

# LINK21

CONNECT NORTHERN CALIFORNIA

## PRELIMINARY BUSINESS CASE REPORT

### DRAFT SUMMARY

---

July 2024

Prepared By:  
Link21 Program Management Consultants (PMC)

DRAFT





**INTENTIONALLY LEFT BLANK**

DRAFT



## Table of Contents

1. Introduction .....	1
1.1. Link21 Program .....	1
1.2. Enabling Transformational Megaregional Benefits .....	1
1.3. Preliminary Business Case Purpose .....	3
2. Key Megaregional Challenges .....	4
2.1. Lack of Convenient and Quality Rail Service.....	4
2.2. Potentially Insufficient Future Capacity and Poor Resilience.....	5
2.3. Equity Challenges.....	5
3. Existing Megaregional Rail Network.....	6
3.1. BART System .....	6
3.2. Regional Rail System .....	7
3.2.1. Corridor ID Program.....	8
4. Technology for a Future Crossing .....	9
4.1. BART Crossing Project.....	10
4.2. Regional Rail Crossing Project.....	12
5. Performance of BART and Regional Rail in the Crossing .....	14
5.1. Business Case Approach .....	14
5.2. Common Benefits for the BART and Regional Rail Crossings .....	15
5.3. Limitations of Analysis .....	19
6. Strategic Case.....	20
6.1. Transforming the Passenger Experience .....	20
6.2. Promote Equity and Livability .....	24
6.3. Support Economic Opportunity and Global Competitiveness .....	26
6.4. Advance Environmental Stewardship and Protection.....	27
7. Economic, Financial, and Deliverability Cases.....	27
7.1. Economic Case .....	27
7.1.1. Benefits .....	28
7.1.2. Costs Versus Benefits.....	29
7.2. Financial Case.....	29
7.2.1. Project Costs.....	29

DRAFT



- 7.2.2. Revenue and Financial Sustainability.....30
- 7.2.3. Project Affordability .....30
- 7.3. Deliverability Case .....31
  - 7.3.1. Design, Construction, and Environmental Risks.....31
  - 7.3.2. Planning and Governance .....32
  - 7.3.3. Displacement Risks .....32
  - 7.3.4. Stakeholder Support.....32
- 8. Opportunities for Project Enhancements .....33
- 9. Next Steps .....34
  - 9.1. Identification of a Preliminary Project.....34
  - 9.2. Advancement to a Proposed Project .....35

## Figures

- Figure 1. Key Features of a Potential BART Crossing Project..... 11
- Figure 2. Key Features of a Potential Regional Rail Crossing Project ..... 13
- Figure 3. Link21 Stage Gates ..... 34

## Tables

- Table 1. Link21 Goals and Expected Outcomes..... 2
- Table 2. Distinct Benefits and Considerations for a BART and Regional Rail Crossing Project..... 17

DRAFT



## Glossary of Terms

TERM	DEFINITION
<b>BART (technology/track type)<sup>1</sup></b>	The technology and track type that is used by BART within its own closed system of facilities and right-of-way. From an infrastructure perspective, BART is a single-level vehicle on broad-gauge tracks that is powered by electricity using a third rail system. BART uses this technology/track type to provide Urban   Metro rail services.
<b>Branch</b>	A physical subdivision of railway that diverges from the rest of the network. The BART network currently has four branches in the East Bay to Richmond, Pittsburg/Bay Point, Dublin/Pleasanton, and Berryessa/North San Jose.
<b>Corridor Identification and Development (Corridor ID) Program</b>	A new intercity passenger rail planning and development program that was established as part of the Bipartisan Infrastructure Law. It is led by the Federal Railroad Administration, and it provides federal funding for planning studies to help guide intercity passenger rail development and create a pipeline of rail projects ready for implementation. The key initial focus of the planning studies is to develop a phased program of projects that achieves planned service levels in a corridor, which is documented in a service development plan. Nine corridors in California, including Capitol Corridor, San Joaquins, and California High-Speed Rail Phase 1, were selected to enter the program in December 2023.
<b>Crossing Project</b>	A new transbay passenger rail crossing between San Francisco and Oakland, including connections back to the existing rail network on either side of the San Francisco Bay, and additional improvements away from the crossing to provide higher levels of train service in the crossing as needed.
<b>East Bay</b>	The area adjacent to the eastern shores of the San Francisco Bay and San Pablo Bay from Richmond/Hercules in the north to Fremont/Berryessa/North San Jose in the south.
<b>Gauge</b>	The distance between the two rails of a train track. Broad gauge (tracks that are 5 feet, 6 inches apart) is used on the BART network, and standard gauge (tracks that are 4 feet, 8.5 inches apart) is used on the Regional Rail network. The two gauges are incompatible with one another.

<sup>1</sup> Specific BART lines are referred to directly (e.g., Yellow Line) with a geographic description if there is any ambiguity (e.g., in the East Bay). Note that 'lines' refer to the specific services operated, as opposed to the physical track infrastructure.



TERM	DEFINITION
<b>Intercity   Express Rail Service</b>	A type of service for medium to long trips that connects regions and urban and rural communities at lower frequencies and higher average speeds compared with Urban   Metro rail services. Operators like Capitol Corridor, San Joaquins, Altamont Corridor Express, and others provide this service on shared Regional Rail/standard-gauge tracks that are sometimes owned by private freight rail operators.
<b>Justice40 Initiative</b>	<a href="#">Justice40</a> is a new federal goal that states 40% of the overall benefits of certain federal investments (including clean transit) flow to communities that are marginalized, underserved, and overburdened by pollution.
<b>Northern California Megaregion</b>	The 21-county area that comprises Alameda, Contra Costa, El Dorado, Marin, Merced, Monterey, Napa, Placer, Sacramento, San Benito, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Sutter, Yolo, and Yuba counties.
<b>Peninsula</b>	The areas south of San Francisco that are adjacent to the San Francisco Bay, including San Mateo County and the northwestern parts of Santa Clara County.
<b>Preliminary Project</b>	<p>The improvements that will be recommended for advancement at Stage Gate 2 that consist of an identified rail technology in the crossing (BART or Regional Rail) for service delivery, and a set of options that will frame upcoming feasibility studies and engagement with communities, stakeholders, and the public. Once identified, it will form the basis for work to define a Proposed Project (and the identification of any Alternatives) that is ready for environmental review at Stage Gate 3.</p> <p>Preliminary Project is used for the concept that is recommended at Stage Gate 2 and advanced for further development, but not for the sets of improvements that are evaluated before Stage Gate 2; those improvements are referred to as concepts.</p>
<b>Priority Populations</b>	Census tracts where people are most impacted by negative economic, mobility, community, and health and safety outcomes. Further details can be found in the document <a href="#">Priority Populations - An Updated Definition for Link21</a> .
<b>Proposed Project</b>	<p>A project sufficiently defined to be advanced to state and/or federal environmental review processes. It is planned that following the Stage Gate 2 resolution, the Preliminary Project will be further refined and developed into the Proposed Project.</p> <p>The Proposed Project is planned to be approved at Stage Gate 3 for potential advancement into the state and/ or federal environmental review processes.</p>

DRAFT



TERM	DEFINITION
<p><b>Regional Rail (technology/track type)</b></p>	<p>The technology and track type used by multiple agencies on an interconnected rail network throughout the Megaregion. From an infrastructure perspective, Regional Rail is a single- or bi-level vehicle on standard-gauge tracks that is sometimes powered by electricity using an overhead catenary system. Regional Rail infrastructure is owned, in some cases, by the passenger operator (e.g., Caltrain from San Francisco to San Jose) and in other cases a freight operator (e.g., Capitol Corridor mostly operates on Union Pacific Railroad right-of-way). On this technology and track type, operators provide two types of service: Intercity   Express and Urban   Metro. Several types of train vehicles can operate on this network, but BART cannot.</p>
<p><b>Stage Gate</b></p>	<p>Key points in the development and delivery of the Link21 Program that provide fundamental strategic definition to the program's progress. They memorialize the actions made at the appropriate governance levels based upon staff recommendations.</p> <p>Among the many actions that must be made over the Link21 Program's life cycle, stage gates capture the foundational guidance that determine the program's direction, effectively closing one part of the life cycle, opening the next, and confirming support for continued investment and progress of the program to the next stage gate.</p>
<p><b>Stage Gate 2</b></p>	<p>At Stage Gate 2, the Link21 Program will reach the milestone of identifying the recommended train technology for the crossing. This will enable the identified Preliminary Project to be refined, with continued community, stakeholder, and public engagement, into a Proposed Project ready for environmental review.</p>
<p><b>Transbay</b></p>	<p>Refers to crossing the San Francisco Bay, specifically between San Francisco and Oakland.</p>
<p><b>Urban   Metro Rail Service</b></p>	<p>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.</p>

DRAFT



**INTENTIONALLY LEFT BLANK**

DRAFT





# 1. Introduction

## 1.1. Link21 Program

The Link21 Program (Link21) is sponsored by the San Francisco Bay Area Rapid Transit District (BART) and Capitol Corridor Joint Powers Authority (CCJPA) with support from the California State Transportation Agency (CalSTA) and other partners. It is a generational initiative with the vision to transform the Northern California Megaregion's (Megaregion)<sup>2</sup> passenger rail network.

### Link21 Vision Statement

The Link21 Program and its partners will transform the BART and Regional Rail (including commuter, intercity, and high-speed rail) network in the Northern California Megaregion into a **faster**, more **integrated** system that provides a **safe, efficient, equitable**, and **affordable** means of travel for all types of trips.

This program, including a new transbay passenger rail crossing between Oakland and San Francisco, will enhance environmental quality, livability, and economic opportunity while protecting against community instability and displacement in the Megaregion as it improves the travel experience. With key investments that leverage the existing rail network and increase capacity and system reliability, rail and transit will better meet the travel needs of residents throughout the Megaregion.

At the core of Link21 is the **Crossing Project**, which is a new transbay passenger rail crossing project between San Francisco and Oakland, that could unlock transformational benefits across the Megaregion.

## 1.2. Enabling Transformational Megaregional Benefits

In a growing economic region, a robust and integrated transportation network is a necessity. Link21 could transform the passenger experience for rail travel, underpinning and enhancing livability, community stability, economic opportunity, and environmental quality in the Megaregion.





---

<sup>2</sup> The 21-county Megaregion comprises Alameda, Contra Costa, El Dorado, Marin, Merced, Monterey, Napa, Placer, Sacramento, San Benito, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Sutter, Yolo, and Yuba counties.



Link21 is designed to meet the goals and objectives that were developed in coordination with key stakeholders and communities and adopted by the BART and CCJPA Boards of Directors. **Table 1** presents these goals and summarizes their desired benefits/outcomes.

**Table 1. Link21 Goals and Expected Outcomes**

GOAL	BENEFIT/OUTCOME
 <p><b>Transform the passenger experience</b></p>	<p>Link21 could change how passengers perceive and use rail travel, better connecting cities and communities across the San Francisco Bay and beyond. By enhancing frequency and capacity, enabling new one-seat rides, and improving transfers and the ability for extended service hours, it could reduce crowding and travel times. This, and providing an alternative transbay rail route, could create a more reliable and efficient rail network, transforming it into a more dependable mode of transportation across the Megaregion.</p>
 <p><b>Promote equity and livability</b></p>	<p>Central to Link21 is its commitment to equity and livability. It looks to provide a more equitable distribution of benefits to communities that have been marginalized, including increasing rail ridership and improving access to important community resources and jobs. The shift from car to rail travel is expected to reduce congestion, improve air quality, and promote healthier, more active lifestyles.</p>
 <p><b>Support economic opportunity and global competitiveness</b></p>	<p>Link21 is set to boost the economy and the global competitiveness of the Megaregion by forging new connections and improved access between homes and workplaces. This could open up job opportunities and support economic growth, enhancing productivity and innovation throughout the Megaregion. Collaboration with local land use jurisdictions and communities could enable more equitable, transit-supportive land use and help avoid potential burdens like displacement.</p>
 <p><b>Advance environmental stewardship and protection</b></p>	<p>Link21 offers a sustainable alternative to car travel, supporting state environmental goals to reduce greenhouse gas emissions and energy use. It also contributes to environmental resilience, helping the Megaregion face climate change challenges like sea level rise.</p>

Link21 has been identified as a critical enabler of a robust and integrated transportation network by the San Francisco Bay Area Region (Bay Area), as outlined in *Plan Bay Area 2050*, and the State of California, as outlined in the 2023 [California State Rail Plan](#), which envisions a fully integrated, zero-emission, and modern passenger and freight rail network that spans the entire state of California.

DRAFT



## California State Rail Plan Vision

California will have a customer-focused, fully integrated rail system serving as a preferred mode of choice for both passengers and shippers. The rail system will enhance economic growth, improve quality of life, advance equity of the state's most vulnerable and impacted communities, while being a force in meeting California's ambitious climate goals.

### 1.3. Preliminary Business Case Purpose

Link21 is a multi-phase, long-range planning initiative that includes close coordination with megaregional agency partners, community stakeholders, and the public throughout each phase of work. The program is currently in the **Project Identification** phase, which focuses on developing and refining project ideas.

One of two potential **train technologies** — BART (operating on broad-gauge track) or Regional Rail (operating on standard-gauge track) — could operate in the new crossing. The goal, in partnership with state and federal funding partners, is to integrate these two systems so they work as a unified and complementary rail and transit network that serves the Megaregion.

The Preliminary Business Case evaluates important considerations for identifying the train technology in the crossing. Its purpose is **not to define** the exact details of the Crossing Project, like station locations or alignments, but to inform the strategic decision of which technology is best suited to create an integrated system.

The choice of train technology in the crossing will influence the services Link21 can reasonably provide and the markets and geographies they serve, shaping the nature of the rail experience for decades to come. It forms the core element of the identification of a **Preliminary Project**<sup>3</sup> for further development and consideration.

This document serves as a summary of the full *Preliminary Business Case Report*, and it includes:

- **Chapter 2:** Discusses the major megaregional challenges Link21 aims to tackle.
- **Chapter 3:** Explores the existing megaregional rail network.
- **Chapter 4:** Examines potential technology choices for the new crossing.

---

<sup>3</sup> The Preliminary Project is defined as the improvements to be recommended for advancement at Stage Gate 2. This consists of an identified rail technology in the crossing (BART or Regional Rail) for service delivery, and a set of options that will frame upcoming feasibility studies and engagement with communities, stakeholders, and the public. Once identified, it will form the basis for work to define a Proposed Project (and the identification of any Alternatives) that is ready for environmental review at Stage Gate 3.



- **Chapters 5 to 7:** Evaluates the performance of the two crossing technologies and examines the key strategic, economic, financial, and deliverability considerations.
- **Chapter 8:** Examines potential opportunities to enhance the performance and cost-effectiveness of the Crossing Project.
- **Chapter 9:** Presents the next steps.

The full *Preliminary Business Case Report* sets out in further detail the challenges Link21 is intended to address, alongside the two potential technologies and evaluation results.

## 2. Key Megaregional Challenges

The Megaregion is growing and continuing to drive demand for travel.

Meeting future travel needs with more integrated and efficient rail and transit networks is essential to driving economic and social progress. The **Problem Statement**, which is documented within the [Link21 Strategic Case Framework](#), sets out the key challenges that are facing the Megaregion and that Link21 intends to address.

The pandemic has altered travel behaviors, including reducing commuting demand by increasing telework. Despite uncertainties in long-term transportation needs, the Megaregion continues to face persistent transportation challenges, particularly for communities that have been marginalized. Ensuring efficient and accessible train service to priority populations<sup>4</sup> is crucial to **advancing equity** in the Megaregion.

### 2.1. Lack of Convenient and Quality Rail Service

BART provides regular service between numerous major destinations within the five Bay Area counties it serves.<sup>5</sup> By contrast, the Regional Rail network spans a vast area within the Megaregion, but the quality and level of service is significantly limited compared to BART.

Combined, they do not operate as an integrated network, and travelers are often faced with journeys that are slow, infrequent, unreliable, and require several transfers between different operators. Many residents find themselves with few alternatives to driving, as rail makes it difficult for them to efficiently reach their workplaces, other major destinations, and important community resources.

---

<sup>4</sup> Link21 defines priority populations as census tracts where people are most impacted by negative economic, mobility, community, and health and safety outcomes. Further details can be found in the document [Priority Populations - An Updated Definition for Link21](#).

<sup>5</sup> BART serves San Francisco, San Mateo, Alameda, Contra Costa, and Santa Clara counties.



## 2.2. Potentially Insufficient Future Capacity and Poor Resilience

Prior to the pandemic, the Megaregion, and especially the Transbay Corridor between Oakland and San Francisco, was plagued by severe congestion and crowded trains. With *Plan Bay Area 2050*'s forecasted growth, it is likely the BART Transbay Tube and the San Francisco-Oakland Bay Bridge (Bay Bridge) will be inadequate to meet future travel demands, even with planned transportation investments in place. Moreover, the reliance on a single rail crossing can lead to significant delays to riders as there are no alternative routes during unplanned closures or maintenance shutdowns.

The pandemic significantly impacted rail usage, and it is recovering slower than anticipated. However, the Bay Bridge is almost back to pre-pandemic congestion levels. Rail ridership is expected to continue to grow as traffic congestion intensifies and as the Megaregion continues to grow, although less than what was expected prior to the pandemic.

## 2.3. Equity Challenges

The existing transportation system poses significant barriers for low-income communities and communities that have been marginalized by exacerbating issues of fare affordability, housing accessibility, and job access. The imbalance between job locations and affordable housing forces many workers to endure lengthy and expensive commutes. The poor access to service in the existing rail network further isolates those without access to personal vehicles or who cannot afford rail fares.

### How Link21 Can Help Address These Challenges

Link21 can help address these existing challenges by enabling the transformation of the Megaregion's rail service, providing future transbay capacity and reliability to meet travelers' needs, and addressing equity concerns. With a more integrated and complementary rail system, Link21 could help foster a more livable, economically vibrant, and environmentally sustainable Northern California.

DRAFT



### 3. Existing Megaregional Rail Network

Rail services in Northern California perform different roles in connecting people and places across the Megaregion. Services are categorized into two groups: **Urban | Metro** and **Intercity | Express**.

**Urban | Metro** is a type of service for short to medium trips that operates within metro regions at high frequencies and medium average speeds. BART provides this type of service today, and Caltrain will provide this type of service with its modern electric trains starting in 2024. Urban | Metro service includes:

- More frequent trains (every 2 to 15 minutes)
- More stops/shorter distances between stations (1 to 5 miles apart)
- Medium average speeds (20 to 40 miles per hour)

**Intercity | Express** is a type of service for medium to long trips that connects regions and urban and rural communities at lower frequencies and higher average speeds. Operators like Capitol Corridor, Amtrak, San Joaquins, Altamont Corridor Express, and others provide service on shared tracks that are typically owned by private freight rail operators. Intercity | Express service includes:

- Less frequent trains (every 30 to 60+ minutes)
- Fewer stops/longer distances between stations (5+ miles apart)
- Higher average speeds (40+ miles per hour)

Within the Megaregion, these rail services are primarily provided by **two systems**: BART and Regional Rail. Both systems can provide Urban | Metro service; however, only Regional Rail can provide Intercity | Express service.

These systems differ in their service provision, track types, power sources, and train car design, making them fundamentally distinct and non-interoperable.

#### 3.1. BART System

BART is a passenger rail network within the Bay Area that features fast, electric trains that currently serve a total of 50 stations. It operates as a 'closed system,' which means it operates on its own dedicated set of broad-gauge tracks that are not shared with other passenger or freight operators. It was exclusively designed for providing reliable, high frequency **Urban | Metro** service.

BART connects San Francisco and San Mateo to Contra Costa, Alameda, and Santa Clara counties via the existing Transbay Tube. The BART Silicon Valley Phase II project, which is currently under development, will extend BART service 6 miles from the Berryessa/North San Jose Station to downtown San Jose and Santa Clara.

DRAFT



Before the onset of the pandemic, BART experienced significant crowding during traditional commuter peak periods, often operating at or near capacity through the Transbay Tube, especially for trips to and from downtown San Francisco. Although passenger demand reduced considerably post-pandemic, it is expected to gradually recover, although less than what was expected before the pandemic. Continued population and employment growth, alongside increasing congestion on the Bay Bridge, is expected to increase rail demand and crowding over the long term.

BART plans to expand capacity with the implementation of the [Core Capacity Program](#), which will allow it to operate up to thirty 10-car trains per hour in each direction through the existing Transbay Tube, compared to the current 24 trains per hour. Nonetheless, the existing Transbay Tube remains the key constraint in the system by limiting the ability to further increase BART transbay service frequency to and from the East Bay. In addition, there is no rail alternative to the Transbay Tube, making BART riders susceptible to considerable delays in the event of any disruption and constraining the ability to offer extended service hours.<sup>6</sup>

## 3.2. Regional Rail System

Regional Rail provides service within the Bay Area and across the broader Megaregion, with an extensive geographic coverage of interoperable standard-gauge tracks. The Regional Rail network is less developed, some routes operate with low service frequencies and poor reliability, and passenger trains often share tracks with freight and other operators. It has the potential to support a wide range of passenger rail services, including **Urban | Metro** and **Intercity | Express**, through shared interoperability.

Regional Rail provides **Intercity | Express** services across the broader Megaregion, and it will provide **Urban | Metro** services along the Peninsula in 2024 after the completion of the Caltrain Electrification Project (and related service improvements).

However, several key constraints limit the ability to provide fast, frequent, and reliable Regional Rail service:

- **Shared right-of-way** with passenger and freight trains sharing the same tracks and frequent at-grade crossings reduce the capacity and frequency of passenger services and have a negative impact on reliability.
- **The absence of a transbay crossing creates a gap in the network**, which effectively isolates the Regional Rail networks in the East and West bays from each other. This limits connectivity between San Francisco/the Peninsula and the East Bay, Sacramento Area, and Northern San Joaquin Valley.

---

<sup>6</sup> Although longer service hours in the evening and overnight periods are predominately policy and operator driven, the lack of an alternative transbay crossing limits the ability to maintain transbay rail service while implementing localized track outages to maintain the network.



- **Various other major capacity and operating constraints**, including the drawbridge crossing of the Carquinez Strait, are a significant source of delay for train services.

There are extensive plans to improve the current Regional Rail network to help address these constraints, as outlined in the [California State Rail Plan](#).

These include:

- Projects currently **under construction**, such as the electrification of Caltrain services, that will bring faster and more frequent service to the Peninsula.
- Projects **included within adopted regional transportation plans**,<sup>7</sup> many of which are fully or partly funded, such as The Portal (formerly known as the Downtown Rail Extension or DTX project), would bring Regional Rail services from the Peninsula to downtown San Francisco at the Salesforce Transit Center.
- Longer-term projects in **preliminary planning**, such as a new rail crossing of the Carquinez Strait, would enable faster, more frequent, and more reliable rail services along the Capitol Corridor.

### 3.2.1. Corridor ID Program

The [Corridor Identification and Development \(Corridor ID\) Program](#), launched by the Federal Railroad Administration in 2022, provides a new source of federal funding for intercity passenger rail planning and development studies. It will develop planned enhancements to several key **Intercity | Express** service corridors in Northern California's Regional Rail network, such as:

- **Capital Corridor** between San Jose and Auburn, with a potential extension to San Francisco, that is delivered through Link21, and to Salinas, Novato, and Reno/Sparks (Nevada).
- **San Joaquins Valley Corridor** between Sacramento/Oakland and Merced, with a potential extension north from Sacramento to Chico and Redding.
- **California High-Speed Rail Phase 1 Corridor** between San Francisco, San Jose, the Central Valley, and Los Angeles/Anaheim.

Each corridor relies on standard-gauge Regional Rail technology and will develop a service development plan that will identify the key enhancements and phasing of infrastructure components. Adopting standard-gauge Regional Rail technology for the Crossing Project could make it an integral part of this connected network.

---

<sup>7</sup> A regional transportation plan is a fiscally constrained long-term blueprint of a region's transportation system, typically updated every four years for a 30-year planning horizon, which identifies the transportation improvements for its metropolitan area and creates a framework for prioritizing transportation investments. Each of the six metropolitan planning organizations in the Megaregion is federally mandated to produce one.





Achieving the future service goals of the [California State Rail Plan](#) is highly dependent on connecting the Regional Rail network between San Francisco and Oakland through Link21. The plan stresses how its vision for a zero-emission, integrated rail corridor between the Peninsula and Sacramento would not be possible without a second transbay crossing.

## 4. Technology for a Future Crossing

The next key decision for Link21 is to identify the train technology for the Crossing Project. The train technology **fundamentally determines** how services connect to the existing rail network. Each technology enables different types of services that serve different markets and meet Link21's goals and objectives in different ways.

Link21 previously considered a dual-gauge crossing with tracks that could be used by BART and Regional Rail trains. After a technical examination, the Link21 Team<sup>8</sup> concluded that a dual-gauge crossing would trigger safety and regulatory requirements, which would present a major risk to successful delivery and likely limit the number of trains that could operate through the new crossing.

Further exploratory studies indicated that a new crossing with standard- and broad-gauge tracks would provide more capacity than is needed to meet forecast future transbay demand. Therefore, the Link21 Team's efforts have focused on prioritizing a **single technology** for this initial crossing, but they are not precluding constructing a third crossing in the future as megaregional needs evolve.

A BART crossing would connect to the existing BART network, providing enhanced Urban | Metro service within the Bay Area. A Regional Rail crossing would connect to the Regional Rail network on both sides of the San Francisco Bay, providing Urban | Metro service within the Bay Area and Intercity | Express service across the Megaregion.

The Preliminary Business Case plays a crucial role in **informing the decision** between these two different train technologies. The Link21 Team identified concepts for BART and Regional Rail crossings to support the evaluation of each technology. Each concept included substantial enhancements in service quality and increased service resilience. The following sections describe the key features and benefits the implementation of either Crossing Project could deliver.

---

<sup>8</sup> BART, CCJPA, Program Management Consultants, and Consultants supporting program identification/project selection



## 4.1. BART Crossing Project

A BART crossing would add a second connection between Oakland and San Francisco, directly connecting to existing East Bay BART infrastructure. This would alleviate the major capacity constraint of the existing Transbay Tube and enable increased transbay service frequencies.

In the East Bay, a BART crossing would serve downtown Oakland and enable additional services on each of the four existing BART branches, and it could include additional stations (e.g., in Alameda). In the West Bay, new infrastructure would serve downtown San Francisco and could include additional stations (e.g., Mission Bay). A BART crossing also envisions new transfer stations to better integrate with the Regional Rail network on both sides of the San Francisco Bay.

A BART Crossing Project would:

- **Increase Urban | Metro service frequencies** throughout the existing BART network in the East Bay on the Red, Yellow, Blue, and Green lines.
- **Improve integration** between the existing BART and Regional Rail networks, including new transfer stations in Oakland and downtown San Francisco.
- **Enable potential new stations** near the crossing; locations could include downtown Oakland, Jack London Square, Alameda, and Mission Bay.
- **Improve resilience by providing an alternative route** for the existing BART system, resulting in greater resilience and reduced delays when the existing BART crossing is closed.

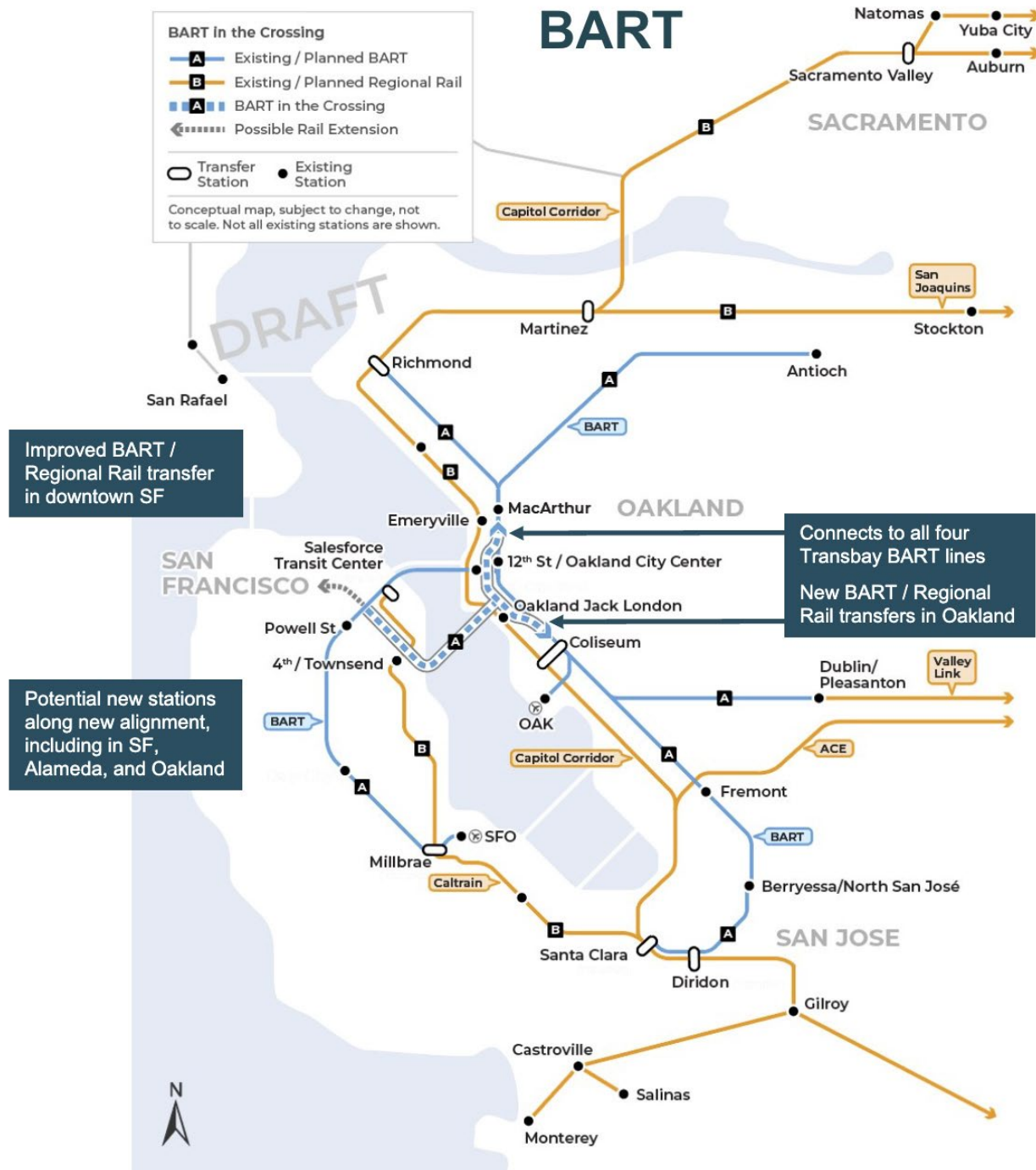
While a BART Crossing would improve Urban | Metro service within the five Bay Area counties it already serves and improve connectivity to Regional Rail Intercity | Express services, it would not directly provide enhanced Intercity | Express service across the wider Megaregion.

**Figure 1** illustrates the key features of a potential BART Crossing Project. Further detail on the specific BART crossing assumed within the evaluation can be found in Section 4.4 of the *Preliminary Business Case Report*.

DRAFT



Figure 1. Key Features of a Potential BART Crossing Project



DRAFT



## 4.2. Regional Rail Crossing Project

A Regional Rail crossing would bridge the existing gap in the Regional Rail network between Oakland and San Francisco, which aligns with the *California State Rail Plan's* vision to connect major city centers in the Megaregion with one-seat rides.

In the West Bay, a Regional Rail crossing would **connect with Caltrain** service at the Salesforce Transit Center,<sup>9</sup> leveraging committed investment in The Portal. In the East Bay, it would connect with the existing Regional Rail network, including separating passenger from freight operations in downtown Oakland with a new, dedicated set of tracks for passenger trains. The Crossing Project also proposes new transfer stations with BART on both sides of the San Francisco Bay (in downtown Oakland and downtown San Francisco), and it considers adding new stations (e.g., Alameda).

Largely due to the lack of consistent funding, the Regional Rail network has not received significant investment in recent years, and it is less developed than the BART system. **Additional investment** in the Regional Rail network is essential on both sides of the San Francisco Bay to fully realize the capabilities of a Regional Rail crossing and ensure the new capacity provided by a Regional Rail crossing is used effectively. Accordingly, a new Regional Rail crossing could be viewed as the key element of a larger investment strategy outlined in the *California State Rail Plan*, and potentially developed and scoped through the Corridor ID Program.

A Regional Rail Crossing Project would:

- **Provide new transbay rail services:**
  - **Intercity | Express service:** Direct, one-seat rides connecting areas like Sacramento, Stockton, and the San Joaquin Valley to downtown San Francisco and the Peninsula with connections to the San Francisco International Airport.
  - **Urban | Metro service:** New services linking the Peninsula and San Francisco to the East Bay, potentially extending Caltrain's reach to include central Oakland, Emeryville, Berkeley, Richmond, and Coliseum with connections to the Oakland International Airport and improving connections within the East Bay.
- **Improve integration** between the existing BART and Regional Rail networks, including new transfer stations in Oakland and downtown San Francisco.
- **Enable potential new stations** near the crossing to enhance local accessibility (e.g., in Alameda).
- **Provide an alternative route** for transbay rail journeys by providing an alternative crossing when the existing BART crossing is closed.

---

<sup>9</sup> The evaluation of BART and Regional Rail Crossing Projects assumes The Portal is completed as a part of a separate project, with Caltrain services along the Peninsula extending from their current terminus at 4th and King Street to the Salesforce Transit Center regardless of Link21.

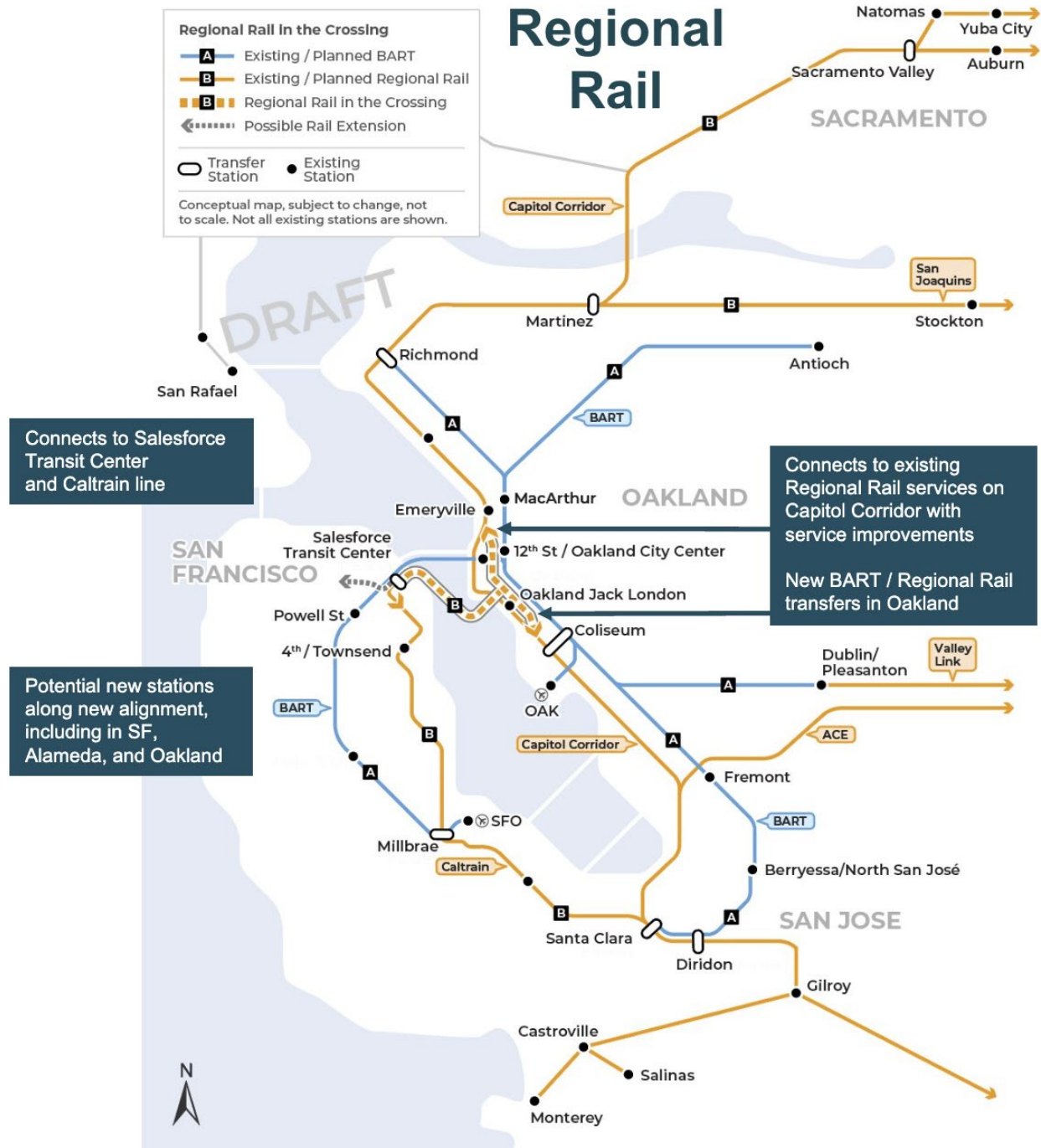


- **Increase reliability** by separating passenger and freight operations along the most congested portions of shared tracks with the greatest freight rail traffic.

Further investments not included in the Regional Rail Crossing Project, such as a new bridge across the Carquinez Strait, would further enhance the benefits of a new Regional Rail crossing.

**Figure 2** illustrates the key features of a potential Regional Rail Crossing Project.

**Figure 2. Key Features of a Potential Regional Rail Crossing Project**





A Regional Rail Crossing Project would have a **strong interdependency** with the planned Capitol Corridor and San Joaquins enhancements that are being developed under the Corridor ID Program, and it would complement the planned enhancements being delivered for California High-Speed Rail Phase 1. Several key elements of a Regional Rail Crossing Project could be developed independently through the Corridor ID Program, each as **separate projects** with their **own benefits**, prior to delivering a transbay crossing.

For example, this could include dedicated passenger tracks between Richmond, Oakland, and Coliseum; a new downtown Oakland station; and/or electrification in the East Bay. This could **reduce the scale of additional investment** a Regional Rail Crossing Project would require to effectively use its capacity.

It means that, at this stage, the scope of a Regional Rail Crossing Project is less certain than a BART Crossing Project, as different elements may be delivered and funded as separate, independent projects outside of Link21. Additional rail investment that is not required for a Regional Rail Crossing Project, such as a new bridge across the Carquinez Strait, would further **enhance the benefits** of a new Regional Rail crossing.

Further detail on the specific Regional Rail Crossing Project that is assumed within the evaluation can be found in Section 4.5 of the *Preliminary Business Case Report*.

## 5. Performance of BART and Regional Rail in the Crossing

### 5.1. Business Case Approach

Link21 employs a business case approach to guide its decision-making process and evaluate a BART or Regional Rail Crossing Project's impact on passengers, society, the economy, and the environment across the Megaregion. This evaluation is structured around four main cases: Strategic, Economic, Financial, and Deliverability, with equity being a component of each.

During the early stages of the program, the focus of the business case is on the **Strategic Case**, particularly the alignment of various concepts with the program's goals and objectives. Thus, the main focus of the Preliminary Business Case is the Strategic Case, as it informs the strategic recommendation whether to use BART or Regional Rail train technology in the crossing. This includes assessing the strategic benefits of each crossing technology, how they address the challenges in the Megaregion, and their alignment with Link21's goals and objectives.

The other three cases — Economic, Financial, and Deliverability — have been evaluated more broadly. Their performance is analyzed to identify key considerations and opportunities facing delivery of a future Crossing Project, such as cost-



effectiveness and the ability to secure funding. These aspects will be explored in greater detail in future stages as details of the Crossing Project are further refined.

BART and Regional Rail crossings present distinct approaches to improving the Megaregion's rail system, each with unique benefits, challenges, and considerations. The remainder of this executive summary considers the:

- **Key benefits and considerations** for each technology.
- **Key limitations** of the evaluation and supporting analyses.
- **Strategic considerations** of BART and Regional Rail (grouped by the Link21 goals).
- Wider **economic, deliverability, and financial** considerations, including key risks.
- Potential **opportunities to enhance the performance** of both technologies.

**Extensive technical analyses** underpin the evaluation findings and conclusions. This includes the modeling of future rail demand and journey times for different BART and Regional Rail crossing concepts alongside a no-build alternative; the assessment of different social, economic, and environmental benefits and costs and risks; and ongoing engagement and outreach.

## 5.2. Common Benefits for the BART and Regional Rail Crossings

Regardless of whether the new crossing uses BART or Regional Rail technology, the Crossing Project could:

- **Meet crossing travel demand** between San Francisco and Oakland by 2050.
- **Enable uninterrupted transbay rail service** if one crossing goes out of service, improving system resilience and reducing delays.
- **Facilitate increased transbay train frequency** that can grow ridership.
- **Reduce traffic** and shift highway journeys onto rail and transit, including from the Bay Bridge.
- **Create new and improved transfers** between the BART and Regional Rail networks for faster and more convenient journeys.
- **Provide greater benefits to priority populations** that are aligned with federal Justice40 goals.
- Potentially **serve new markets** with new stations near the crossing (e.g., Alameda).

DRAFT



- Potentially **support extended service hours** on the BART network.<sup>10</sup>

**Table 2** summarizes the **distinct benefits and considerations** associated with each crossing. Further information on the evaluation that was conducted to support these findings and the limitations of the analysis can be found in the remaining sections.

DRAFT

---

<sup>10</sup> Although limited-service hours in the evening and overnight periods are policy and operator driven, an additional transbay crossing improves opportunity for providing some form of transbay rail service while implementing localized track outages to maintain the network.





**Table 2. Distinct Benefits and Considerations for a BART and Regional Rail Crossing Project**

BART CROSSING CONCEPT	REGIONAL RAIL CROSSING CONCEPT
<p><b>Overview:</b>  <b>Improves frequency and service in the five Bay Area counties it already serves. Generates increased ridership and reduces crowding in the existing Transbay Tube.</b></p>	<p><b>Overview:</b>  <b>Enables the <i>California State Rail Plan</i> vision by connecting and integrating the rail network across the San Francisco Bay. Enables more one-seat rides across the wider Megaregion.</b></p>
<p>Enhances existing BART services and creates improved transfers with Regional Rail.</p>	<p>Closes the gap in the Regional Rail network to provide an integrated rail system across the Megaregion. Complements the existing BART system and creates improved transfers with BART.</p>
<p>Enables incremental travel time benefits (through shorter wait times) to well-served markets across the East Bay BART network. Creates new, faster travel opportunities and substantial benefits for potential new markets (e.g., Mission Bay, Alameda).</p>	<p>Delivers transformational travel time savings to areas with poor service (e.g., Emeryville) and new one-seat rides (e.g., the Peninsula to the East Bay, Sacramento to San Francisco). Creates new, substantially faster travel opportunities for potential new markets (e.g., Alameda).</p>
<p>Increases rail ridership within established markets and from new stations and reduces auto vehicle miles traveled, mainly from trips within the five-county BART service area.</p>	<p>Increases rail ridership within new markets with poor rail service (e.g., Emeryville, West Berkeley) and less established interregional markets (e.g., Sacramento). Makes other planned Regional Rail investments more effective by providing direct transbay service.</p>
<p>Does not improve the poor reliability of the Regional Rail system. Improves the resilience and redundancy of the existing BART crossing.</p>	<p>Removes bottlenecks and improves Regional Rail reliability. Improves the resiliency and redundancy of the existing BART crossing.</p>
<p>Supports increased availability of affordable housing, primarily around existing BART stations, and improves access to jobs for priority populations within the five-county BART service area.</p>	<p>Supports increased availability of affordable housing and improved access to jobs for priority populations. Potential to support development of affordable housing within a broader geography if appropriate land use policies are implemented.</p>

DRAFT



BART CROSSING CONCEPT	REGIONAL RAIL CROSSING CONCEPT
<p>Requires a lower level of overall investment as it capitalizes on existing BART infrastructure and does not require significant investment beyond the actual crossing infrastructure.</p>	<p>Requires a higher level of overall investment as the Regional Rail network is less developed and requires greater investment beyond the crossing to improve services; potentially delivered and funded outside of Link21. Level of investment for the transbay crossing is comparable to BART.</p>
<p>Faces greater funding challenges than Regional Rail due to fewer, more limited, and more competitive funding sources. Could potentially compete against other BART funding needs.</p>	<p>Is eligible for a wider range of funding opportunities than BART, with the potential ability to be separated into more easily funded phases, and it has greater alignment with state and federal priorities, plans, and funding sources.</p>
<p>Requires modest enhancements to improve cost-effectiveness that are potentially achieved through changes to stations, alignments, and/or service plans.</p>	<p>Requires enhancements to improve cost-effectiveness that are potentially achieved through complementary investments across a wider geography.</p>
<p>Has lower deliverability risks, reflecting a smaller construction extent, fewer project interfaces, and the self-contained nature of the existing BART system.</p>	<p>Has higher deliverability risks, reflecting complex interfaces with different operators, a potential need for new governance, and greater right-of-way requirements with associated construction, environmental, and displacement risks.</p>

DRAFT



### 5.3. Limitations of Analysis

The business case approach uses a combination of **qualitative** and **quantitative metrics** to evaluate the performance of the BART and Regional Rail crossings, including:

- Aligning each proposed concept with Link21's goals and objectives.
- Understanding the key financial, economic, and deliverability considerations.

These metrics and supporting analyses were specifically designed to **inform the identification of a crossing technology** and not to define the exact details of the Crossing Project, like station locations or alignments, or provide a definitive assessment of its performance or cost-effectiveness. Several key assumptions were made to compare the performance of both technologies transparently and consistently:

- **Representative Concepts:** The evaluation uses representations of what BART and Regional Rail Crossing Projects might involve, including service levels, specific stations, and infrastructure needs. Each Representative Concept includes a new transbay passenger rail crossing and the associated infrastructure improvements needed to connect the crossing to the wider BART or Regional Rail network. After a technology decision is made, the definition of the Crossing Project will continue to evolve with further design development and refinement, with specific Regional Rail enhancements developed and scoped through the Corridor ID Program. Further detail on the specific infrastructure and service assumed in the evaluation can be found in Chapter 4 of the *Preliminary Business Case Report*.
- **Assumptions about the Future:** The evaluation of long-term transportation projects, like the Crossing Project, requires assumptions with a high degree of uncertainty about the future. These include future population growth, employment trends, changes in travel behavior (e.g., teleworking or willingness to use rail and transit), implementation of planned projects (e.g., The Portal), and evolving policies (e.g., fare integration or land use policies).
- **Ridership and Cost Estimates:** At this early stage, ridership and cost estimates can only be indicative. Forecasts and estimates are based on available data, modeling tools, and preliminary engineering work, and are **highly dependent** on **key assumptions**, such as alignments, station locations, and service levels — none of which have been decided. For example:
  - The Regional Rail crossing assumed in the evaluation includes a dedicated right-of-way between Richmond and Coliseum rather than some form of shared operations with Union Pacific Railroad. This is a substantial cost which may be reduced if a shared right-of-way can be negotiated with the host railroad.
  - Between Coliseum, Oakland, and Richmond, the evaluation assumes no prior investment in supporting infrastructure required to facilitate a Regional Rail crossing. The Corridor ID Program may result in such infrastructure being funded

DRAFT



and delivered prior to advancing the Crossing Project, which would reduce the capital costs attributable to Link21.

- Ridership is highly sensitive to the number of stations served by transbay services, especially in San Francisco. For example, the additional rail ridership of a Regional Rail crossing is estimated to increase by 30%, from 90,000 to 115,000 daily trips, by including an additional station at Bayview.
- The BART crossing assumed in the evaluation has 50% more transbay trains per hour than the Regional Rail crossing, reflecting current constraints in the wider Regional Rail network.
- While the business case provides a framework for comparing the technologies under consideration for the Crossing Project, it is subject to the limitations of the assumptions and data used in the analysis. Estimated ridership, benefits, and costs will change as the data, tools, and assumptions are refined over time. Future stages of analysis will refine these assessments as more detailed information becomes available.

## 6. Strategic Case

The Strategic Case identifies the key megaregional challenges to address Link21's vision and how a BART or Regional Rail crossing could satisfy the identified goals and objectives. Further detail on the specific strategic considerations for a BART and Regional Rail crossing can be found in Chapter 6 of the *Preliminary Business Case Report*.

### 6.1. Transforming the Passenger Experience

Link21's primary goal is to transform the passenger experience in the Megaregion by providing better service and improved day-to-day reliability and system performance. This transformation aims to build ridership and mode share to support broader societal and environmental objectives.

The evaluation indicates that both technologies could help achieve these objectives but in different ways. Common outcomes for a BART and Regional Rail crossing, and distinct outcomes for each technology, are discussed as follows.

#### Common Outcomes for BART and Regional Rail Crossings

- **Improve service:** Both technologies could deliver shorter travel times, increase transbay frequencies, reduce crowding, provide direct one-seat rides, expand potential service to new rail markets, improve connectivity between BART and Regional Rail networks, and support extended transbay service hours. Both include a new transfer station between BART and Regional Rail in Oakland, and could support a potential new station in Alameda, new stations on the existing network (e.g., Bayview, San Antonio), and an extension to western San Francisco.



- **Enhance system resilience and reliability:** Both technologies could enhance the system's ability to handle disruptions to the existing Transbay Tube, support extended service hours, and improve the ability to maintain existing and new infrastructure to minimize passenger inconvenience and reduce delays.
- **Increase ridership potential:** Both technologies could build ridership for transbay, regional, and interregional trips, including for priority populations, and support mode shift to rail.

### Specific Outcomes of a BART Crossing

- **Provide better service:** A BART crossing could improve the passenger experience in several ways:
  - **Double peak service frequencies** across existing BART Urban | Metro transbay and East Bay routes, which will lead to shorter wait times. Although the travel time savings per rider from these frequency improvements are relatively modest, the large number of riders affected, together with larger travel time savings for new markets (e.g., Mission Bay), result in greater overall travel time savings compared to a Regional Rail crossing. Journey time benefits are concentrated around BART's existing and extended corridors in the Bay Area.
  - **Reduce potential future crowding** to many existing BART markets with a 15% reduction in AM peak period riders in the existing crossing. However, if travel patterns and the propensity to use rail and transit does not recover to pre-pandemic levels, the additional value of providing more capacity on the established network (where a good level of service is already available) could be limited.
  - **Provide new stations** to facilitate direct transfer between BART and Regional Rail in Oakland and serve potential new markets, such as Mission Bay. These new stations would enable new one-seat rides between 290 station pairs.
- **Enhance reliability and system performance:** A BART crossing would not deliver reliability improvements to the Regional Rail network. Although a BART crossing benefits from existing and future BART improvements (e.g., BART Silicon Valley Phase II), it does not improve direct Regional Rail connectivity across the San Francisco Bay.
- **Increase ridership potential:** Ridership levels are closely linked to the number and locations of new stations served by transbay services, particularly in San Francisco. A BART crossing could potentially generate 110,000 new daily rail trips if serving only downtown San Francisco, 130,000 trips if also serving 4th and Townsend and Mission Bay, and 140,000 trips if further serving San Antonio. Mode shift from auto to rail could lead to around 500 million fewer vehicle miles traveled per year.

DRAFT



## Specific Outcomes of a Regional Rail Crossing

- **Improve service:** A Regional Rail crossing could enhance service quality in several ways:
  - **Create new, direct one-seat rides** between 370 station pairs, delivering substantial travel time savings to travelers wanting to make specific journeys. Unlike BART, where service is limited to the Bay Area, Regional Rail provides direct interregional connections, including journeys to San Francisco from select markets in the Megaregion outside the Bay Area. Notable journeys with new one-seat rides and faster travel times<sup>11</sup> include:
    - > Direct interregional journeys between downtown San Francisco and Sacramento, Stockton, and the Central Valley (e.g., the travel time from Sacramento to downtown San Francisco decreases from approximately 145 to 120 minutes with one fewer transfer).
    - > Direct, faster, and more frequent regional transbay journeys between the East Bay, like downtown Oakland or Berkeley (Capitol Corridor), and destinations on the Peninsula, like Palo Alto and Redwood City (e.g., the travel time from Emeryville to Redwood City decreases from 105 to 60 minutes with two fewer transfers).
    - > Direct, faster, and more frequent regional transbay journeys between Emeryville or Berkeley (Capitol Corridor) and downtown San Francisco. (e.g., the travel time from West Berkeley to downtown San Francisco decreases from 50 to 20 minutes with one fewer transfer).
  - **Provide new Urban | Metro service in the East Bay** as it lacks fast, frequent, and reliable Regional Rail service, unlike the Peninsula. A Regional Rail crossing would provide new electric Urban | Metro services to areas along the Capitol Corridor route (e.g., Emeryville and West Berkeley), improving access to rail for markets that currently lack good rail connectivity.
  - **Complement BART service** by providing transbay rail travelers an alternative route to the existing crossing, helping reduce potential future crowding with an 11% reduction in AM peak period riders in the existing crossing, and supporting extended service hours.
- **Enhance reliability and system performance:** A Regional Rail crossing could:
  - **Improve reliability** of Regional Rail services by removing key bottlenecks with a new dedicated, electrified, grade-separated passenger rail route that is

---

<sup>11</sup> Note these travel times include in-vehicle and waiting times (estimated from half the service combined headway at departure and transfer stations, with a 10-minute waiting cap at the departure station) and assume the faster combination of transit modes, including bus where appropriate. Travel times are rounded to the nearest five minutes. Assumed stations for downtown San Francisco are the Salesforce Transit Center (for a Regional Rail crossing) or BART Montgomery St. Station (for the Baseline).



separated from freight lines in the most congested parts of the existing Regional Rail network (e.g., in Oakland). However, it is important to note that this separation, especially between Emeryville and Richmond, has the potential to require right-of-way acquisition with related direct displacement risks and cost implications that would need to be studied further, in coordination with other planned Regional Rail enhancements needed to realize the *California State Rail Plan*.

- **Improve network connectivity** by linking the rail networks on both sides of the San Francisco Bay. The interoperability provided by Regional Rail could enable operators to seamlessly expand their service to other parts of the network in the Megaregion. A Regional Rail crossing also would capitalize on existing planned improvements, such as the Caltrain electrification and The Portal projects, enhancing the benefit of each investment.
- **Facilitate and leverage potential future improvements**, such as a new rail bridge across the Carquinez Strait or infrastructure investments to support Caltrain’s High Growth service concept. For example, a new Carquinez Rail Crossing would enable an increased frequency of Intercity | Express services between the Bay Area and Sacramento, likely increasing demand for both a Carquinez Rail Crossing and the Crossing Project and improving the benefits of both.
- **Increase ridership potential:** As stated previously, ridership is fundamentally linked to the number and locations of new stations, particularly in high demand areas, such as San Francisco. A Regional Rail crossing could potentially generate 90,000 new daily trips if serving only existing and planned regional rail stations<sup>12</sup> in San Francisco, or 115,000 trips with the addition of a new Bayview station. Future analyses may consider the inclusion of stations in other high-potential areas, such as Mission Bay, western San Francisco, and central Oakland.

Ridership is further influenced by the **level of service** offered in the new crossing. The projected ridership figures assume that the BART crossing would provide 50% more transbay trains per hour compared to the Regional Rail crossing. This difference reflects the current constraints of the broader Regional Rail network on both sides of the San Francisco Bay. Further enhancements to the Regional Rail network, potentially developed through the Corridor ID Program, could enable up to 24 transbay trains per hour, comparable to that of a BART crossing, potentially increasing ridership.

The mode shift from auto to rail could lead to around 300 million fewer vehicle miles traveled per year. Approximately 45% of new rail trips could be attributed to areas

---

<sup>12</sup> Existing and planned stations that would be served by a Regional Rail crossing are the Salesforce Transit Center, 4th and Townsend, and 22nd Street and Bayshore.



with new Urban | Metro service (e.g., Alameda, Emeryville, West Berkeley) that are currently without access to good rail service.

A Regional Rail crossing could deliver a focused and transformational improvement in rail service for specific journeys across the Megaregion, opening rail travel for routes that are less traveled and currently too difficult to attract riders. Even if peak period rail demand does not recover to pre-pandemic levels and the additional capacity provided by an additional transbay crossing is not required, a Regional Rail crossing would still enable new, direct one-seat rides across a wide geography.

## 6.2. Promote Equity and Livability

Link21 aims to promote equity and livability by better connecting people and places; improving safety, health, and air quality; and advancing equity while protecting against community instability and displacement. Both technologies could help achieve these objectives.

### Common Outcomes for BART and Regional Rail Crossings

- **Enhance transportation benefits to priority populations:** Both technologies could provide, on average, around 40% of their transportation benefits to priority populations (compared to a share of population of 32% within the Megaregion), which aligns with federal Justice40 goals. It is worth noting that fares for BART and Regional Rail are assumed to be the same for comparable journeys (consistent with *Plan Bay Area 2050*), which is a change from the current fare structure. This means there is no difference in fare affordability between the two technologies.
- **Improve accessibility:** Both technologies could offer new and expanded access to jobs and important community resources through new and improved stations and services. With a BART or Regional Rail crossing, an average resident in the Megaregion could access approximately 44,000 additional jobs within one hour of travel time by rail.
- **Provide wider social and environmental benefits:** Both technologies could help reduce auto use and:
  - Improve safety from fewer auto-involved crashes.
  - Improve air quality from reductions in emissions like nitrous oxide, sulfur dioxide, and PM2.5.<sup>13</sup>
  - Enhance health benefits from more walking to access rail and transit.
- **Protect against displacement risk:** New stations and improved service (e.g., introduction of a new frequent Urban | Metro service) could pose indirect displacement risks to surrounding communities due to rising rents and housing

---

<sup>13</sup> Particulate Matter 2.5 microns or smaller in diameter





redevelopment, which could potentially be mitigated through improved coordination with local land use jurisdictions and the introduction of appropriate land use policies.

### Specific Outcomes of a BART Crossing

- **Enhance transportation benefits to priority populations:** A BART crossing could provide transportation benefits to priority populations within the existing BART network, largely by reducing wait times.
- **Improve access:** A BART crossing could improve access to new markets. The BART concept assumes new stations in Alameda, Jack London Square, and Mission Bay, which would result in an additional 29,000 residents within a half-mile of Urban | Metro service.
- **Provide wider benefits:** A BART crossing could generate higher ridership leading to higher reductions in auto travel and its related benefits. BART could generate an estimated reduction of 200 tons of nitrous oxide, sulfur dioxide, and PM<sub>2.5</sub><sup>14</sup> emissions and 360 fewer fatalities from auto-involved crashes over the evaluation period<sup>15</sup> compared to a no-build alternative.

### Specific Outcomes of a Regional Rail Crossing

- **Enhance transportation benefits to priority populations:** A Regional Rail crossing could deliver substantial travel time benefits and new direct journey opportunities to priority populations across the Megaregion. This includes through:
  - New Urban | Metro service between the Peninsula and Richmond/Coliseum that serves priority populations without current access to good rail service, such as in West Berkeley.
  - New Intercity | Express service across the Megaregion that provides priority populations in areas such as Martinez, Suisun, Fairfield, and Sacramento with direct rail service to San Francisco.
- **Improve access:** A Regional Rail crossing could improve access to potential new markets, such as Alameda, and stations where new Urban | Metro service is introduced, such as West Berkeley and Emeryville. This would provide an additional 37,000 residents with access to an Urban | Metro service.
- **Provide wider benefits:** A Regional Rail crossing could generate an estimated reduction of 120 tons of nitrous oxide, sulfur dioxide, and PM<sub>2.5</sub> emissions and 220 fewer fatalities from auto-involved crashes over the evaluation period<sup>16</sup> compared to a no-build alternative.

---

<sup>14</sup> Particulate Matter 2.5 microns or smaller in diameter.

<sup>15</sup> Measured over the period up to 60 years from service commencing.

<sup>16</sup> Measured over the period up to 60 years from service commencing.



### 6.3. Support Economic Opportunity and Global Competitiveness

Link21 aims to support economic opportunity and global competitiveness by improving access to employment and opportunity; connecting major economic, research, and education centers; and enabling transit-supportive and equitable land use. Both technologies could help achieve these objectives, and there are no substantial differences between them.

#### Common Outcomes for BART and Regional Rail Crossings

- **Improve access to opportunities:** Both technologies could improve access to job markets, particularly in downtown San Francisco and Oakland. The BART concept further enhances this access with a potential new station in Mission Bay, although a Regional Rail crossing could provide a new station near Mission Bay.
- **Stronger economic performance:** Consequently, both technologies could enhance the productivity of the Megaregion by connecting major economic, research, and educational hubs, expanding businesses' reach to a broader employee base and facilitating greater business collaboration, which is known as agglomeration effects.<sup>17</sup>
- **Promote equitable and transit-supportive land use:** Both technologies could align with Link21's goal of promoting equitable and transit-supportive land use. They both encourage residential development, including affordable housing units. A BART crossing would support equitable and transit-supportive land use largely within the five-county BART service area. A Regional Rail crossing could potentially support housing development within a broader geography in the 21-county Megaregion, including outside the nine-county Bay Area.

However, it is important that jurisdictions with new or upgraded stations adopt policies that support transit-oriented development to maximize the transportation and wider economic and environmental benefits of the Crossing Project. Based on the current land use policies, a BART crossing serves areas with local land use policies that are more consistent with Link21 transit-oriented development policies than a Regional Rail crossing.

Regardless of the technology adopted for the crossing, the Link21 Team will continue to promote transit-supportive and equitable land use by creating partnerships with municipalities to proactively plan and rezone areas adjacent to rail stations. This approach will maximize the benefits of the Crossing Project, particularly in areas adjacent to existing and proposed rail stations.

---

<sup>17</sup> Agglomeration effects refer to how firms and workers become more productive because they are closer and better connected to one another. These significant productivity benefits from agglomeration help explain why many similar firms choose to cluster together in urban areas, such as high-tech companies within Silicon Valley.



## 6.4. Advance Environmental Stewardship and Protection

Link21 aims to advance environmental stewardship and protection by increasing **climate change resilience**, **reducing greenhouse gas emissions**, and conserving resources. Both technologies could help achieve these objectives, and there are no substantial differences between them.

### Common Outcomes for BART and Regional Rail Crossings

- **Operate clean, zero-emission rail vehicles:** Both technologies will utilize clean, zero-emission rail vehicles.
- **Reduce greenhouse gas emissions:** Both technologies contribute to lowering emissions due to the mode shift from auto to rail.<sup>18</sup>
- **Increase resilience against climate change risks:** Both technologies could enhance the rail network's resilience to climate change threats, such as sea level rise. This is achieved by offering an alternative route for transbay journeys and constructing infrastructure to higher resilience standards than current structures.

## 7. Economic, Financial, and Deliverability Cases

### 7.1. Economic Case

The Economic Case considers the societal benefits and cost-effectiveness of the Crossing Project. It provides a means to quantify transportation benefits and weigh them against life cycle costs for each crossing technology. The current analysis is based on concepts that reflect a reasonable representation of each crossing technology, offering a preliminary insight into their potential benefits while highlighting areas for further exploration and optimization as the Crossing Project is refined in subsequent stages of work. These findings are intended to guide strategic decisions rather than provide a definitive assessment of the Crossing Project's economic performance.

Public transportation investment, including the Crossing Project, can deliver a broad range of economic benefits beyond the transportation benefits for regular users. According to the American Public Transportation Association's [Economic Impact of Public Transportation Investment Report](#), investment in public transit can yield

---

<sup>18</sup> Note that this effect is lower than originally anticipated. State legislation requires 100% of new cars and light trucks sold in California be zero-emission vehicles, including plug-in hybrid electric vehicles, by 2035.



49,700 jobs per \$1 billion invested, and offer a 5 to 1 economic return.<sup>19</sup> Public transportation investment can contribute towards long-term economic growth as a result of both a short-term stimulus from construction and longer-term productivity benefits from travel cost savings, reduced traffic congestion and increased business connectivity.

The focus to date has been an **initial assessment** of the travel time savings and reduced crowding for each technology, and a limited range of non-user benefits such as reductions in greenhouse gas emissions. **Not all benefits have been quantified to date.** Benefits not currently captured include wider economic benefits, such as increased productivity due to agglomeration effects, and non-monetized benefits, such as journey time reliability and community benefits. Early work has indicated that including agglomeration effects could increase the scale of monetized benefits by 30 to 90%, comparable to other projects such as California High Speed Rail. The Link21 Team intends to monetize a broader range of benefits, including agglomeration, in subsequent evaluation stages.

Further detail on the cost-benefit analysis for BART and Regional Rail crossings can be found in Chapter 7 of the *Preliminary Business Case Report*.

### 7.1.1. Benefits

Both a BART and Regional Rail crossing provide transportation benefits to users, including travel time savings and reduced crowding, and societal benefits, like lower air pollution and greenhouse gas emissions, fewer auto-related crashes, and improved health outcomes.

The BART concept yields higher overall monetized transportation benefits through incremental travel time savings (mostly from shorter wait times) for larger and more established travel markets and reduced travel times for new BART markets (e.g., Mission Bay). The Regional Rail concept offers larger travel time saving benefits to a focused number of riders in less established travel markets.

Constraints on the wider BART and Regional Rail networks mean that neither concept fully utilizes the operational capacity of the new crossing itself.<sup>20</sup> Therefore, there is

---

<sup>19</sup> The American Public Transportation Association calculates an economic impact (in gross domestic product) of \$3.2 billion from long-term cost savings and \$1.8 billion from investment spending effects per billion dollars of enhanced investment in public transportation per year by 2040. Note that this is distinct from travel time benefits, which typically form the largest component of a cost-benefit analysis.

<sup>20</sup> The Regional Rail crossing assumed in the evaluation includes 16 trains per hour of peak service compared to a maximum theoretical operating capacity in the crossing of 24 trains per hour. This compares to 24 trains per hour of peak service, compared to a maximum theoretical operating capacity of 30 trains per hour for the BART crossing assumed in the evaluation. Capacity constraints on either side of the San Francisco Bay, such as terminals, junctions, and line capacity on the BART and Regional Rail networks means that not all theoretical operating capacity can be utilized without additional investment for either crossing technology.



potential for further investment to alleviate these wider constraints, enable greater frequency in the new crossing, and amplify these transportation benefits.

The potential for increased transportation benefits for both BART and Regional Rail crossings is further discussed in Chapter 9. This points to the possibility of improving and expanding the advantages of both concepts as development of the Crossing Project progresses.

### 7.1.2. Costs Versus Benefits

As currently defined, neither concept has monetized transportation and wider societal benefits that offset the high costs.

The BART concept comes closer to this balance, with higher monetized benefits and lower life cycle costs. The Regional Rail concept provides service to a less developed network, which necessitates further investment in other projects to fully utilize the additional transbay capacity and connectivity created by the crossing. This presents a unique opportunity to better integrate the rail services in Northern California, which could be transformational to megaregional train travel in the long term.

There is significant opportunity to further refine the design and costs and optimize the performance of the Crossing Project through further planning and development work, including through the Corridor ID Program for a Regional Rail crossing. The Link21 Team intends to monetize a broader range of benefits in subsequent evaluation stages and when seeking discretionary federal or state funding.

## 7.2. Financial Case

The Financial Case considers the costs involved in the program, funding methods, financing options, and potential revenue generation.

Further detail on the financial considerations for a BART and Regional Rail crossing can be found in Chapter 8 of the *Preliminary Business Case Report*.

### 7.2.1. Project Costs

Capital costs for a BART and Regional Rail Crossing Project represent a rough **order-of-magnitude** estimate only, and they are subject to **significant change** with future development and refinement. The range in cost estimates reflects the early stage of project development, and they should not be referenced without appropriate context.

The capital costs of the transbay crossing, largely a new tunnel under the San Francisco Bay, is similar for both technologies, **between \$18 and \$30 billion** in 2023 dollars. Overall capital costs differ for how a future crossing is connected to the BART and Regional Rail networks on either side of the San Francisco Bay.

Since the BART network is already well developed, the scale of additional infrastructure required to effectively connect it to the wider network is modest compared to the

DRAFT



crossing, **between \$5 and \$10 billion** in 2023 dollars. Total estimated capital costs for a BART Crossing Project are **between \$24 and \$38 billion** in 2023 dollars.

Since the Regional Rail network is less developed, a Regional Rail Crossing Project requires **greater investment** to alleviate constraints on the wider network (especially between Emeryville and Richmond), enable improved Urban | Metro service, and support ridership in the crossing. This means a Regional Rail crossing would cost **between \$15 and \$25 billion** in 2023 dollars to effectively connect to the wider rail network and ensure the new capacity is used effectively. Total estimated capital costs for a Regional Rail Crossing Project are **between \$33 and \$54 billion** in 2023 dollars.

However, some elements of a Regional Rail Crossing Project could be delivered and funded as separate, independent projects that are developed under the Corridor ID Program and in line with the proposals presented in the *California State Rail Plan*. This could include dedicated passenger tracks between Richmond, Oakland, and Coliseum; a new downtown Oakland station; and/or electrification in the East Bay. These enhancements each have distinct benefits and costs, and, if delivered independently, potentially in advance of Link21, could reduce the capital costs of a Regional Rail Crossing Project.

This means the capital costs of a Regional Rail Crossing Project are less certain as they are dependent on the scale of infrastructure delivered independently of Link21 and the conclusions of the Corridor ID Program planning studies.

The Crossing Project's future definition will influence costs (and benefits) depending on decisions regarding stations, service patterns, and infrastructure requirements. There are opportunities to improve these aspects in future iterations of the Crossing Project, regardless of the crossing technology.

### **7.2.2. Revenue and Financial Sustainability**

Both concepts are expected to generate additional revenue through increased rail trips.

For the BART crossing, at this early stage of development, the additional revenue from projected ridership increases is anticipated to exceed the added operating costs, potentially making the service improvements self-sustaining. Conversely, the Regional Rail crossing could require ongoing financial support to maintain service levels on an on-going basis.

### **7.2.3. Project Affordability**

Regardless of technology, the cost and scale of a new transbay passenger rail crossing would necessitate significant funding and financing to implement and operate. There are a range of potential funding sources available, each with unique requirements, and the total availability of funding for either a BART or Regional Rail crossing is unclear.

The BART crossing, though less costly than Regional Rail, has fewer opportunities for federal or state funding and may compete with other BART network funding needs.

DRAFT



The Regional Rail crossing has more potential funding opportunities than a BART crossing, especially with the recent increase in federal funding for intercity passenger rail projects, from which the Bay Area has already benefited. The selection of the Capital Corridor within the Corridor ID Program — which Link21 is included in — positions Link21 for federal support and funding. The next step involves a planning process that will identify a phased program of projects to realize planned service levels in the corridor. The resulting projects — which may include the Crossing Project — are then eligible for federal design and construction grants under the Federal-State Partnership for Intercity Passenger Rail Grant Program.

The Portal continues to advance with support from local, state, and federal partners, including federal funding through the Federal Transit Administration’s Capital Investment Grants Program. The project, which would be leveraged by a Regional Rail crossing, demonstrates that Regional Rail improvements are being funded by Federal Transit Administration and Federal Railroad Administration programs, and a Regional Rail Crossing Project could be eligible for funding from both sources.

The Portal’s success also demonstrates that a Regional Rail Crossing Project could be delivered through a series of smaller projects over a longer period of time, scoped and developed through the Corridor ID Program, and better aligned to the long-term profile of federal funding.

### **7.3. Deliverability Case**

The Deliverability Case evaluates the requirements for successfully implementing and operating the Crossing Project. This assessment includes governance, construction, operations, and addressing risks, like displacement.

Further detail on the deliverability considerations for a BART and Regional Rail crossing can be found in Chapter 9 of the *Preliminary Business Case Report*.

#### **7.3.1. Design, Construction, and Environmental Risks**

Both BART and Regional Rail crossings involve considerable risks in design, construction, and environmental factors, which is common for large-scale projects. However, they are not insurmountable barriers to project approval and implementation.

A BART crossing carries lower risks than a Regional Rail crossing due to a smaller construction extent and fewer and less complex interfaces, at-grade structures, and right-of-way acquisition needs.

DRAFT



### 7.3.2. Planning and Governance

Governance and funding processes for a BART or Regional Rail crossing would be different. The Federal Transit Administration has a long history of overseeing the planning and development of urban transit systems, which would be beneficial to a BART crossing, whereas the Federal Railroad Administration does not have the same level of experience for a Regional Rail crossing. However, this should not be seen as a barrier since Capitol Corridor, which includes a future transbay crossing, was accepted into the Federal Railroad Administration Corridor ID Program.

A Regional Rail crossing would require more interagency coordination due to the intercity nature of the system and interconnectivity between different operators' networks; therefore, existing governance may need revisions. It also would require engagement with the host railroad (Union Pacific Railroad) to agree to a commercial agreement regarding the potential widening of right-of-way for dedicated passenger rail service.

### 7.3.3. Displacement Risks

**Direct displacement risks** are largely dependent on the scale of the construction extents and right-of-way requirements. A Regional Rail crossing poses direct displacement risks, including for priority populations, due to the potential need to widen existing Union Pacific Railroad right-of-way. This is required to achieve separation of freight and passenger rail services, which could require significant land acquisition in priority populations areas. Direct displacement risks for a BART crossing are more limited, as the alignment is primarily underground.

**Indirect displacement risks** are dependent on how Link21 changes the attractiveness of a location as a place to live and work and the level of local anti-displacement policy protections, including just cause eviction laws, rent control, and inclusionary zoning requirements.

Generally, indirect displacement risks are less for a BART crossing compared to a Regional Rail crossing. This is largely due to more BART stations being in areas with stronger existing anti-displacement policies, including just cause eviction laws, rent control, and inclusionary zoning requirements. Note that this analysis does not account for the willingness of jurisdictions without these protections to adopt stronger anti-displacement policies prior to project delivery. The Link21 Team is developing an Anti-displacement Toolkit to support local jurisdictions and will explore possible options that could reduce direct displacement risk.

### 7.3.4. Stakeholder Support

A public survey in fall 2023 showed a preference for features offered by a Regional Rail crossing over those offered by a BART crossing. For example, 71% of respondents considered it important to create a broader, more connected passenger rail network in

DRAFT





Northern California by directly linking systems, and 65% of respondents considered it important to create faster, direct connections from Northern California destinations, such as Sacramento and Stockton, to jobs and housing in San Francisco and the Peninsula. This compares with 45% of respondents who considered it important to increase the frequency of trains on all East Bay BART lines. It should be noted that the survey did not provide the public with a description of any specific concept, nor did it describe the benefits and costs, so this preference should be considered as indicative rather than definitive.

## 8. Opportunities for Project Enhancements

The Crossing Project is at an early stage of development. Future work will explore potential opportunities to enhance benefits and reduce costs while considering how different project elements could be best phased for delivery.

This includes:

- **Serving new markets** by adding new stations on the existing rail network, such as Bayview and San Antonio, or expanding to new markets, such as a potential future rail line to western San Francisco.
- **Investigating complementary Regional Rail investments** that could help fully utilize the capacity of a new Regional Rail crossing by increasing rail demand and enhancing transportation benefits. Future Regional Rail investments are planned to be developed through the Corridor ID Program in line with the *California State Rail Plan*.
- **Examining cost reduction strategies** that could help enhance the crossing's performance by increasing the proportion of benefits relative to costs. Potential cost-saving measures include optimizing service levels (to better match capacity to demand), refining right-of-way requirements, and exploring how Link21 could be delivered as a series of smaller, independent projects over time, each with their own benefits.

Further evaluation, that is informed by the findings of work performed to date, will seek to review and refine concepts to improve the performance of the Crossing Project. Specifically for a Regional Rail crossing, further work through the Corridor ID Program would be required to define the extent and phasing of the Crossing Project alongside parallel investment in the Capitol Corridor, San Joaquins, and California High-Speed Rail corridors. The phasing of these parallel enhancements will be critical to determine the scope of investment required for the Crossing Project.

DRAFT



## 9. Next Steps

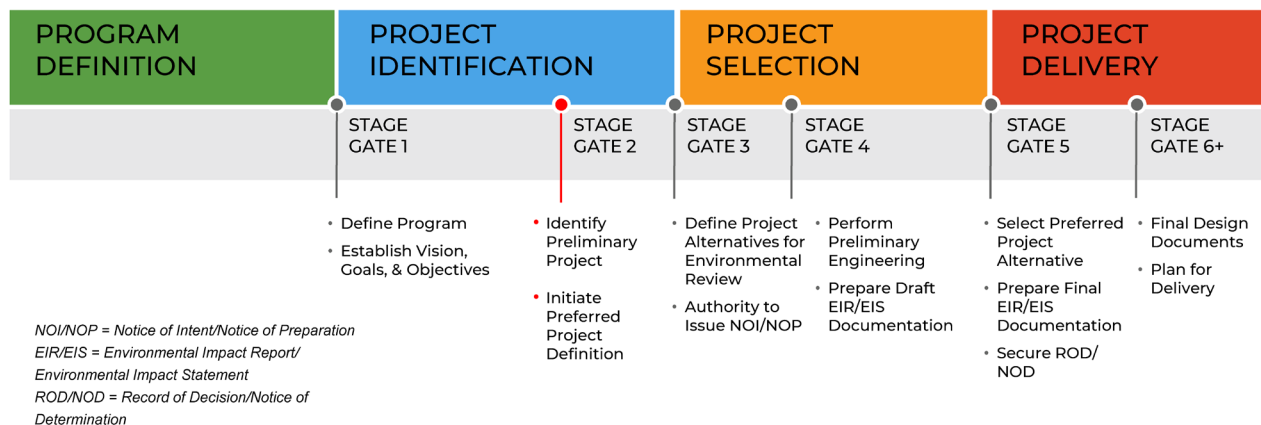
### 9.1. Identification of a Preliminary Project

The Preliminary Business Case, and the evaluation findings that underpin it, is intended to provide guidance that supports the identification of the **train technology** in the future crossing. Its purpose is **not** to define the exact details of the Crossing Project, like station locations or alignments, but to inform the strategic decision of which technology is best suited for creating an integrated system.

The identification of a technology forms the core element of the **Preliminary Project** that is centered on a new transbay passenger rail crossing between San Francisco and Oakland. This technology identification forms a key output of Stage Gate 2,<sup>21</sup> which advances the **Preliminary Project** for further development.

**Figure 3** summarizes the key next steps at each stage gate and how they correspond to each project phase (a [plain text version of Figure 3](#) is provided at the end of this document).

**Figure 3. Link21 Stage Gates**



DRAFT

<sup>21</sup> Stage gates are key points in the development and delivery of Link21 that provide fundamental strategic definition to Link21's progress. They memorialize the actions made at the appropriate governance levels based upon staff recommendations. Among the many actions that must be made over Link21's life cycle, stage gates capture the foundational guidance that determine Link21's direction, effectively closing one part of the life cycle, opening the next, and confirming support for continued investment and progress of the program to the next stage gate.



## **9.2. Advancement to a Proposed Project**

After Stage Gate 2, the concept options, including station and service improvements and infrastructure to support those improvements, will continue to be advanced into a Proposed Project by working closely with key agency partners, community stakeholders, and in partnership with state and federal funding partners through the Corridor ID Program.

An Intermediate Business Case will be developed in later stages to evaluate options (e.g., under Chapter 8 Opportunities for Project Enhancements) to support the advancement of a Proposed Project (and potential Alternatives). The Proposed Project will define in detail the project extents, alignments, and station locations to the level of detail necessary to advance into environmental review in accordance with the National Environmental Policy Act and California Environmental Quality Act.

DRAFT



**INTENTIONALLY LEFT BLANK**

DRAFT



## Figure 3 Text

### Phase 1: Program Definition

Stage Gate 1 occurred at the end of Phase 1 and included two key steps: Define Program and Establish Vision, Goals, & Objectives.

### Phase 2: Project Identification

It includes Stage Gate 2 and 3.

The program is currently at Stage Gate 2, which is approximately 65% through Phase 2 and includes two key steps: Identify Preliminary Project and Initiate Preferred Project Definition.

Stage Gate 3 is at the end of Phase 2 and includes two key steps: Define Project Alternatives for Environmental Review and Authority to Issue Notice of Intent/Notice of Preparation.

### Phase 3: Project Selection

It includes Stage Gates 4 and 5.

Stage Gate 4 is approximately 40% through this phase and includes two key steps: Perform Preliminary Engineering and Prepare Draft Environmental Impact Report/Environmental Impact Statement Documentation.

Stage Gate 5 is at the end of this phase, and it includes three key steps: Select Preferred Project Alternative, Prepare Final Environmental Impact Report/Environmental Impact Statement Documentation, and Secure Record of Decision/Notice of Determination.

### Phase 4: Project Delivery

Stage Gate 6 (and potential additional stage gates) occurs during this phase and includes two key steps: Final Design Documents and Plan for Delivery.

[Return to Figure 3](#)

DRAFT