:26					7:37								
SAN JOSE - ARR	6:59	7:02	7:12	7:10	7:18	7:21	7:23	7:32	7:42	7:48	7:51	7:40	7:42	7:48	7:51					
SAN JOSE - DEP	7:01		7:14	7:17	7:20		7:25	7:31	7:44	7:50		7:47	7:44	7:50						
COLLEGE PARK																				
SANTA CLARA							7:31													8:01
LAWRENCE				7:30								8:00								
SUNNYVALE	7:11																			
MOUNTAIN VIEW	7:16			7:36			7:39	7:45				8:06								8:09
SAN ANTONIO							7:42													8:12
CALIFORNIA AVENUE	7:19						7:45	7:49												8:15
STANFORD STADIUM																				
PALO ALTO	7:23			7:42			7:49	7:53				8:12								8:19
MENLO PARK				7:46			7:51					8:16								8:21
ATHERTON				7:48								8:18								
REDWOOD CITY	7:28			7:51				7:58				8:21								
SAN CARLOS	7:31						7:57	8:01												8:27
BELMONT							8:00													8:30
HILLSDALE	7:36			7:57				8:06				8:27								
HAYWARD PARK	7:38							8:08												
SAN MATEO				8:00			8:06					8:30								8:36
BURLINGAME				8:03								8:33								
BROADWAY	7:43							8:13												
MILLBRAE	7:46			8:07	7:54		8:10	8:16				8:37	8:24							8:40
SAN BRUNO							8:14													8:44
SOUTH SAN FRANCISCO				8:12								8:42								
BAYSHORE	7:58							8:28												
22nd STREET							8:23													8:53
SAN FRANCISCO / 4th AND KING	8:05		8:02	8:22	8:08		8:27	8:36	8:32	8:38		8:52								8:57

8 APPENDIX 2

Track schematic showing 2033 Gilroy Station Configuration with 'RELOCATED CALTRAIN STORAGE YARD' shown.

