



CONNECT NORTHERN CALIFORNIA

PRELIMINARY BUSINESS CASE REPORT

APPENDIX A: DRAFT EXPLORATORY EVALUATION REPORT EXECUTIVE SUMMARY

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Prepared By:
Link21 Program Management Consultants (PMC)

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Issue and Revision Record

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Table of Contents

Executive Summary	1
Background.....	1
Overview of Exploratory Concepts.....	1
Findings and Recommendations: BART	3
Findings and Recommendations: Regional Rail	4
Findings and Recommendations: Combined BART and Regional Rail.....	5
Recommendations: Summary.....	5

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Acronyms and Abbreviations

ACRONYM/ABBREVIATION	DEFINITION
BART	San Francisco Bay Area Rapid Transit District
CCJPA	Capitol Corridor Joint Powers Authority
SFO	San Francisco International Airport
STC	Salesforce Transit Center

Link21 Program Team Names

TEAM NAME	TEAM MEMBERS
Program Management Consultants (PMC)	The HNTB Team
Program Management Team (PMT)	BART/CCJPA + PMC
Consultants	Consultants supporting program identification/project selection
Link21 Team	PMT + Consultants

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Glossary of Terms

TERM	DEFINITION
Baseline	The Baseline is a future scenario against which benefits, costs, and risks of the Crossing Project over the project life cycle are evaluated. The Baseline adopts future planning assumptions relating to demographics, transportation networks, and policies consistent with Plan Bay Area 2050 and other adopted regional transportation plans in the Northern California Megaregion.
BART (technology/track type)	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 transit services.
BART Crossing Concept	A new transbay passenger rail crossing concept that uses BART technology. A BART crossing concept may have improvements to the Regional Rail network. If the crossing uses BART technology, it should connect, at a minimum, to existing BART infrastructure in the East Bay and serve downtown San Francisco.
Blue Line	BART Dublin/Pleasanton – Daly City service
Crossing Project	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.
East Bay	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.
Exploratory Concept (Exploratory Round)	Early definitions of concepts for Exploratory Evaluation. Exploratory Concepts will be refined based on Exploratory Evaluation results before becoming Initial Concepts to be evaluated in Round 1.
Exploratory Evaluation	High-level evaluation of a series of Exploratory Concepts that uses the Initial Travel Demand and Land Use (TDLU) Tool and select key metrics to understand the relative performance of concept features to generate Initial Concepts that were evaluated in Round 1.
Green Line	BART Berryessa/North San José – Daly City service

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TERM	DEFINITION
Initial Concept (Round 1)	A developed idea consisting of a new transbay passenger rail crossing with an identified rail vehicle technology, markets accessed through existing or potential new stations, a conceptual service plan, and associated infrastructure required. Concepts were evaluated in Round 1 to inform the development of the Representative Concepts to be evaluated in Round 2 and options considered following Stage Gate 2.
Intercity Express Rail Service	A type of service for medium to long trips that connects regions, as well as urban and rural communities, at lower frequencies and higher average speeds compared with Urban Metro rail services. Operators like Capitol Corridor, Amtrak, Altamont Corridor Express, and others provide this service on shared Regional Rail/standard gauge tracks sometimes owned by private rail.
Minimum Crossing	A new transbay passenger rail crossing and any minimum improvements that are required to connect it to the existing rail network.
Northern California Megaregion	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.
Peninsula	The areas south of San Francisco that are adjacent to the San Francisco Bay, including San Mateo County, the northwestern parts of Santa Clara County, and Silicon Valley.
Preliminary Project	<p>The improvements to be recommended for advancement at Stage Gate 2 will consist of an identified rail technology in the crossing (BART or Regional Rail) for service delivery, potential extents (geographic limits) of the improvements, and a set of Options that will frame forthcoming feasibility studies and engagement with communities, stakeholders, and the public. Once approved, it will form the basis for work to define a Project (and the identification of any Alternatives) that is ready for Environmental Review at Stage Gate 3.</p> <p>“Preliminary Project” is to be used for the concept that is recommended at Stage Gate 2 and advanced to further development, but not for the sets of improvements evaluated before Stage Gate 2; those improvements are still to be referred to as “Concepts.”</p>
Priority Populations	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 .
Red Line	BART Richmond – Millbrae + SFO (San Francisco International Airport) service

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TERM	DEFINITION
Regional Rail (technology/track type)	A 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 José) 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.
Regional Rail Crossing Concept (Rounds 1 and 2)	A new transbay passenger rail crossing concept that uses Regional Rail (standard gauge) technology. A Regional Rail concept may have improvements to the BART network. If the crossing uses Regional Rail technology, it should connect, at a minimum, to existing Regional Rail infrastructure in San Francisco and the East Bay.
Representative Concept (Round 2)	A high-performing concept that is a reasonable representation of the crossing technology. Representative Concepts will be subject to detailed evaluation in Round 2 to inform the identification of a crossing technology, and then further advanced to a Preliminary Project for Stage Gate 2.
Round 1	The evaluation of the Initial Concepts to develop (one or more) high-performing Representative Concept(s) for each crossing technology to be evaluated in Round 2.
Round 2	The evaluation of Representative Concepts to select a crossing technology and to identify a Preliminary Project to advance at Stage Gate 2.
South Branch (for Regional Rail)	The area south of downtown Oakland in the East Bay that is along the Capitol Corridor alignment, including the Jack London and Coliseum corridors.
Transbay	Refers to crossing the San Francisco Bay, specifically between San Francisco and Oakland.
Urban Metro Rail Service	A type of service that operates within metro regions at higher frequencies and medium average speeds. BART currently provides this service. Caltrain will provide this type of service with its modern, electrified trains starting in 2024.
Variant	Variants are concepts that are similar to Exploratory Concepts, Initial Concepts, or Representative Concepts with minor differences to specific features, such as service, markets, and/or infrastructure.
Yellow Line	BART Antioch – SFO + Millbrae service

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Important Notice

This document is Appendix A to the *Preliminary Business Case Report*, which is expected to be complete in early 2024. This document has been made available to the public, in draft form, for informational purposes in advance of the *Preliminary Business Case Report*.

Other reports referred to in this document may still be under development. In due course, an updated version of this document with complete links to reference documents will be made available alongside the *Preliminary Business Case Report*.

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Executive Summary

Background

The *Exploratory Evaluation Report* is the first step in the Link21 Program's (Link21) concept development process for the new transbay passenger rail crossing project (Crossing Project). The Round 1 and Round 2 evaluations, which will further evaluate and refine the concepts discussed in this report, will follow. Each step advances by building on the findings from the previous step(s). For a full description of the concept development process refer to the *Preliminary Business Case Report*.

The objective of the Exploratory Evaluation was to inform the development of the Initial Concepts and Variants that will be refined and evaluated in further detail in the Round 1 Evaluation in spring 2023.

Several Link21 Exploratory Concepts¹ were developed for initial evaluation. These Exploratory Concepts were informed by the [Link21 Market Analysis](#) and other factors, such as engineering and operations considerations and stakeholder and public input. They were designed to extract insights about the value of a minimum crossing² and additional related improvements to the rail network. The Exploratory Concepts were evaluated using high-level tools and a limited set of metrics that were in line with the Link21 business case principles. The evaluation was based on analyzing Exploratory Concepts against a 2050 future Baseline scenario.³

These findings are summarized in the following sections.⁴

Overview of Exploratory Concepts

The Crossing Project is being developed with the following guiding principles:

- **Provide a second rail crossing** between Oakland and San Francisco with San Francisco Bay Area Rapid Transit District (BART) and/or Regional Rail⁵ technology.
- **Provide other improvements** to the BART and Regional Rail networks that enhance the performance of the crossing.

¹ Exploratory concepts are early definitions of concepts for the Exploratory Evaluation. Exploratory Concepts will be refined based on the Exploratory Evaluation results before becoming Initial Concepts and Variants to be evaluated in Round 1.

² A new transbay passenger rail crossing and any minimum improvements that are required to connect it to the existing rail network. Additional related improvements involved exploring the value of different potential extents beyond the minimum crossing.

³ The Baseline is a future scenario against which benefits, costs, and risks of the Crossing Project over the project life cycle are evaluated. The Baseline adopts future planning assumptions relating to demographics, transportation networks, and policies consistent with *Plan Bay Area 2050* and other adopted regional transportation plans in the Northern California Megaregion (Megaregion). Further information on the Baseline can be found in Section 3.

⁴ Findings must be considered alongside the caveats and limitations that are related to the findings and tools used.

⁵ Could include intercity, commuter, or high-speed rail.



- **Demonstrate independent utility** that achieves Link21’s goals and objectives, is economically beneficial and financially viable, and is deliverable.
- **Build upon existing adopted plans** and support other relevant projects that are in line with the *Megaregional Program Report* and not preclude a future western San Francisco rail line.

Exploratory Concepts were identified and defined by the Link21 Team,⁶ and they were developed to align with the guiding principles above and other key inputs, including:

- **Link21 Market Analysis Report** that estimated unmet potential for train travel for the region⁷ and helped identify options to analyze further.
- **Alignment with Link21’s goals and objectives**, including equity considerations.
- **Stakeholder inputs** gathered through the fall 2022 engagement, which included direct connections with more than 1,800 people.
- **Engineering and operations considerations** related to the feasibility of infrastructure and service patterns.

Some potential Link21 elements and Exploratory Concepts were filtered out prior to this Exploratory Evaluation round and were not included within this analysis. The details of these are provided in the *Concepts Considered But Not Advanced Report* and *Appendix C: Concept Development Process*.

Evaluations were conducted for a variety of crossing concepts and design elements for the BART, Regional Rail, and combined BART and Regional Rail crossings. At the core of the Crossing Project is a new transbay passenger rail crossing between Oakland and San Francisco.

For **BART**, this crossing connects to existing BART infrastructure in the East Bay and serves downtown San Francisco with an Urban | Metro service, at a minimum. In downtown San Francisco, it should connect with the Regional Rail network for transfers between BART and Caltrain services. The minimum viable connection in the East Bay from an operational and ridership perspective is to connect to either BART’s northern lines, which compromises the Red (Richmond – Millbrae + SFO [San Francisco International Airport] service) and Yellow (Antioch – SFO + Millbrae service) lines, or BART’s southern lines, which comprises the Blue (Dublin/Pleasanton – Daly City service) and Green (Berryessa/North San José – Daly City service) lines. A BART crossing concept may have improvements to the Regional Rail network to better integrate the BART and Regional Rail networks.

⁶ BART, Capitol Corridor Joint Powers Authority (CCJPA), Program Management Consultants (PMC), and Consultants supporting program identification/project selection (Consultants)

⁷ Equity was incorporated in this analysis through an equity-weighted unmet potential for train travel based on priority populations.



Variations to the BART Exploratory Concepts involved different infrastructure configurations in the East Bay to connect with different BART lines, different station/transfer configurations in downtown Oakland/Alameda and downtown San Francisco, and different crossing alignments. A total of four BART Exploratory Concepts were evaluated in the Exploratory Evaluation.

For **Regional Rail**, this crossing connects to existing rail infrastructure in San Francisco (downtown) and the East Bay (connections in Emeryville and San Antonio), at a minimum. Regional Rail Crossing Concepts include both Intercity | Express and Urban | Metro services.

- **Intercity | Express** Regional Rail services that terminate in downtown Oakland or San Francisco in the Baseline would be extended across the San Francisco Bay via a new Regional Rail crossing.
- Additional **Urban | Metro** Regional Rail services would also be introduced between downtown San Francisco, downtown Oakland, the Emeryville/Berkeley/Richmond corridor, and the Jack London Square/Coliseum corridor.

A Regional Rail concept may have improvements to the BART network to better integrate the BART and Regional Rail networks.

Variations to Regional Rail exploratory concepts involved different potential extents to the Regional Rail infrastructure on the north and south branches in the East Bay, different station/transfer configurations in downtown Oakland/Alameda, and different crossing alignments. A total of four Regional Rail Exploratory Concepts were evaluated in the Exploratory Evaluation.

There also were two Exploratory Concepts of combined BART and Regional Rail crossings that included infrastructure and service elements from one Regional Rail and one BART Exploratory Concept.

Findings and Recommendations: BART

The five key findings related to a BART Crossing Concept are:

1. Future crowding relief could be achieved.
2. Increased frequency on transbay BART lines is a key enabler of benefits.
3. Connecting new transbay crossing services to all the East Bay lines enables more geographically distributed benefits.
4. Crossing variants present trade-offs.
5. Equity could be promoted with service modifications, such as prioritizing service enhancements to corridors with high priority populations.



The evaluation of the BART Exploratory Concepts led to the following recommendations to inform the development of the Initial List of Concepts that will be refined and evaluated in further detail in Round 1:

- Develop crossing concepts that connect the new crossing to the Red/Yellow and Green/Blue lines in the East Bay to expand ridership, reduce future crowding, increase cost-effectiveness, and improve operations and incident management potential.
- Evaluate the Salesforce Transit Center (STC) and Mission Bay crossing alignments to understand the trade-offs between travel times and new markets served.
- Explore concepts that increase intra-East Bay service and further increase service to the Red Line in the East Bay to expand ridership and help improve the proportion of benefits to priority populations.

Findings and Recommendations: Regional Rail

The six key findings for a Regional Rail Crossing Concept are:

1. Benefits could extend beyond the Bay Area from new one-seat rides.
2. Future crowding relief could be achieved.
3. Infrastructure and service extents in the East Bay are key enablers of benefits.
4. Infrastructure and service extents beyond San Francisco to the Peninsula may increase benefits.
5. Crossing variants present trade-offs.
6. Equity could be promoted with benefits to priority populations.

The evaluation of the Regional Rail Exploratory Concepts led to the following recommendations for the development of the Initial List of Concepts that will be refined and evaluated in further detail in Round 1:

- Extend infrastructure improvements at least to Richmond in the Emeryville/Berkeley/Richmond corridor, evaluate whether extensions to San Pablo or Hercules increase ridership, increase cost-effectiveness, and help promote equity.
- Extend infrastructure improvements at least to the Coliseum Station⁸ in the south to increase ridership, increase cost-effectiveness, and help promote equity.
- Explore different transfer locations in the East Bay to enhance connectivity and increase resiliency.
- Explore infrastructure improvements beyond the STC on the Peninsula to enable increased transbay frequency on Regional Rail.

⁸ Located in the vicinity of the existing BART Coliseum Station.



- Explore a Regional Rail service to a potential new Bayview station to increase ridership and help promote equity.
- Explore service improvements to the Richmond corridor and intra-East Bay service to increase ridership and help increase the proportion of benefits to priority populations.

Findings and Recommendations: Combined BART and Regional Rail

The key finding from the Combined BART and Regional Rail evaluation is that incremental demand generated from two new passenger rail crossings is insufficient to justify the high capital cost.

The recommendation from the Exploratory Evaluation is that a combined BART and Regional Rail crossing concept should not be advanced due to low additional ridership potential and high capital costs compared to single technology crossing Exploratory Concepts.

Recommendations: Summary

Recommendations for BART and Regional Rail Crossing Concept development are summarized here.

To increase ridership:

- BART crossing concepts should connect the Red/Yellow and Green/Blue lines to the new crossing. Service options that include greater service to the Red Line in the East Bay and higher intra-East Bay service levels should also be evaluated.
- Regional Rail crossing concepts should extend infrastructure to at least Richmond in the north (with possible extensions to San Pablo or Hercules) and extend infrastructure to at least the Coliseum Station in the south. Improvements in San Francisco and the Peninsula that enable greater service levels in the crossing should be evaluated.

To promote equity:

- BART crossing concepts with service options that include greater service to the Red Line in the East Bay and higher intra-East Bay service levels should be evaluated.
- Regional Rail crossing concepts with the following should be evaluated:
 - Infrastructure extended to at least Richmond and the Coliseum Station in the East Bay
 - Service to a potential new Bayview station in San Francisco
 - Service improvements to the Emeryville/Berkeley/Richmond corridor and intra-East Bay service levels

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To increase cost-effectiveness:

- BART crossing concepts should connect the Red/Yellow and Green/Blue lines to the new crossing. The STC and Mission Bay crossing alignments should be evaluated to understand the trade-offs.
- Regional Rail crossing concepts should extend infrastructure to at least Richmond in the north (with possible extensions to San Pablo or Hercules) and extend infrastructure to at least the Coliseum Station in the south. The STC and Alameda crossings with different transfer locations in the East Bay should be evaluated to understand trade-offs.

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