LINK21

CONNECT NORTHERN CALIFORNIA

CONCEPT PLANNING AND ENGINEERING SUMMARY REPORT

DRAFT

June 2024

DRAFT

BART

CAPITOL CORRIDOR

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ACRONYMS AND ABBREVIATIONS

ACRONYM/ABBREVIATION	DEFINITION
BART	San Francisco Bay Area Rapid Transit District
CCJPA	Capitol Corridor Joint Powers Authority
BC	Business Case
CPER	Concept Planning and Engineering Report
JLS	Jack London Square
MTC	Metropolitan Transportation Commission
PAX	Pennsylvania Avenue Extension
PBCR	Preliminary Business Case Report
P&E	Planning and Engineering
ROW	right-of-way
RR	Regional Rail
RTPs	Regional Transportation Plans
SEM	Sequential Excavation Methods
SOMA	South of Market
STC	Salesforce Transit Center
TBM	Tunnel boring machine
UPRR	Union Pacific Railroad

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GLOSSARY OF TERMS

Route Alignment

TERM	DEFINITION
Alignment	Route centerline and station areas that serve as the basis for development of service plans and engineering cost estimates.
Grade Separation	A method of aligning a junction of two or more surface transport axes at different heights (grades) so that they will not disrupt the traffic flow on other transit routes when they cross each other.

Track

TERM	DEFINITION
Broad Gauge	A BART specific rail infrastructure used within its own system, referencing the width of the tracks between the inner sides of the two parallel rails, which is 5 feet 6 inches wide.
Crossover	A section of track where two parallel tracks cross each other at the same level, used to enable trains to move from one track to another, allowing for various operational needs such as changing tracks, passing other trains, or accessing different parts of a rail network.
Standard Gauge	The universally adopted fixed distance between the inner sides of the two parallel rails on a railroad track, which is typically 1,435 millimeters (4 feet 8.5 inches) wide.
Storage Tracks	A section of railroad track that is specifically designated for the temporary parking and storage of trains, railcars, or locomotives when they are not in active service.
Tailtrack Cavern	An underground space or chamber at the end of a railway track that provides a storage area where trains can be parked when they are not in service.
Turnback Track	A section of track or a special facility where a train can reverse direction and travel back along its original route.
Turnout	A mechanical installation that allows trains to change tracks from one line to another.

Tunnels/Construction Methods

TERM	DEFINITION
Cut and Cover	A typical construction method used for stations, turnouts and portals. With cut and cover (excavation) methods, excavation proceeds from the surface using diaphragm walls (ridged or with internal bracing) for initial support, control of groundwater inflow and mitigation for movement of adjacent buildings.
Mined Tunnel/Station	Where geologic conditions allow a deep tunnel or station to be mined using Sequential Excavation Methods (SEM). In this method, surface disturbance is greatly reduced, and the station can more easily be located outside the city streets.
Portal	A transition structure that ties a single bore or twin bored tunnel to tracks at the ground surface.
Single Bore Tunnel	A single, large diameter tunnel boring machine (TBM)-bored tunnel carrying two guideways in a side-by-side configuration separated by a vertical partition wall. Single-bore tunnels are planned for the bay crossing tunnel and may be better suited for meeting operational and train storage requirements
Twin Bore Tunnel	Twin, TBM-bored tunnels carrying a single guideway in each tunnel. Twin-bores are typically used for the on-shore tunnels for greater alignment flexibility, shallower profiles and to facilitate adoption of center-platform stations.

Stations

TERM	DEFINITION
At-Grade Station	At-grade stations are surface stations. They are limited in the Link21 Study Area/concepts and therefore location specific.
Pedestrian Concourse	Station level fare payment, barriers and gates that control passenger access to the train platform.
Underground Station	Underground Stations are below-grade and are the primary type of station within the current Link21 study area/concepts. These stations require a concourse (fare payment, barrier, gates), and vertical circulation elements (escalator, elevator, stairs and ramps) to access the train platform below ground.
Vertical Circulation Elements	The infrastructure and mechanisms used to move passengers between different levels of the station typically includes elevators, escalators, stairways, and accessibility features such as ramps.

Service Terms

TERM	DEFINITION
High Speed Rail	The California High-Speed Rail program is a statewide effort to implement and operate high-speed intercity rail service along grade-separated and electrified tracks between San Francisco and Los Angeles via the Central Valley. In the Bay Area, high-speed rail would operate along the Caltrain corridor and use the future Caltrain Downtown Rail Extension to terminate at the Salesforce Transit Center in downtown San Francisco.
Intercity/Express rail service	A type of service for medium to long trips that connects regions, as well as urban and rural communities, at lower frequencies and higher average speeds compared with Urban/Metro rail services. Operators like Capitol Corridor, Amtrak, Altamont Corridor Express, and others provide this service on shared Regional Rail/standard-gauge tracks sometimes owned by private rail.
In-vehicle travel time	The duration passengers spend traveling inside a transit vehicle, such as a bus or train, from the point of boarding to the point of alighting, excluding any waiting time or transfer time.
Redundancy	The intentional inclusion of backup systems to ensure the continued operation of the system if a particular route becomes unavailable due to failures, disruptions, or unforeseen events.
Urban/Metro rail service	A type of service that operates within metro regions at higher frequencies and medium average speeds. BART currently provides this service. Caltrain will provide this type of service with its modern, electrified trains starting in 2024.
Viriato Model	A timetable model that determines travel time estimates and schedules with the input of service network patterns and route alignments with stations and grade, curvature and maximum speed.

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1. BACKGROUND

The Link21 Program (Link21) is a generational initiative that includes a second passenger rail crossing across the San Francisco Bay to transform the Northern California Megaregion's passenger rail network into a faster, more integrated system that provides safe, efficient, and affordable travel for everyone. At the heart of Link21 is a new passenger rail crossing between San Francisco and Oakland.

The Concept Planning and Engineering Report (CPER) is a document to support the new passenger rail crossing technology decision, selecting between BART and Regional Rail technologies. The CPER is complementary to the *Preliminary Business Case Report* (PBCR). It provides information on the concepts made possible by using each technology in a new San Francisco Bay crossing, the process to develop concepts, and a description of the Representative Concepts. The differences between the two technologies and the concept evaluation process are described in the PBCR.

2. CONCEPT DEVELOPMENT PROCESS

The overall concept development process involved a wide range of inputs and considerations which are described in the PBCR.

A range of Concepts was developed for the Link21 Program to test different ways that BART and Regional Rail service could be provided in response to market demand. Each Concept included an assessment of the infrastructure required to provide that service including different arrangements of alignments and station locations. Concepts were developed and tested over three rounds of planning, engineering, initial cost estimating and evaluation. The Concepts were also shared with the public and stakeholders. This analysis helped narrow the range of Concepts being studied and supported the development of two Representative Concepts, one each for BART and Regional Rail. The Representative Concepts were used to inform the Preliminary Business Case, allowing a comparison to be made of the performance of the two technologies in meeting the goals and objectives, and to facilitate a choice of technology.

The Representative Concepts are not projects; they only represent one possible arrangement of service and infrastructure. Once the technology choice is made, the Link21 team will define the Preliminary Project. This work will draw on the analysis from the concept development process to refine service, alignment, and station location options to move to a project definition. This work will include additional public and stakeholder engagement.

2.1. BART Representative Concept

OVERVIEW

This Representative Concept would construct a new BART tunnel under the San Francisco Bay between San Francisco (Mission Bay and South of Market [SOMA] neighborhoods), Alameda, and Oakland. In San Francisco, this concept terminates at a new underground SOMA (3rd and Mission) station, providing a new transfer to the existing BART line at Montgomery station. From downtown San Francisco, the concept extends through new underground stations at 4th & Townsend and Mission Bay/UCSF and crosses under the San Francisco Bay to a new underground station in Alameda at Main and Atlantic. It then travels north to a new underground Jack London Square BART station, which would provide a transfer opportunity to a relocated Regional Rail station in Jack London Square at the Howard Terminal site within the Port of Oakland.

The route then splits in the north and south directions. The northern route would continue to a new underground Downtown Oakland BART station and onward to tie-in the existing BART Red, Orange and Yellow lines south of MacArthur BART Station. The southern route would connect to the existing BART Blue, Green and Orange lines near the San Antonio neighborhood of Oakland. Improvements would also be made to the Regional Rail network to enable improved connectivity to BART, including the extension of San Joaquin service to the relocated Jack London Square Station as well as improved BART to Regional Rail transfers at Coliseum Station.

Figure 2-1 provides a visual overview of the BART Representative Concept.

BART REPRESENTATIVE CONCEPT OVERVIEW

CONCEPTUAL. SUBJECT TO CHANGE. NOT TO SCALE.

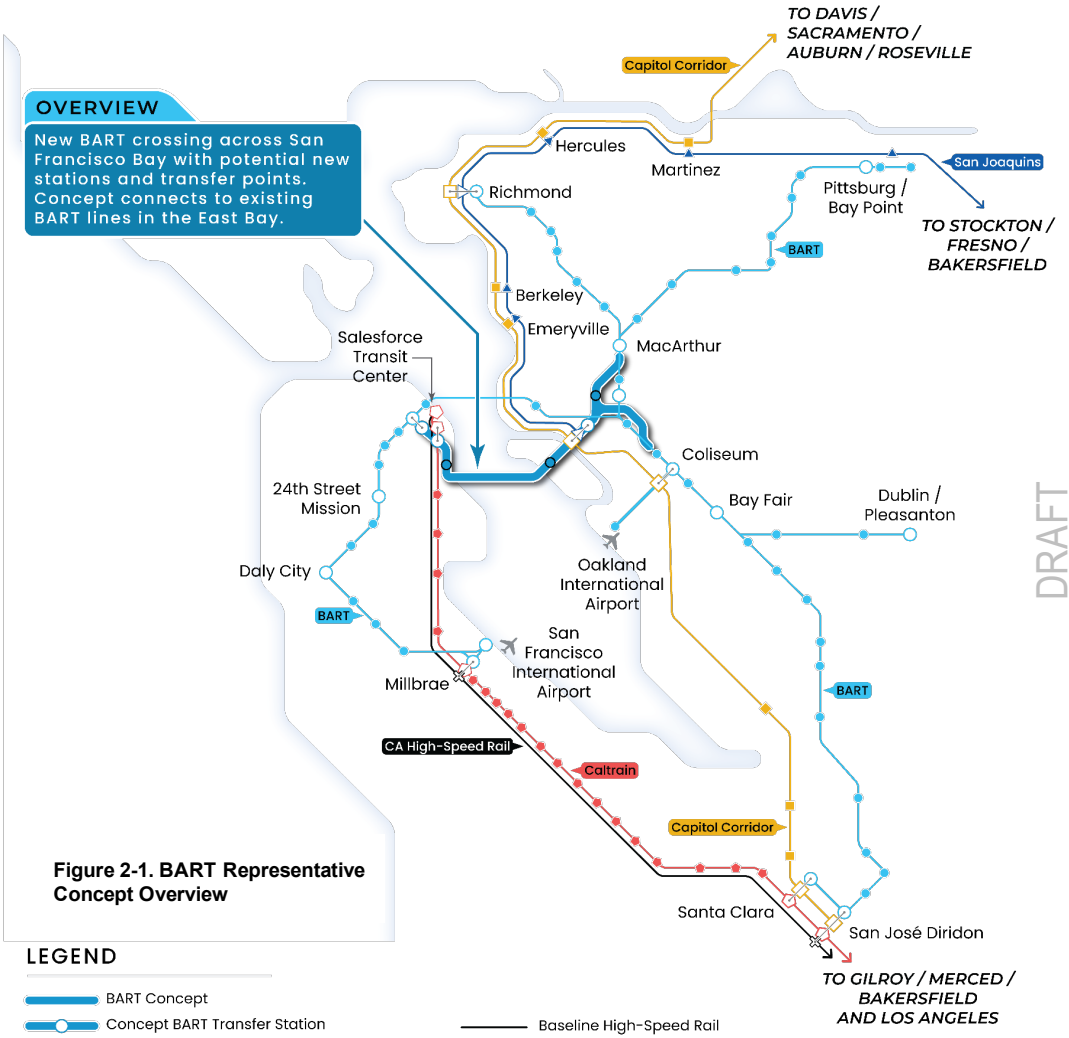


Figure 2-1. BART Representative Concept Overview

LEGEND

- BART Concept
- Concept BART Transfer Station
- Concept BART Station
- Baseline BART
- Baseline BART Transfer Station
- Baseline BART Station
- Baseline Caltrain
- Baseline Caltrain Transfer Station
- Baseline Caltrain Station
- Baseline High-Speed Rail
- Baseline High-Speed Rail Transfer Station
- Baseline Capitol Corridor
- Baseline Capitol Corridor Transfer Station
- Baseline Capitol Corridor Station
- Baseline San Joaquins
- Baseline San Joaquins Transfer Station
- Baseline San Joaquins Station

Note: Monterey County Rail Extension, Altamont Corridor Express (ACE) and Sonoma-Marin Area Rail Transit (SMART) not shown

SERVICE

The Baseline BART concept is a 5-route, 10-min base frequency service providing 30 trains per hour (tph) through the existing transbay crossing. The BART Representative Concept would add four new BART routes to the Baseline BART concept in a new crossing, connecting from San Francisco to all East Bay lines. Each of these new routes would operate with a 10-min base frequency, providing an additional 24tph across the bay.

Regional Rail service would be provided at Baseline levels. Peninsula Corridor service during peak periods would include High Speed Rail (HSR) at 4tph and Caltrain at 8tph. Capitol Corridor would provide hourly service between Sacramento and San José, with limited additional service between Auburn and Jack London Square (JLS). San Joaquin service would be extended from its Baseline terminus at Martinez to JLS station, which offers San Joaquin riders a convenient transfer to BART at JLS.

Figure 2-2 and **Table 2-1** summarize the routes and frequencies for the BART Representative concept.

BART REPRESENTATIVE CONCEPT SERVICE MAP

CONCEPTUAL. SUBJECT TO CHANGE. NOT TO SCALE.

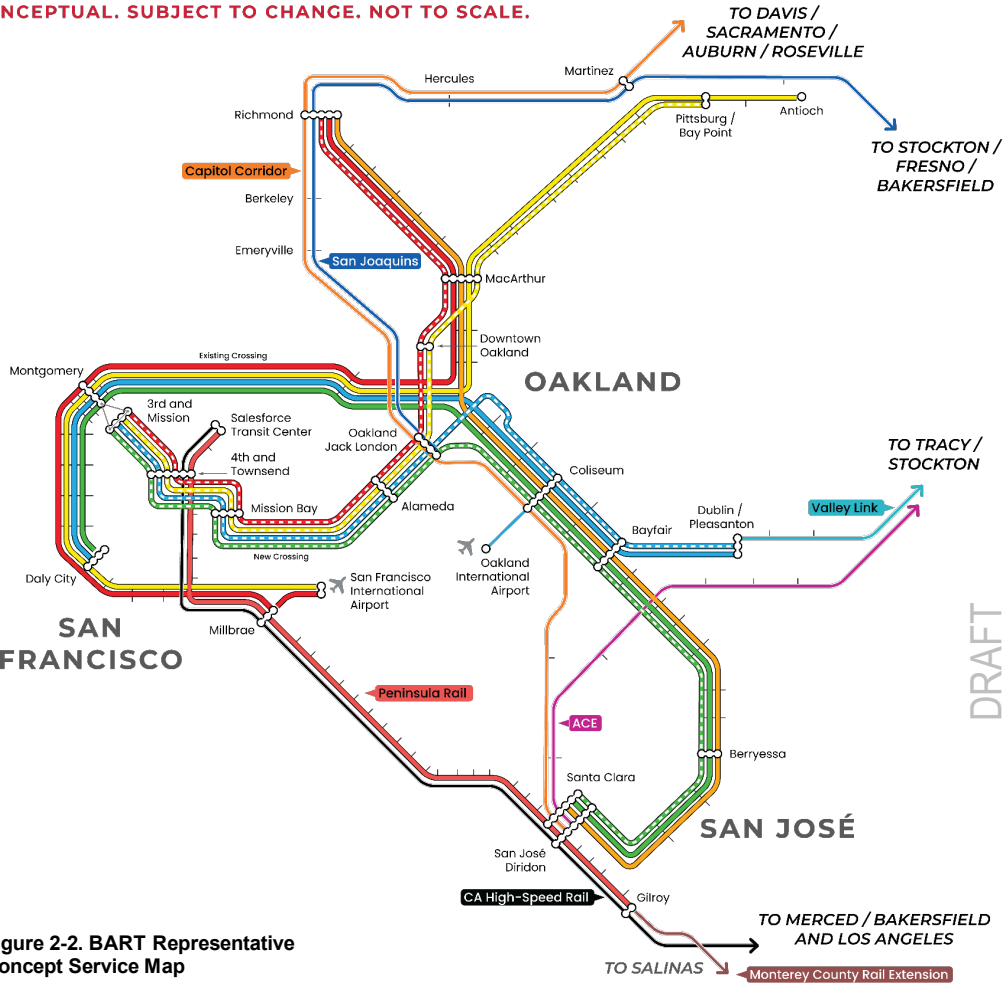


Figure 2-2. BART Representative Concept Service Map

Urban | Metro Service Routes

- BART Concept (3rd and Mission - Richmond)
- BART Concept (3rd and Mission - Pittsburg / Bay Point)
- BART Concept (3rd and Mission - Dublin / Pleasanton)
- BART Concept (3rd and Mission - Santa Clara)
- BART (Millbrae - Richmond)
- BART (SFO Airport - Antioch)
- BART (Daly City - Dublin / Pleasanton)
- BART (Daly City - Berryessa)
- BART (Richmond - Santa Clara)
- Peninsula Rail

Intercity | Express Service Routes

- California High-Speed Rail
- Capitol Corridor
- San Joaquins
- Valley Link
- Altamont Corridor Express (ACE)
- Monterey County Rail Extension
- Transfer Station Between Service Providers

Table 2-1. Routes and Frequencies for BART Representative Concept

SERVICE TYPE	ROUTE	AVERAGE TIME BETWEEN TRAINS IN AM PEAK PERIOD (*CHANGE FROM BASELINE*)
Urban/Metro - BART	Baseline BART routes (except for Daly City ⇔ Santa Clara route)	10 minutes (no change)
Urban/Metro - BART	Daly City ⇔ Berryessa (was Daly City ⇔ Santa Clara route, truncated to terminate at Berryessa instead of Santa Clara)	10 minutes (no headway change)
Urban/Metro - BART	3rd and Mission ⇔ Richmond	10 minutes (new service)
Urban/Metro - BART	3rd and Mission ⇔ Pittsburg/Bay Point	10 minutes (new service)
Urban/Metro - BART	3rd and Mission ⇔ Dublin/Pleasanton	10 minutes (new service)
Urban/Metro - BART	3rd and Mission ⇔ Santa Clara	10 minutes (new service)
Urban/Metro - RR	Baseline Peninsula Rail routes	Local-15 minutes, express-30 minutes *(no change)*
Intercity/Express - RR	Capitol Corridor - Auburn ⇔ Jack London Square	4 hours (existing JLS station replaced by new Howard Terminal station, no headway change)
Intercity/Express - RR	Capitol Corridor - Sacramento Valley ⇔ San José Diridon	1 hour (existing JLS station replaced by new Howard Terminal station, no headway change)
Intercity/Express - RR	San Joaquins - Bakersfield ⇔ Jack London Square	3 hours (extended from Martinez to JLS, no headway change)

With this concept, some trips would benefit from significant time savings. For example, passengers taking trips on BART from Jack London Square to Mission Bay get one-seat rides and cut their travel time by 25 minutes. Passengers taking trips on BART from Alameda to 4th & Townsend get one-seat rides and cut their travel time by 30 minutes. **Table 2-2** summarizes the key service benefits and example trips for the BART Representative Concept.

Table 2-2. Key Service Benefits/Example Trips for BART Representative Concept

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
Martinez/ Suisun City/ Fairfield/ Vacaville/ Davis/ Sacramento/ Roseville/ Auburn	Central Bay Area	▫ Improved connectivity between Intercity/ Express service (Capitol Corridor) and the Urban/Metro network (BART) with a new transfer point at Jack London Square Station. ▫ Approximately 20-25 minutes travel time savings to Alameda, Mission Bay (UCSF/Chase Center), and SF SOMA (Caltrain, Oracle Park).	▫ Martinez ⇨ Mission Bay – Route: Capitol Corridor ⇨ BART (transfer: Jack London Square) – In-vehicle travel time: reduced from 85 minutes to 60 minutes (25 minutes faster) – Transfer: reduced from two to one (one less transfer) ▫ Sacramento ⇨ Downtown San Francisco – Route: Capitol Corridor ⇨ BART (transfer: Jack London Square) – In-vehicle travel time: 130 minutes (no change) Transfer: one (no change)
Central Valley	Bay Area	▫ Direct Intercity/ Express service (San Joaquins) to Richmond, Berkeley, Emeryville, and Oakland. ▫ Improved connectivity between Intercity/ Express service (San Joaquins) and the Urban/Metro network (BART) with a new transfer point at Jack London Square Station.	▫ Stockton ⇨ Mission Bay – Route: ACE ⇨ Valley Link ⇨ BART (transfers: North Lathrop, Dublin/ Pleasanton) – In-vehicle travel time: reduced from 125 minutes to 110 minutes (15 minutes faster) – Transfer: reduced from three to two (one less transfer) ▫ Stockton ⇨ Downtown San Francisco

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
		▫ Approximately 15 minutes travel time savings to Alameda, Mission Bay (UCSF/Chase Center), and SF SOMA (Caltrain, Oracle Park). ▫ Peak frequency of BART service improves from every 10 minutes to every 5 minutes at Dublin/Pleasanton for connections with Valley Link.	– Route: ACE ⇨ Valley Link ⇨ BART (transfer: North Lathrop, Dublin/ Pleasanton) – In-vehicle travel time: 125 minutes (no change) Transfer: two (no change)
East Bay BART Stations	San Francisco and Peninsula	▫ New, direct Urban/Metro (BART) service to Mission Bay, SF SOMA (Caltrain, Oracle Park), saving 10 or more minutes for trips to/from these locations. ▫ Improved connectivity within Urban/Metro network (BART and Peninsula Rail) with a new transfer point at 4th & Townsend.	▫ Fremont ⇨ Mission Bay – Route: BART – In-vehicle travel time: From 60 minutes to 50 minutes (10 minutes faster) ▫ Transfer: From one to zero (one less transfer)
Richmond/ West Berkeley/ Emeryville/ Oakland	Peninsula	▫ Improved connectivity between Intercity/ Express service (Capitol Corridor) and the Urban/Metro network (BART) with a new transfer point at Jack	▫ Emeryville ⇨ Redwood City – Route: Emery Go-Round ⇨ BART ⇨ Peninsula Rail (transfers: MacArthur, 4th & Townsend)

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
		London Square Station as well as a new transfer point within Urban/Metro network (BART and Peninsula Rail) at 4th & Townsend.	– In-vehicle travel time: From 95 mins to 85 mins (10 mins faster) ▫ Transfer: Two (no change)
Alameda and Jack London Square	All Locations	▫ New, direct Urban/Metro (BART) service to all East Bay BART lines, as well as Mission Bay, SF SOMA (Caltrain, Oracle Park), and downtown San Francisco.	▫ Alameda ⇨ 4th & Townsend – Route: BART – In-vehicle travel time: From 40 mins to 10 mins (30 mins faster) Transfer: From two to zero (two less transfers) ▫ Jack London Square ⇨ Mission Bay – Route: BART – In-vehicle travel time: From 35 mins to 10 mins (25 mins faster) ▫ Transfer: From two to zero (two less transfers)
OAK Airport	Other Rail Stations	▫ New Urban/Metro (BART) service to Alameda, Mission Bay, SF SOMA (Caltrain, Oracle Park), saving 10 or more minutes for trips between these locations. ▫ Peak frequency increases with an additional 6 trains per hour on BART for trips between Coliseum Station and Stations on the	▫ Oak Airport ⇨ 4th & Townsend – Route: BART (OAK Airport Line) ⇨ BART (transfer: Coliseum) – In-vehicle travel time: From 40 mins to 30 mins (10 mins faster) ▫ Transfer: From two to one (one less transfer)

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
		Dublin/Pleasanton and Berryessa routes.	
SFO Airport	Other Rail Stations	▫ Improved access to BART Green and Blue line corridors with a new transfer between Caltrain and BART at 4th & Townsend	▫ SFO Airport ⇨ Davis – Route: BART ⇨ Capitol Corridor (transfer: Richmond) – In-vehicle travel time: 155 mins (no change) – Transfer: one (no change) ▫ SFO Airport ⇨ Oak Airport – Route: BART ⇨ Peninsula Rail ⇨ BART ⇨ BART (transfers: Millbrae, 4th & Townsend, Coliseum) – In-vehicle travel time: From 65 mins to 55 mins (10 mins faster) ▫ Transfer: From two to three (one more transfer, or no change with no travel time savings)
Other trips within the BART System	Other trips within the BART System	▫ Peak frequency increases with an additional 6 trains per hour on most East Bay BART lines.	

INFRASTRUCTURE

The BART Representative Concept includes infrastructure elements organized by geographic segment (East Bay Central, East Bay Inland, and San Francisco).

East Bay Central

The Alameda segment alignment would consist of two tracks in a twin-bore tunnel under Atlantic and Main, continuing across the Oakland Estuary. There would be one underground station in the segment: “Main & Atlantic Station”. Permanent surface structures would be constructed adjacent to the Alameda Station for transbay tunnel ventilation.

The West/Central Oakland segment alignment would consist of two tracks in a twin-bore tunnel under Martin Luther King Junior Way, continuing across San Pablo Ave to Interstate 980 continuing north to the existing BART tracks south of MacArthur Station. There would be two new underground stations (“Jack London Station” and “Downtown Oakland Station”). Portals for each tunnel that reach the surface near MacArthur Station would be located parallel to the existing BART tracks in the Interstate 980 median. A turnout box would be located north of the Jack London Station with twin-bore tunnels branching to the south and generally parallel with the existing BART line east of Lake Merritt Station.

Regional Rail would remain at grade through Jack London Square. A new transfer point between BART and Regional Rail would be created at the new Jack London BART Station by relocating the existing at-grade Amtrak station west along the Embarcadero between Castro and Clay Streets.

East Bay South

The San Antonio/Coliseum alignment would consist of two tracks in a twin-bore tunnel under Merritt Channel, along and under 8th Street to tie into the existing BART tracks. Tunnel portals that connect to the surface would be located parallel to the existing BART tracks west of the Merritt Channel.

San Francisco

The Downtown San Francisco/SOMA segment alignment would consist of two tracks in a twin-bore tunnel constructed by a tunnel boring machine (TBM) and would run under 3rd Street south of Market Street. Support facilities would include a crossover located south of the 3rd and Mission Station and tailtracks located north of Market Street along Geary Street.

There would be two underground stations in the segment: “3rd and Mission Station” (south of Market Street) with a transfer to existing BART Montgomery station via a pedestrian tunnel and “4th and Townsend Station” with a transfer to Caltrain and HSR.

The BART Representative Concept tailtrack cavern (enlarged tunnel) would extend further west from Market Street along Geary Street and end at Polk Street. There would

be three tracks in the cavern to facilitate operations and train storage along with a crossover at the east end and an egress and ventilation shaft at the west end. The tail tracks and additional crossover would also enhance flexibility in operations while not precluding a future BART Western SF extension as a separate project.

The Mission Bay segment alignment would consist of two tracks within a twin-bore tunnel under 4th Street, continuing across 16th Street to the transbay tunnel. There would be one underground station in the segment: "Mission Bay Station". Permanent surface structures would be constructed adjacent to the Mission Bay launch shaft for transbay tunnel ventilation.

The Bay Crossing segment alignment would consist of two tracks in a single-bore tunnel. Tunnel boring machine launch boxes would be included at either end of the crossing in Mission Bay and Alameda.

Additional Infrastructure

Additional infrastructure may include storage and maintenance facilities and turnback tracks. Turnback tracks are being considered north of the Pleasant Hill BART station to enable trains to truncate service and reverse direction and to provide temporary storage for trains. Storage and maintenance facilities may include storage tracks and yards where trains can park and be cleaned and maintained. Sizing of storage and maintenance facilities are based on fleet assumptions and will be updated in future work.

REGIONAL RAIL IMPROVEMENTS WITH A BART CONCEPT

The BART Representative Concept would include the following complementary improvements to the Regional Rail network:

- The existing Regional Rail station at Oakland Jack London would be relocated to the west to enhance transfers with BART.
- The Baseline assumes that San Joaquins services to and from Stockton would start and end at Martinez. These services would be extended to JLS, reducing the number of transfers for many riders.

In addition, the existing pedestrian connections between BART and Regional Rail would be improved at the Oakland Coliseum/Oakland Airport Connector station.

OPTIONS

Options will be considered in future work for alignment, track layout, potential station location, configuration, and additional features. Different options will be studied to evaluate the trade-offs between different alignments and station locations. **Figure 2-3** shows infrastructure options under consideration in future work for the BART Representative Concept.

BART REPRESENTATIVE CONCEPT INFRASTRUCTURE OPTIONS

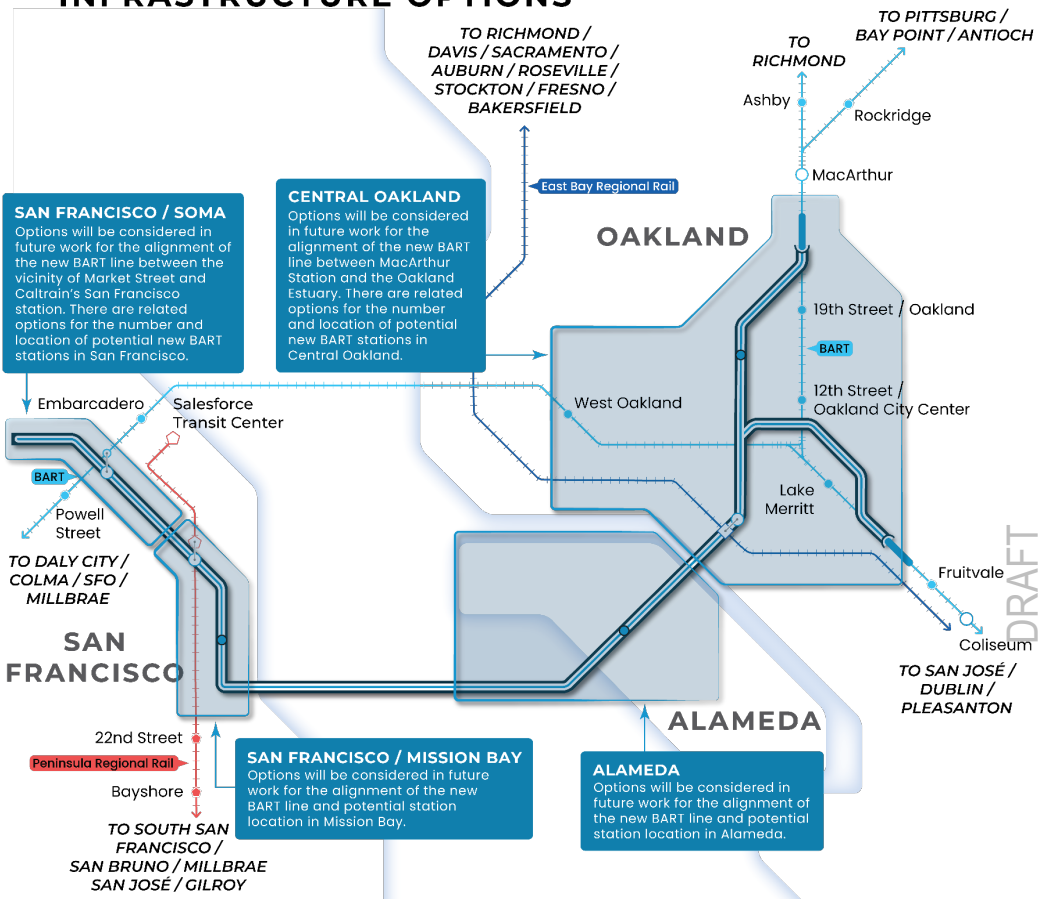


Figure 2-3. BART Representative Concept Infrastructure Options

LEGEND

- BART Concept (At or Above Grade)
- BART Concept (Below Grade)
- Concept Transfer Station
- Concept BART Station
- Baseline BART
- Baseline BART Transfer Station
- Baseline BART Station
- Baseline Peninsula Regional Rail
- Baseline Peninsula Regional Rail Transfer Station
- Baseline Peninsula Regional Rail Station
- Baseline East Bay Regional Rail
- Baseline East Bay Regional Rail Transfer Station
- Baseline East Bay Regional Rail Station

2.2. Regional Rail Representative Concept

OVERVIEW

This Representative Concept would construct a new Regional Rail tunnel under the Bay between San Francisco, Oakland, and Emeryville. In the west, Regional Rail service would connect to the Salesforce Transit Center and continue south down the Peninsula on the existing Caltrain line, including both Urban/Metro and Intercity/Express service. The rail tunnel would continue east under the Bay to a new underground station in Alameda at Main and Atlantic. Then the route would split in the north and south directions. The northern route would continue in a tunnel and then surface south of the Emeryville Station and continue to Berkeley and an improved station at Richmond with a transfer to BART. The southern route would continue in a tunnel to a new underground station at 12th Street / Oakland City Center with transfers to the existing BART station. The route would continue south in tunnels and surface in the San Antonio area of Oakland and would continue on dedicated tracks to an improved Coliseum station. Transfer between BART and Regional Rail would be available at the Salesforce Transit Center, via an underground pedestrian concourse connecting to the existing Embarcadero Station. Improvements would also be made to transfers to BART at Richmond and Coliseum.

Figure 2-4 provides a visual overview of the Regional Rail Representative Concept.

REGIONAL RAIL REPRESENTATIVE CONCEPT OVERVIEW

CONCEPTUAL. SUBJECT TO CHANGE. NOT TO SCALE.

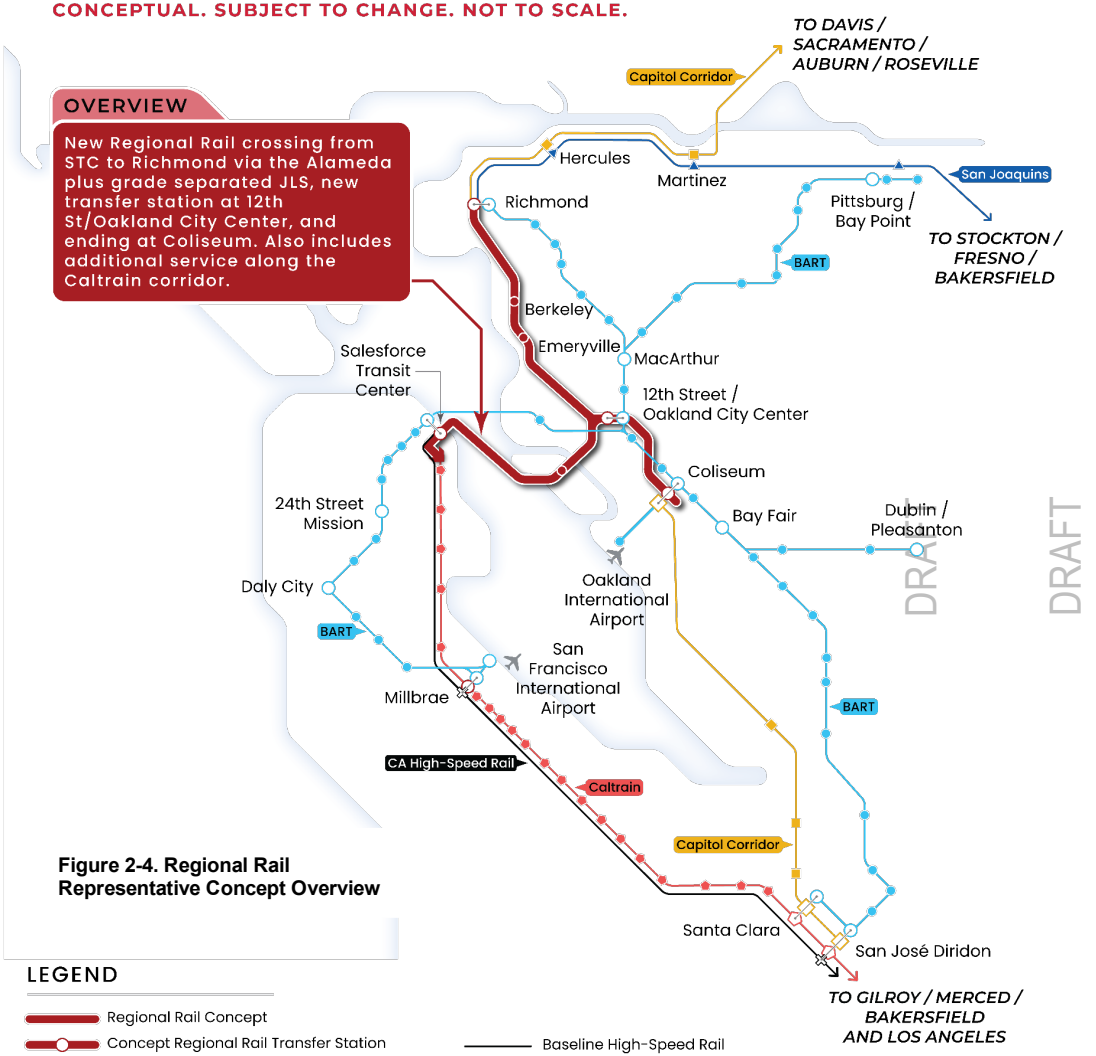


Figure 2-4. Regional Rail Representative Concept Overview

LEGEND

- Regional Rail Concept
- Concept Regional Rail Transfer Station
- Concept Regional Rail Station
- Baseline BART
- Baseline BART Transfer Station
- Baseline BART Station
- Baseline Caltrain
- Baseline Caltrain Transfer Station
- Baseline Caltrain Station
- Baseline High-Speed Rail
- Baseline High-Speed Rail Transfer Station
- Baseline Capitol Corridor
- Baseline Capitol Corridor Transfer Station
- Baseline Capitol Corridor Station
- Baseline San Joaquins
- Baseline San Joaquins Transfer Station
- Baseline San Joaquins Station

Note: Monterey County Rail Extension, Altamont Corridor Express (ACE) and Sonoma-Marin Area Rail Transit (SMART) not shown

SERVICE

Future Baseline Regional Rail service would include the Caltrain Enhanced Growth Plan (8tph), Capitol Corridor (20tpd), and San Joaquins (5tpd). The Regional Rail Representative Concept would extend Peninsula corridor Urban/Metro service trains to the East Bay, split evenly between heading north to Richmond and south to Coliseum. New Intercity/Express service would be provided between East Bay and to the Peninsula, including Capitol Corridor and San Joaquins. The Regional Rail Representative Concept would also provide additional Urban/Metro service from Richmond and Coliseum to Salesforce Transit Center and between Richmond and Coliseum Stations. The peak volume through the new transbay tunnel would be 16tph. For this concept, BART service would remain the same as in the future baseline. **Figure 2-5** and **Table 2-3** summarize the routes and frequencies for the Regional Rail Representative Concept.

REGIONAL RAIL REPRESENTATIVE CONCEPT SERVICE MAP

CONCEPTUAL. SUBJECT TO CHANGE. NOT TO SCALE.

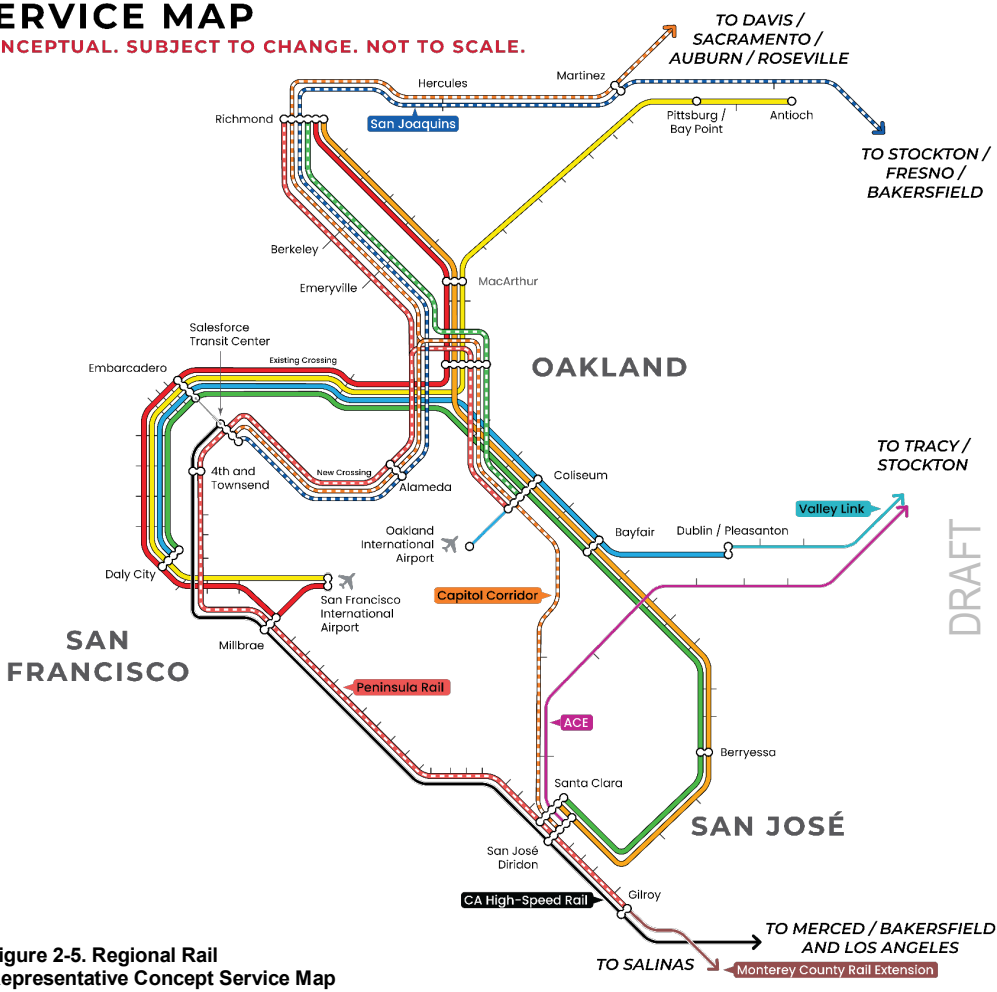


Figure 2-5. Regional Rail Representative Concept Service Map

Urban | Metro Service Routes

- Regional Rail Concept (Peninsula Corridor - Salesforce Transit Center - Richmond / Coliseum)
- Regional Rail Concept (Hercules - Coliseum)
- BART (Millbrae - Richmond)
- BART (SFO Airport - Antioch)
- BART (Daly City - Dublin / Pleasanton)
- BART (Daly City - Santa Clara)
- BART (Richmond - Santa Clara)

Intercity | Express Service Routes

- Regional Rail Concept (Capitol Corridor)
- Regional Rail Concept (San Joaquins)
- California High-Speed Rail
- Valley Link
- Altamont Corridor Express (ACE)
- Monterey County Rail Extension
- Transfer Station Between Service Providers

Table 2-3. AM Routes/Peak Headways for Regional Rail Representative Concept

SERVICE	ROUTE	AVERAGE TIME BETWEEN TRAINS IN AM PEAK PERIOD (*CHANGE FROM BASELINE*)
Urban/Metro – BART	Baseline BART routes	10 min *(no change)*
Urban/Metro – RR (New service extended from Salesforce Transit Center to Richmond)	Richmond ⇔ Tamien	30 min
Urban/Metro – RR	Richmond ⇔ Gilroy	30 min
Urban/Metro – RR	Oakland International Airport/Coliseum ⇔ Tamien	30 min
Urban/Metro – RR	Oakland International Airport/Coliseum ⇔ Blossom Hill	30 min
Urban/Metro – RR	Richmond ⇔ Salesforce Transit Center	30 min
Urban/Metro – RR	Oakland International Airport/Coliseum ⇔ Salesforce Transit Center	30 min
Urban/Metro – RR	Richmond ⇔ San Francisco International Airport/Millbrae	25 min
Urban/Metro – RR	Richmond ⇔ Oakland International Airport/Coliseum	15 min
Urban/Metro – RR	Richmond ⇔ Diridon	80 min
Intercity/Express – RR	Auburn ⇔ Diridon	4 hours *(extended from JLS to Diridon, rerouted via Oakland City Center and East Bay instead of JLS)*
Intercity/Express – RR	Sacramento ⇔ San Francisco International Airport/Millbrae	1 hour *(rerouted from Diridon to San Francisco International Airport/Millbrae)*
Intercity/Express – RR	Bakersfield ⇔ San Francisco International Airport/Millbrae	2 hours *(extended from Martinez to San Francisco International Airport/Millbrae, no headway change)*

With this concept, some trips would benefit from significant time savings. For example, passengers taking trips on Regional Rail from Emeryville to Redwood City via Peninsula Rail get one-seat rides and cut their travel time by 35 minutes and have two fewer transfers. Similarly, passengers taking trips on Regional Rail from Alameda to 4th & Townsend via Peninsula Rail/Capitol Corridor get one-seat rides and cut their travel time by 30 minutes. **Table 2-4** summarizes the key service benefits and provides example trips.

Table 2-4. Key Service Benefits/Example Trips for Regional Rail Representative Concept

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
Martinez/ Suisun City/ Fairfield/ Vacaville/ Davis/ Sacramento/ Roseville/ Auburn	Central Bay Area	▫ Direct Intercity/Express service (Capitol Corridor) to Downtown San Francisco, and upper Peninsula with travel time savings of 15-20 minutes. ▫ Improved connectivity between Intercity/ Express service (Capitol Corridor) and the Urban/Metro network (Peninsula Rail and BART).	▫ Martinez ⇨ Mission Bay – Route: Capitol Corridor ⇨ Transbay/Caltrain Shuttle (transfer: STC) – In-vehicle travel time: reduced from 85 minutes to 65 minutes (20 minutes faster) – Transfer: reduced from two to one (one less transfer) ▫ Sacramento ⇨ Downtown San Francisco – Route: Capitol Corridor – In-vehicle travel time: reduced from 130 minutes to 110 minutes (20 minutes faster) Transfer: reduced from one to zero (one less transfer)
Central Valley	Bay Area	▫ Direct Intercity/ Express service (San Joaquins) to Richmond, Berkeley, Emeryville, Downtown San Francisco, and upper Peninsula. ▫ Approximately 25-minute travel time savings, and no transfer required, to Downtown San Francisco and upper Peninsula.	▫ Stockton ⇨ Mission Bay – Route: San Joaquins ⇨ Transbay/Caltrain Shuttle (transfer: STC) – In-vehicle travel time: reduced from 125 minutes to 115 minutes (10 minutes faster) – Transfer: reduced from three to one (two less transfers) ▫ Stockton ⇨ Downtown San Francisco

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
		▫ Improved connectivity between Intercity/ Express service (San Joaquins) and the Urban/Metro network (Peninsula Rail and BART).	– Route: San Joaquins – In-vehicle travel time: reduced from 125 minutes to 100 minutes (25 minutes faster) ▫ Transfer: reduced from two to zero (two less transfers)
East Bay BART Stations	San Francisco and Peninsula	▫ New, direct Urban/Metro (Peninsula Rail) service from 12th Street/Oakland City Center to downtown San Francisco and Peninsula ▫ Improved connectivity within the Urban/Metro network between BART and Peninsula Rail with a new transfer point at 12th Street/Oakland City Center Station.	▫ Fremont ⇨ Mission Bay – Route: BART ⇨ Muni (transfer: Powell) – In-vehicle travel time: 60 minutes (no change) ▫ Transfer: one (no change)
Richmond/ West Berkeley/ Emeryville/ Oakland	Peninsula	▫ New Urban/Metro service (extension of Caltrain) between Peninsula Corridor stations and Richmond, West Berkeley, and Emeryville with approximately 30-40 minutes of travel time savings.	▫ Emeryville ⇨ Redwood City – Route: Peninsula Rail – In-vehicle travel time: reduced from 95 minutes to 60 minutes (35 minutes faster) ▫ Transfer: reduced from two to zero (two less transfers)
Alameda and Jack London Square	All Locations	▫ New, direct Urban/Metro (Peninsula Rail) service from Alameda to downtown San Francisco and Peninsula with	▫ Alameda ⇨ 4th & Townsend – Route: Peninsula Rail/Capitol Corridor

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
		travel time savings of 10 minutes and more. ▫ JLS is not served by Regional Rail under this Concept.	– In-vehicle travel time: reduced from 40 minutes to 10 minutes (30 minutes faster) – Transfer: reduced from one to zero (one less transfer) ▫ Jack London Square ⇨ Mission Bay – Route: AC Transit ⇨ BART ⇨ Transbay/Caltrain Shuttle (transfer: STC) – In-vehicle travel time: 35 minutes (no change) ▫ Transfer: two (no change)
OAK Airport	Other Rail Stations	▫ New Urban/Metro service (extension of Caltrain) from Oakland Coliseum to Downtown San Francisco and Peninsula.	▫ Oak Airport ⇨ 4th & Townsend – Route: BART (OAK Airport Line) ⇨ Peninsula Rail (transfer: Coliseum) – In-vehicle travel time: reduced from 40 minutes to 30 minutes (10 minutes faster) ▫ Transfer: reduced from two to one (one less transfer)
SFO Airport	Other Rail Stations	▫ Improved connectivity between Intercity/ Express service (Capitol Corridor) and the Urban/Metro network (BART) with new transfer points at 12th Street/Oakland City Center and Millbrae Stations. ▫ Direct Intercity/Express service (Capitol Corridor) to	▫ SFO Airport ⇨ Davis – Route: BART ⇨ Capitol Corridor (transfer: Millbrae) – In-vehicle travel time: reduced from 155 minutes to 125 minutes (30 minutes faster) – Transfer: one (no change) ▫ SFO Airport ⇨ Oak Airport

TRIP ORIGINS	TRIP DESTINATIONS	SERVICE BENEFITS (COMPARED TO BASELINE)	EXAMPLE TRIPS
		Downtown San Francisco and upper Peninsula.	– Route: BART ⇨ Peninsula Rail ⇨ BART (OAK Airport Line) (transfers: Millbrae, Coliseum) – In-vehicle travel time: reduced from 65 minutes to 45 minutes (20 minutes faster) ▫ Transfer: two (no change)
Other trips within the BART System	Other trips within the BART System	▫ New transfer opportunity between all BART lines and the new extended Peninsula Corridor Urban/Metro service at 12th Street/Oakland City Center, Millbrae or Coliseum Stations. ▫	▫

INFRASTRUCTURE

The Regional Rail Representative Concept would include infrastructure elements organized by geographic segment (East Bay Central, East Bay South, East Bay North, San Francisco, and Peninsula).

East Bay Central

The Alameda segment alignment would consist of two tracks in a twin-bore tunnel under Atlantic and Main, continuing in the northeast direction across the Oakland Estuary. There would be one underground station in the segment: "Main & Atlantic Station". The Alameda launch box would be located between the Bay Crossing segment and the station.

The West/Central Oakland segment alignment would split into two directions near Howard Terminal. The northbound alignment would consist of two tracks in a twin-bore tunnel in the northwest direction and would run under Mandela Parkway north of West Grand Avenue and continue north to the existing UPRR tracks south of Emeryville Station. Support facilities would include Howard Turnout adjacent to Oakland Estuary, West Oakland Turnout at West Grand Avenue, and Emeryville Portal at the north end of the segment which would consist of the approach box and the trench.

The southbound alignment would consist of two tracks in a twin-bore tunnel running parallel to the northbound alignment until 8th Street where it turns to southeast direction and continues under 12th Street towards Lake Merritt and Merritt Channel. Support facilities would include an Oakland turnout under I-980. There would be one underground station in the segment: "12th Street Oakland City Center Station".

There would be another tunnel connecting between the Oakland turnout and West Oakland turnout along 12th Street and Mandela Parkway to accommodate North-South service from Richmond to Coliseum.

East Bay South

The San Antonio/Coliseum segment alignment would consist of two tracks in twin-bore tunnels under East 11th Street and runs at-grade next to existing Capitol Corridor tracks at 14th Avenue, transitioning onto an elevated structure from 24th Avenue to 54th Avenue and returning back to at-grade until merging into the existing Capitol Corridor tracks south of Coliseum Station. Support facilities would include a San Antonio portal, and a potential grade separation at 66th Avenue. No new station locations would be included in this segment.

The proposed Coliseum Regional Rail station location would remain adjacent to the freight corridor. To improve the transfer experience, vertical circulation to the existing pedestrian bridge with improved pedestrian bridges would be added for improved access to the Oakland Airport connector and included in the Representative Concept for this station. This concept would include an aerial structure between San Antonio and Coliseum.

East Bay North

The Emeryville/Richmond segment alignment would consist of two tracks in a twin-bore alignment from West Oakland graduating to an at-grade alignment through Emeryville Portal which would include an approach box and a trench. The alignment would then follow the existing rail alignment to Richmond, which is owned by the Union Pacific Railroad (UP), so Link21 would coordinate with UP to develop and approve any proposed changes in this segment. There would be three at-grade stations in the segment: “Emeryville Station”, “Berkeley Station”, and “Richmond Station.” There would be potential grade separations at 65th Avenue, Gilman Street, Cutting Boulevard, and Market Avenue.

San Francisco

The SOMA segment alignment would consist of two to three tracks in underground structures exiting the at-grade Salesforce Transit Center station box parallel to Mission Street turning eastward to the new transbay crossing. The underground structures would consist of a cut-and-cover transition box with a vent shaft, a mined approach tunnel, and a cut-and-cover turnout box, which provides opportunity for future expansion of service to Western San Francisco.

The Bay crossing segment alignment would consist of two tracks in a single bore tunnel exiting under the San Francisco seawall and Interstate 80 curving eastward to a tunnel at Ferry Point in Alameda. Support facilities would include crossovers at the San Francisco and Alameda ends of the crossing.

Peninsula

The Peninsula segment alignment is on right-of-way owned by the Peninsula Corridor Joint Powers Board (Caltrain), so Link21 would coordinate with Caltrain to develop and approve any proposed improvements on this segment. Changes here would consist of the incremental infrastructure improvements needed to increase service to 12tph on the northern portion of the existing Caltrain line. These improvements, a subset of those presented in the Caltrain Business Plan 2040 High Growth Scenario, are:

- The Portal (Downtown Extension) included in the Baseline;
- Pennsylvania Avenue Tunnel;
- Railway improvements to provide four tracks in the northern portion of the Peninsula south of San Francisco;
- Associated grade separations; and
- Station improvements to accommodate 10-car trains.

Improvements in the corridor that accommodate California High-Speed Rail Service (CAHSR) are assumed to be included in the Baseline. New turnback tracks would be provided to accommodate both Urban/Metro and Intercity/Express service coming from the East Bay.

Additional Infrastructure

Additional infrastructure may include storage and maintenance facilities and turnback tracks. Storage and maintenance facilities may include storage tracks and yards where trains can park and be cleaned and maintained overnight. Sizing of storage and maintenance facilities will be based on fleet assumptions and updated in future work.

BART Improvements with a Regional Rail Concept

The Regional Rail Representative Concept includes complementary improvements to the BART network, with existing pedestrian connections between BART and Regional Rail improved at the following stations:

- Oakland Coliseum/Oakland Airport Connector
- 12th Street/Oakland City Center
- Salesforce Transit Center

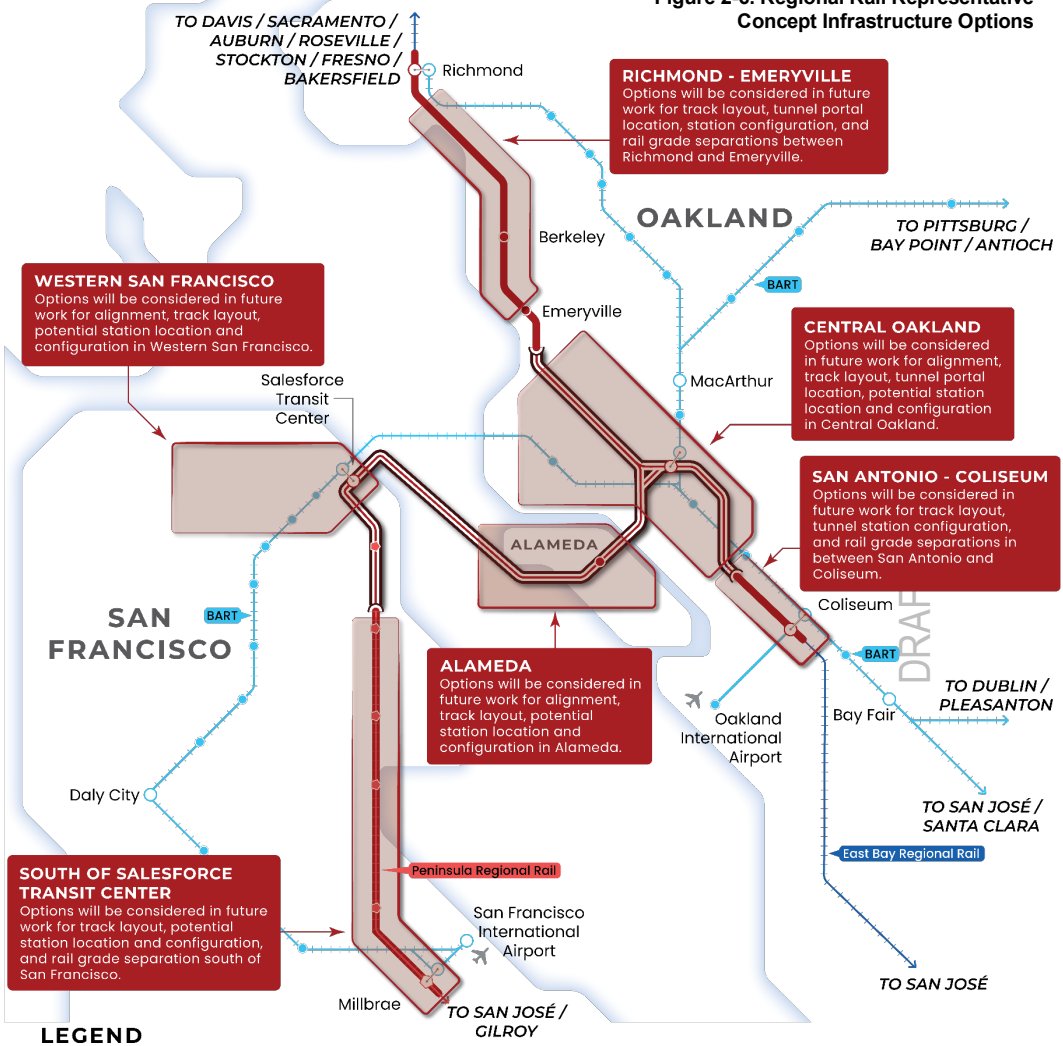
OPTIONS

Options will be considered in future work for alignment, track layout, potential station location, configuration, and additional features. Different options will be studied to evaluate the trade-offs between different alignments and station locations.

Figure 2-6 shows infrastructure options under consideration in future work for the Regional Rail Representative Concept.

REGIONAL RAIL REPRESENTATIVE CONCEPT INFRASTRUCTURE OPTIONS

Figure 2-6. Regional Rail Representative Concept Infrastructure Options



LEGEND

- Regional Rail Concept (At or Above Grade)
- Regional Rail Concept (Below Grade)
- Concept Regional Rail Transfer Station
- Concept Regional Rail Station
- Baseline BART
- Baseline BART Transfer Station
- Baseline BART Station
- Baseline Peninsula Regional Rail
- Baseline Peninsula Regional Rail Transfer Station
- Baseline Peninsula Regional Rail Station
- Baseline East Bay Regional Rail
- Baseline East Bay Regional Rail Transfer Station
- Baseline East Bay Regional Rail Station

3. NEXT STEPS

The Link21 team will continue to engage with stakeholders and communities to develop and narrow options and define the project for environmental review, which will include developing further details on storage and maintenance facilities, concept alignment and station locations, engineering studies and cost estimate development, and development of service plans.

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