Corridor Crossings

STRATEGY

Strategy Report Part I

MAY 2023

Caltrain

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Lists of Acronyms

ACE	Altamont Corridor Express
BATAC	Bicycle and Active Transportation Advisory Committee
CAC	Citizens Advisory Committee
CAHSR	California High-Speed Rail
CCS	Corridor Crossings Strategy
CPUC	California Public Utility Commission
CRISI	Consolidated Rail Infrastructure and Safety Improvements Program
CSCG	City/County Staff Coordinating Group
DEDJTR	Department of Economic Development, Jobs, Transport, and Resources
DOT	Department of Transportation
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GMG	General Manager Group
INFRA	Nationally Significant Multimodal Freight & Highway Projects
JPB	Peninsula Corridor Joint Powers Board
LIRR	Long Island Rail Road
LPA	Locally Preferred Alternative
LPMG	Local Policy Makers Group
LXRA	Level Crossings Removal Authority
LXRP	Level Crossings Removal Project
MEGA	National Infrastructure Project Assistance Grants Program
MOU	Memorandum of Understanding
MPDG	Multimodal Project Discretionary Grant
MTA	Metropolitan Transportation Authority
MTIA	Major Transport Infrastructure Authority
OBAG	One Bay Area Grant
PPG	Project Partner Group
PSA	Project Service Agreement
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
ROW	Right-of-Way
SAT	Stakeholder Awareness Team
SCRRA	Southern California Regional Rail Authority
SGVCOG	San Gabriel Valley Council of Governments
SMCTA	San Mateo County Transportation Authority
TOD	Transit-Oriented Development
UPRR	Union Pacific Railroad
VTA	Santa Clara Valley Transportation Authority

1 Introduction

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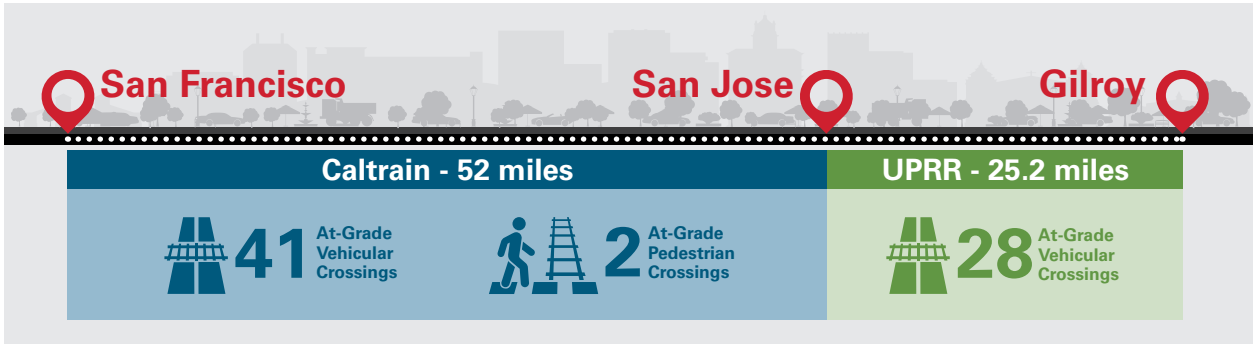
1 Introduction

The Caltrain corridor includes 43 at-grade crossings (41 at-grade vehicular and two at-grade pedestrian) between San Francisco and San Jose, with an additional 28 at-grade crossings on the Union Pacific Railroad (UPRR)-owned segment of the corridor between the stations of Tamien and Gilroy.[1]

Grade separations in the Caltrain corridor are necessary to support shared goals around circulation, regional mobility, safety, and reliability of operations.

As Caltrain and other operators plan to increase rail services, Caltrain understands that a coordinated approach to grade separations and closures is needed to unlock local circulation, regional mobility, and safety benefits. Grade separations and closures can enhance corridor safety, facilitate rail operations, and address circulation challenges in local jurisdictions. The Caltrain Business Plan acknowledges that grade separation projects are costly, complex, and challenging, and identifies the Corridor Crossings Strategy (CCS) to find areas for enhancement in the current grade separation project delivery process.

In addition to enhancing the current project delivery process, the CCS is intended to develop a strategic approach to the delivery of grade separation projects. Corridor stakeholders also recognize that no entity can deliver a corridor-wide strategy on their own, and the CCS is an opportunity to build corridor-wide consensus on how to bridge the gap between grade separation ambitions and the current scale of corridor-wide funding, organizational, and delivery capacity. **The goal of this report is to provide an overview of the initial program strategy efforts and findings informed by extensive stakeholder engagement and technical work.**



1 *An at-grade crossing is where a roadway or bike/pedestrian pathway crosses the rail corridor at the same level. A bike/pedestrian at-grade crossing only provides access for people walking or biking to cross the rail corridor, whereas a vehicular at-grade crossing allows access for all modes to cross the rail corridor.*

The Program Strategy is intended to develop a corridor approach to address the delivery of grade separations. This report will include:

- Overview of the Corridor Crossing Strategy
- Current grade separation project delivery process and challenges
- Case study summaries
- Program strategy development

Corridor Crossings Strategy

Overview

The Corridor Crossings Strategy was originally identified as part of the Caltrain Business Plan to enhance the current grade separation process and develop corridor-wide consensus on a strategy to deliver grade separation projects at the regional scale. The CCS is a stakeholder engaged process to develop a shared vision and a corridor-wide, programmatic approach for the organization, delivery, funding, and implementation of grade separations and closures. This effort will also identify how grade separations and closures fit into the future of the Caltrain and UPRR corridor.

The CCS will accomplish two outcomes:

Crossings Delivery Guide:

The Crossings Delivery Guide will serve as a consolidated resource of design standards, criteria, practices, procedures, and policies related to the planning and implementation of removing existing highway-rail grade crossings (i.e., grade separation and closure). The delivery guide is a result of stakeholder feedback and desire for consistency and clarity regarding project delivery processes. This guide will enable efficient project development through clearly defined roles and design criteria.

Crossings Program Strategy:

The Program Strategy will shape the discussion of how Caltrain and its stakeholders envision the future of addressing at-grade crossings throughout the corridor. The strategy is informed by a series of case studies identifying how other agencies and entities around the world address at-grade crossings on a programmatic level. The strategy then dives into a scenario planning approach, evaluating how varied approaches may yield different outcomes for the corridor. ***The Program Strategy is intended to develop a program to capitalize on funding opportunities and bring more funding to the corridor.***

Stakeholder Engagement Summary

A focus of the CCS is to create and communicate a clear, corridor-wide vision and approach to grade separation projects. Due to the length of the corridor and vested interest from numerous corridor jurisdictions and partner agencies, the CCS is using extensive engagement with internal (i.e., Caltrain staff) and external (i.e., local and regional agency staff, agency staff, and advocacy organizations) stakeholders and targeted communications to help foster the identification of a shared corridor-wide vision with a high degree of community sensitivity.

The initial stakeholder coordination process was to identify challenges, goals, and ambitions, as well as lessons learned (specific to the peer agencies, or external interviews). These topics would ultimately be articulated as common themes among all interviews, even if the specific points of view or articulation of issues for these topics or themes weren't identical.

Based on the stakeholder interviews, there is not a single consensus vision around (a) how much of the Caltrain corridor should be grade separated or (b) how grade separation projects should be completed to align with stakeholder ambitions. This complexity is compounded by the sheer number of stakeholders, which include 21 jurisdictions, three counties, two owners (Caltrain and UPRR), five operators (Caltrain, UPRR, Amtrak, ACE, and eventually CAHSR), and countless members of the public who will be impacted by CCS-related decisions. Therefore, it will be vitally important that stakeholders remain engaged to reach consensus on the goals, objectives, and needs of the CCS process.

The following stakeholder groups continue to be engaged on a regular basis as part of the CCS:

- Local Policy Makers Group (LPMG)
- City/County Staff Coordinating Group (CSCG)
- Peninsula Corridor Joint Powers Board (JPB)
- JPB Advocacy and Major Projects Committee (AMP) - JPB Subcommittee
- General Manager Group (GMG)
- Citizens Advisory Committee (CAC)
- Bicycle and Active Transportation Advisory Committee (BATAC)
- CCS Project Partner Group (PPG)
- CCS Stakeholder Awareness Team (SAT)

These groups are engaged to provide a clear and direct avenue for stakeholders to receive information about the CCS, provide input, and build consensus around strategic decisions.

Purpose

The CCS is an effort to define a systematic corridor-wide approach to crossings. The strategy aims to align stakeholder ambitions into balance with an implementable program, addressing funding, organization, and program delivery. This strategy is intended to develop a program to capitalize on funding opportunities and bring more funding to the corridor.

2 Current Grade Separation Delivery

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2 Current Grade Separation Delivery

Active Projects

Caltrain, in partnership with local jurisdictions, currently has 15 grade separation, bicycle/pedestrian crossing, and closure projects in various stages of development along the corridor. Planning, environmental review, design, and construction of these projects are large, multi-year efforts. The location of each project, along with a brief description of project status, is listed in **Table 1** and **Figure 1**.

Table 1 - Active Projects

COUNTY	PROJECT NAME	CROSSING STREET	PROJECT STAGE			
			PLANNING	ENVIRONMENTAL	DESIGN	CONSTRUCTION
San Francisco	Pennsylvania Avenue Extension	• Mission Bay Dr • 16th St At 7th	✓			
San Mateo	South Linden Avenue and Scott Street Grade Separation	• S Linden Ave • Scott St			✓	
	Burlingame Broadway Grade Separation	• Broadway			✓	
	Redwood City Grade Separation Study	• Whipple Ave • Brewster Ave • Broadway • Maple St • Main St • Chestnut St	✓			
	North Fair Oaks Bicycle and Pedestrian Railroad Crossing and Community Connections Study	• Under Evaluation	✓			
	Menlo Park Grade Separation Project	• Encinal Ave • Glenwood Ave • Oak Grove Ave • Ravenswood Ave	✓			
	Middle Avenue Undercrossing**	• Middle Ave			✓	
Santa Clara	Connecting Palo Alto	• Palo Alto Ave • Churchill Ave • Meadow Dr • Charleston Rd	✓			
	Rengstorff Grade Separation	• Rengstorff Ave			✓	
	Mountain View Transit Center and Grade Separation*	• Castro St			✓	
	Bernardo Avenue Undercrossing**	• Bernardo Ave	✓			
	Mary Avenue Grade Separation	• N Mary Ave	✓			
	Sunnyvale Avenue Grade Separation	• N Sunnyvale Ave	✓			
	Diridon Integrated Station Concept Plan	• Auzerais Ave • West Virgina St	✓			
	Southern San José Grade Separations Project (Union Pacific Rail Road)	• Skyway Dr • Branham Ln • Chynoweth Ave	✓			

*Crossing Closure and Construct Bike/Pedestrian Only Crossings **Bike/Pedestrian Only Crossings

Figure 1 - Active Projects

Active Projects

1. Pennsylvania Avenue Extension
2. South Linden Avenue and Scott Street Grade Separation
3. Burlingame Broadway Grade Separation
4. Redwood City Grade Separation Study
5. North Fair Oaks Bicycle, Pedestrian Railroad Crossing, and Community Connection Study
6. Menlo Park Grade Separation Project
7. Middle Avenue Undercrossing
8. Connecting Palo Alto
9. Rengstorff Grade Separation
10. Mountain View Transit Center and Grade Separation
11. Bernardo Avenue Undercrossing
12. Mary Avenue Grade Separation
13. Sunnyvale Avenue Grade Separation
14. Diridon Integrated Station Concept Plan
15. Southern San Jose Grade Separation Project

Source: Caltrain Business Plan Summary Report, 2020

Caltrain has partnered with local agencies to combine multiple grade separation projects into a larger project to help achieve economies of scale. A current example of this is the South Linden Avenue and Scott Street project currently in development, which involves both the City of San Bruno and City of South San Francisco. A constructed example of this partnership includes the Harbor Boulevard / Ralston Avenue / Holly Street project, which involved both the cities of Belmont and San Carlos.

Current Funding Model

Current grade separation projects are developed on a project-by-project basis. If a city desires a grade crossing to be separated, they initiate the process with Caltrain, with the City acting as the project sponsor.

As the project sponsor, the City is responsible for preparing and executing a funding plan for the project's planning, design, and construction. Of note, Caltrain does not currently have any funding resources to support grade separation implementation. A typical funding plan will likely utilize the following sources:

Local funds from the project sponsor

- Often utilized as matching funds for leveraging funding with the County, State, or Federal programs. These funds typically come from overall city Capital Improvement Program funds, and there are often competing pressures for growing local infrastructure needs.

County funding opportunities:

- **San Mateo County Transportation Authority (SMCTA) Measure A Funding Program** is available for SamTrans, San Mateo County cities and county, and JPB. Measure A was reauthorized in 2004 and went into effect in 2009 (2009-2033 Transportation Expenditure Plan). Measure A provides funding to improve transit and relieve traffic congestion. Fifteen percent of the total sales tax revenue generated is dedicated to the Grade Separation Category, which is estimated to be $225 million over the lifespan of the measure. The Measure A funding has been largely allocated on a first come, first serve basis. For the 2009-2033 Measure A Funding Program, there are 46 candidate grade separation projects and five projects have received $109 million of Measure A funding to date. An estimated $116 million remains earmarked to fund eligible grade separation projects until 2033.
- **SMCTA Measure W Funding Program** is available for SamTrans, San Mateo County cities and county, and JPB. Measure W was passed in 2018 and went into effect in July of 2019. Measure W provides a 2.5% share of the total sales tax revenue collected for grade separation projects, which is estimated to total $68 million ($2 million per year) over the 30 year lifespan of the measure. Allocation of Measure W funds will be based on the outcomes of this CCS.
- **Santa Clara Valley Transportation Authority (VTA) Measure B Funding Program** is a county-wide funding program sourced from a 30-year, half-cent sales tax to enhance transit, highways, expressways, and active transportation (bicycles, pedestrians, and complete streets) within Mountain View, Palo Alto, and Sunnyvale. Measure B was approved in 2016 and went into effect in 2017. Measure B provides 11.11% of the program tax

revenues to "Caltrain Grade Separations" category which is estimated to allocate approximately $700 million over the lifespan of the measure. Currently, two projects (Mountain View Transit Center and Grade Separation and CSS) have received Measure B funding of $11 million to date. In addition, another $42 million dollars for the Mountain View Transit Center and Grade Separation project have been allocated in the 2023 Fiscal Year.

- **Palo Alto Measure K** is a city-wide business tax that raises funds for public safety, affordable housing and homeless services, and grade separated crossings. The measure was recently passed in the November 2022 election, providing an estimated $9.6 million in funding each year. More information is expected in 2023.

Statewide funding opportunities:

- **The California Public Utility Commission (CPUC) Section 190 Program** provides state funds to local agencies to grade separate at-grade crossings or to improve grade separated crossings. The program typically provides approximately $15 million distributed among three to four projects each fiscal year. For consideration, jurisdictions must submit their crossing for evaluation and ranking within the Section 190 Program.
- **The CPUC Section 130 Program** provides state funds to local agencies to reduce the number and severity of highway accidents by eliminating hazards to vehicles and pedestrians at existing at-grade crossings. Under Section 130, most eligible projects involve incremental improvements to the at-grade crossing. However, grade crossing elimination projects (through roadway closure) are also eligible projects. For consideration, jurisdictions must submit their crossing for evaluation and ranking within the Section 130 Program.
- **Reconnecting Communities: Highway to Boulevards** establishes $149 million in FY 2023 to fund planning and construction efforts aimed at converting highways or other transportation facilities, including rail facilities, that create barriers to community connectivity to reconnect communities divided by transportation infrastructure. Funding is provided on a reimbursement basis, once jurisdictions enter an agreement with Caltrans. At the time of this report, the program guidelines were still a rough draft, so details may change by the time the final Program Strategy Report is released.
- **The Transit and Intercity Rail Capital Program** is a state program that funds transformative capital improvements to modernize California's intercity, commuter, and urban rail systems, and bus and ferry transit systems, to significantly reduce emissions of greenhouse gases, vehicle miles traveled, and congestion. In the sixth cycle of the program, over $3.63 billion is available for projects throughout the state with an additional $350 million available for High-Priority Grade Separation projects.

Federal funding opportunities:

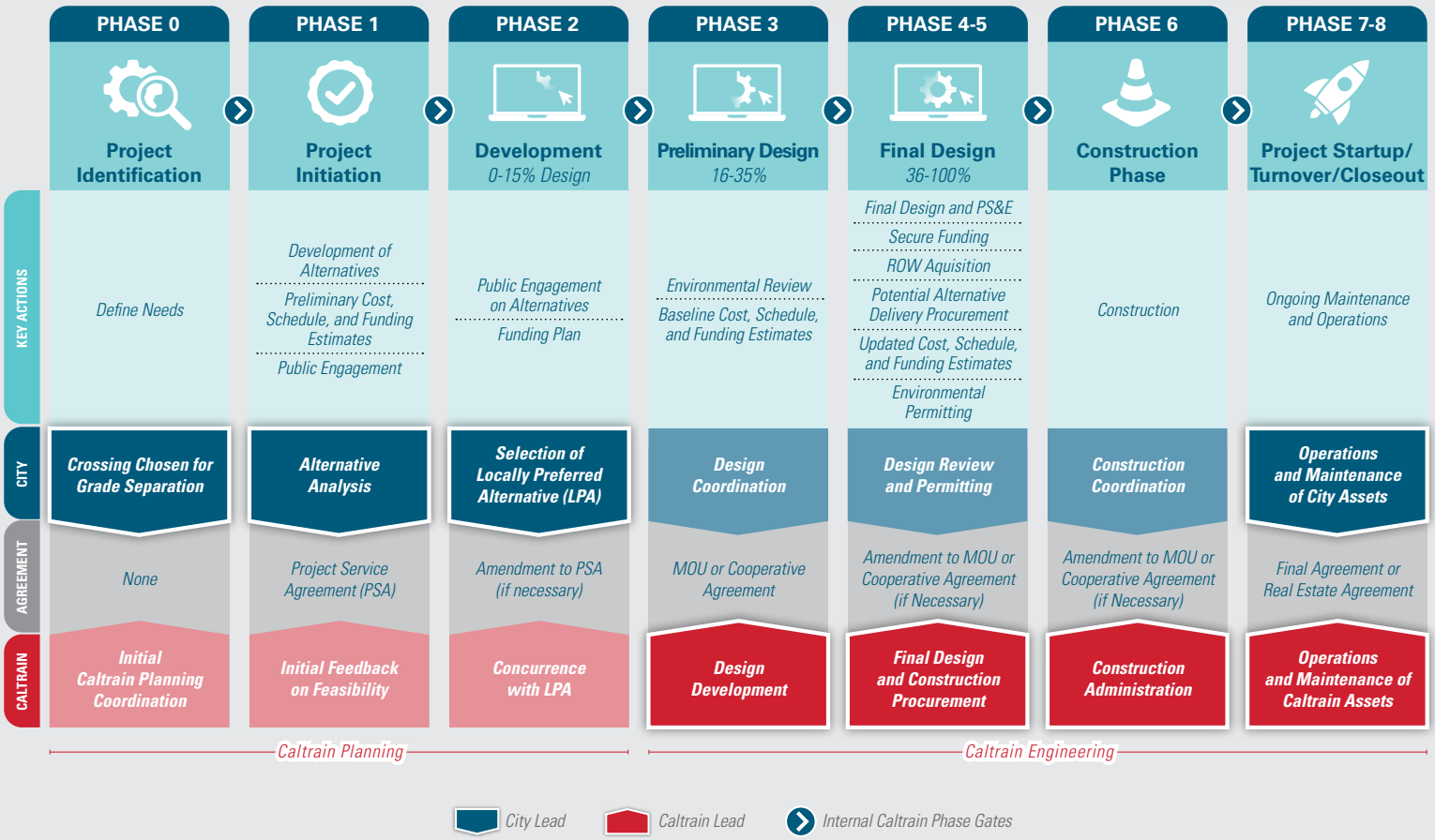
- **One Bay Area Grant County and Local Program (OBAG 3)** was adopted by Metropolitan Transportation Commission (MTC) in 2022 and provides $340 million in federal funding throughout the Bay Area. This program enables County Transportation Agencies (CTA) to nominate specific projects to be funded. Nomination amounts for Caltrain corridor counties include $62 million for San Francisco, $37 million for San Mateo, and $109 million for Santa Clara.
- **Federal Rail Administration (FRA) Railroad Crossing Elimination Grant Program** is a new program available to all states' and local jurisdictions' vehicular/pedestrian-rail grade crossing projects that focus on improving the safety and mobility of people and goods. Enacted in 2022, this grant program is authorized to allocate $500 million per year until 2026, with total funding estimated at $2.5 billion nationwide. There is no specific allocation for states, but each eligible funded project will receive at least $1 million without a funding maximum. No state shall receive more than 20% of total funds ($100 million) and 20% of the fund is dedicated to Rural Areas and Tribal Lands.

- **FRA's Consolidated Rail Infrastructure and Safety Improvements Program (CRISI)** is a federal funding program targeting improvements to safety, efficiency, and reliability for intercity passenger and freight rail, which includes mitigating rail congestion and chokepoints as well as ridership growth. The program was enacted in 2015 with additional funding made available in 2022. In 2020, $320 million was made available for funding and 2021 offered $360 million. The additional funding added for 2022 drove the total available funding up to $1.42 billion which includes $150 million dedicated to passenger rail and $25 million dedicated to anti-trespassing measures. Federal funding must not make up more than 80% of a project's funding, but there is no dollar limit on the funding available for a given project.
- **Federal State Partnership for Intercity Passenger Rail Program** is a federal funding program to improve American passenger rail assets to expand or establish new intercity passenger rail service, including privately operated intercity passenger rail service, reduce the state of good repair backlog, improve performance, and enhance rail safety. First enacted in 2015, the program was renamed and reformed in 2021 with the Infrastructure Investment and Jobs Act making a total of $4.566 Billion in funding available. There is no dollar limit on funding, but the federal share of total costs shall not exceed 80% and a minimum 20% non-Federal share is required.
- **Nationally Significant Multimodal Freight & Highway Projects (INFRA)** is a federal funding program available for multimodal freight and highway projects of national or regional significance to improve the safety, efficiency, and reliability of the movement of freight and people. In FY 2022, $1.55 billion in funding was made available under the Multimodal Project Discretionary Grant (MPDG). The minimum award amount for projects with less than $100 million in costs is $5 million, and the minimum award amount for projects with more than $100 million in costs is $25 million. Federal assistance may not exceed 80% of future total eligible project costs, except for states with a population density of not more than 80 persons per square mile area.
- **National Infrastructure Project Assistance Grants Program (MEGA)** is an additional federal funding program available under the Multimodal Project Discretionary Grant. In FY 2022, this program provided $1 billion in funding for large, complex projects that are difficult to fund by other means and likely to generate national or regional economic, mobility or safety benefits. There is no award minimum, but federal assistance may not exceed 80% of future total eligible project costs.
- **Reconnecting Communities Pilot Program** is a new program announced in 2022 to fund projects that reconnect communities burdened by past transportation infrastructure decisions. $198 million was made available in FY 2023, with $50M allocated for planning projects and $148 allocated for capital projects. Planning projects will receive no more than $2 million and capital construction projects will receive no less than $5M. Total federal assistance may not exceed 80%.
- **Rebuilding American Infrastructure with Sustainability and Equity (RAISE)** provides funds to road, rail, transit, and port projects that improve safety, economic strength and global competitiveness, equity, and climate and sustainability. The minimum award size for capital grants is $1 million in rural areas and $5 million in urban areas. There is no minimum award size for planning projects. Grant requests must not exceed $25 million to be considered under the full $2.3 billion funding amount.
- **The FTA Capital Investment Grants Program** is a discretionary grants program that funds fixed guideway investments including new and expanded rapid rail, commuter rail, light rail, streetcars, bus rapid transit, and ferries, as well as corridor-based bus rapid transit investments that emulate the features of rail. Proposed projects must go through a multi-year, multi-step development process to receive funds, with over $4.6 billion available in FY 2024.
- **The Transit-Oriented Development Pilot Program** provides financing to comprehensive or site-specific planning projects associated with new fixed guideway and core capacity improvement projects. $14 million in annual funding is allocated for eligible projects from FY 2024 through FY 2026

Current Delivery Model

The planning, design, and construction of grade separation projects on the Caltrain corridor have taken many different forms based on funding and project nuances. The current broad process for grade separation projects is shown in **Figure 2** and described in further detail below. During Phase 0 – Phase 2, the local jurisdiction is the lead in the grade separation project, although Caltrain is available for initial planning coordination, feedback on feasibility, and concurrence with the Locally Preferred Alternative (LPA). Caltrain is the lead for Phase 3 – Phase 6. Internal stakeholders explained that Caltrain Planning oversees the project during the early conceptual phases until the local jurisdiction selects the LPA. Caltrain Engineering and Program Delivery staff provide advice, guidance, and support. When the project moves into preliminary and final design, Caltrain Engineering staff assumes the lead role and planning moves into an advisory role. For the final Phases (Project Startup/Turnover/Closeout), Caltrain and the local jurisdiction are co-leads.

Figure 2 - CCS Delivery Model



Phase 0: A jurisdiction desires to grade separate a crossing. This is typically done by the jurisdiction with initial planning-level conversations with Caltrain.

Phase 1: The jurisdiction develops Alternative Analysis plans and initial cost estimates for initial conversations with Caltrain and the community. At this stage, the City and Caltrain enter into a Project Service Agreement (PSA) that details the Caltrain scope of work for planning coordination and technical review, number of coordination meetings, schedule for review times. The PSA also includes the budget for Caltrain's participation in these activities.

Phase 2: The City, with concurrence from Caltrain in keeping with the PSA, selects a LPA and prepares initial plans, generally up to 15% design. The City is responsible for project cost estimates and funding plans.

Phase 3: Caltrain and the City enter into a Memorandum of Understanding (MOU) (projects within San Mateo County) or a Cooperative Agreement (projects within Santa Clara County) and Caltrain begins to lead the process. The City or Caltrain develops the environmental documentation. Caltrain develops preliminary engineering plans to a 35% design level along with baseline cost, schedule, and funding estimates. The City retains responsibility for the funding plan.

Phase 4-5: Caltrain leads completion of design and construction procurement. During this stage the City secures full funding for the project, ROW is acquired, environmental permits are secured, and the cost, schedule, and funding estimates are all updated. Caltrain also explores potential alternative delivery approaches during this phase of project development.

Phase 6: Caltrain administers project advertisement, selection of a contractor, and construction of the project. Grade separation projects along the Caltrain corridor have been delivered by a Design-Bid-Build delivery model. Caltrain does not have a process to allow other agencies to perform or oversee construction on the active rail corridor.

Phase 7-8: During construction, Caltrain and the City enter into a Final Agreement or Real Estate Agreement to outline ownership and maintenance responsibilities. While these agreements vary by project, usually after project completion and closeout Caltrain is responsible for maintenance of all rail-related structures, while the City assumes responsibility for maintenance of roadways and other public improvements.

Conclusion

Project delivery for grade separations occurs on a project-by-project basis and Caltrain's delivery model has been design-bid-build. Caltrain has an interest in delivering projects under alternative delivery methods to expedite project delivery and has set up internal processes to explore alternative delivery, but at this time has not delivered a grade separation project with an alternative delivery method.

While there are numerous projects underway in the Caltrain corridor, there is no standardized process for advancing grade separations. Funding and prioritization for these projects is fragmented, and there are far more projects than there is available funding. Only certain funding mechanisms are dedicated to specific projects, and for these the timing may largely be unknown. The CCS presents an opportunity to explore programmatic funding opportunities that can be used to implement a streamlined project delivery processes.

3 Case Studies

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3 Case Studies

The CCS approach is informed by how Caltrain's current grade separation project processes compare to other agencies' major infrastructure projects around the world. The peer agencies selected for this exercise provide examples of a range of organizational structure types and project approaches. Information from these peer agency efforts will provide Caltrain and corridor stakeholders with a better understanding of the range of project approaches available as well as information that can be used to optimize the agency's future grade separation strategy. The four peer agencies analyzed for the CCS include:

Metrolink – Los Angeles, CA metro

Alameda Corridor - East Project – Los Angeles, CA metro

Main Line Expansion, Long Island Rail Road – New York, NY metro

Level Crossing Removal Project – Melbourne, Victoria, Australia

Each example provides points of comparison in terms of the governance model, funding sources, delivery approach, and other process elements. **Table 2** compares the four peer agencies and their progress in addressing at-grade crossings, their primary funding sources, which entity leads the implementation of these projects, and the general timeframe each agency has to address their crossings. Additional detail is included in **Appendix A**.

Table 2 - Case Study Comparison Table

Case Study	At-Grade Crossings Addressed	Primary Funding	Implementation Lead	Timeframe
MetroLink/ SCRRA	Project-by-Project	State + Federal (Local Secondary)	County Transportation Authority	Not Set (as funding available)
Alameda Corridor - East Project	20	Regional + State (Federal + Other secondary)	Single-Purpose Construction Authority	Started in 1998, final projects in design
Long Island Rail Road (LIRR)	8	MTA Capital Funds	LIRR	Construction began 2018, complete 2023
Melborne, Australia	110 (Initially 50)	Federal + Regional	Level Crossing Removal Authority	Began 2015, anticipated completion in 2030

Metrolink

METROLINK Metrolink is a public transportation system operated by the Southern California Regional Rail Authority (SCRRA) serving the counties of Los Angeles, Orange, Riverside, San Bernardino, Ventura, and North San Diego. SCRRA is a Joint Powers Authority created in 1991 to plan, design, construct, maintain, and administer the operation of Metrolink regional commuter rail service. Metrolink, or SCRRA, largely addresses their grade separation projects individually, rather than in segments or as a program. The Metrolink system now has nearly as many grade-separated crossings (426) as highway-rail grade crossings (457). Projects have been funded on a project-by-project basis from county, state, and federal sources, and the success of SCRRA member jurisdictions in implementing grade separation projects has been due to the success of receiving discretionary grant funds from multiple sources.

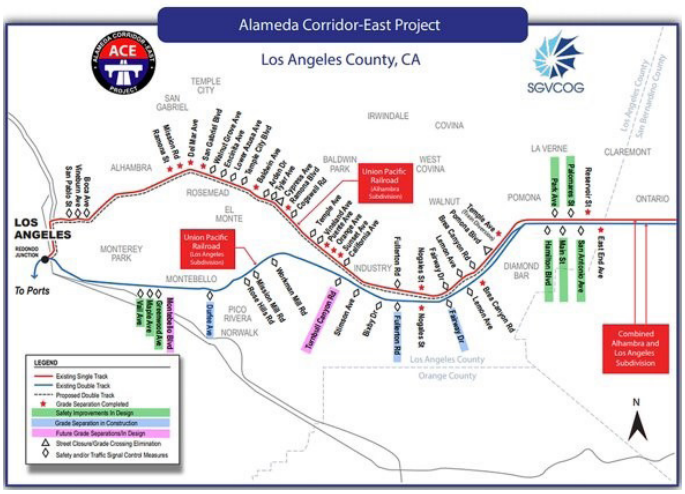
The exploration of these peer agency case studies has revealed several possibilities for Caltrain and its stakeholders to consider as the CCS works towards a consensus vision for its at-grade crossings.

Alameda Corridor - East Project

The Alameda Corridor – East Project was established by the San Gabriel Valley Council of Governments (SGVCOG) in Southern California in 1998 as a single-purpose construction authority to implement a construction program intended to mitigate vehicle delays and collisions at rail-highway crossings along a corridor spanning over 35 miles of track from eastern Los Angeles to Pomona, with projects expected in seven cities' jurisdictions.

In 1997, SGVCOG initiated a feasibility study to assess the condition of the corridor's existing rail crossings in anticipation of planned rail corridor improvements to be completed in 2002, that would result in increased in rail traffic. SGVCOG is a Joint Powers Authority comprised of 31 cities and four counties. SGVCOG proactively sought to mitigate adverse crossing impacts along this corridor, such as congestion (vehicular and trains) and safety. Given that the efficiency of this corridor has regional, state, and national trade implications, the US Congress designated Alameda Corridor – East as a Project of National and Regional Significance. This designation makes improvement projects along the corridor more competitive for funding.

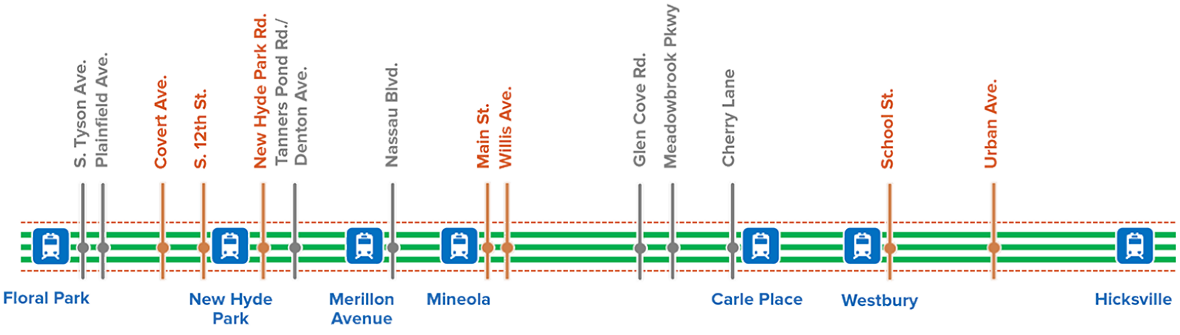
The Alameda Corridor – East Project has identified the need for safety improvements at over 50 at-grade crossings and the elimination of 20 at-grade crossings.



Long Island Rail Road

The Long Island Railroad (LIRR) operates under the umbrella of the Metropolitan Transportation Authority (MTA), which services the greater New York City metro area. The MTA is North America's largest transportation network, serving a population of over 15 million people. The LIRR is the busiest commuter railroad in North America, carrying an average of over 300,000 customers each weekday on 735 daily trains. LIRR service includes over 700 miles of track on 11 different branches, stretching from Montauk (eastern tip of Long Island) to Penn Station in Manhattan. In 2016, the MTA began the LIRR Main Line Expansion project, which consisted of 9.8 miles of new third track, the elimination of eight street-level grade crossings, modifications to seven rail bridges, installation of sound and retaining walls throughout the corridor to reduce train noise, Americans with Disabilities Act (ADA) improvements and enhanced stations, new traction power substations, new parking facilities, landscaping, and more. The LIRR's Main Line is the central artery of the commuter rail system in Nassau and Suffolk counties.

The Main Line Expansion project was an intentional, centralized effort that aimed at increasing throughout and efficiency along the rail corridor. LIRR and MTA identified the project as high enough priority to utilize capital program funding to fast track the improvements in just over two years of construction for the 9.8-mile corridor. By combining several improvements into one project package (third track construction, eight at-grade crossing eliminations, station improvements, etc.), MTA decreased the magnitude of impacts to the community and gained significant efficiencies.



Melbourne, Australia

LEVEL CROSSING REMOVAL PROJECT

Melbourne is the largest city in Victoria, Australia, with the Melbourne metro area having a population of nearly 5 million in 2021. Due to the size of the metro area and the large population, public transport is a key concern for many residents, and there is a relatively large amount of commuter rail available. As of December 2020, the state-owned commuter rail agency VicTrack owned approximately 1,000 km (~620 miles) of railway, serving primarily commuter rail, but with some sections carrying freight as well. In 2015, there were nearly 170 grade crossings within Melbourne. Originating as a campaign promise in the 2014 Victoria elections, removal of grade crossings became a key issue for the Labor Party's Daniel Andrews in the runup to his eventual election victory, vowing to remove 50 of the most dangerous crossings by 2022. This gave the program strong political support with a prominent champion.

First announced in February 2015 and then formally created in May 2015, the Level Crossings Removal Authority (LXRA) was established by the Government of Victoria as an administrative office within the Department of Economic Development, Jobs, Transport, and Resources (DEDJTR) to administer the project—the largest public works project in the history of Victoria. Not only did the LXRA set out to remove level crossings, it also served to improve the rail networks as a whole, including more trains for more frequent service, new train stations, and upgraded signaling. Public amenities such as parks, sidewalks, and bike lanes were also included in new sections of rail as part of the project. In 2019, a reorganization consolidated roles and the project is officially the Level Crossing Removal Project (LXRP) managed by Victoria's Major Transport Infrastructure Authority (MTIA), which is an administrative agency within the Department of Transport (DoT). Due to its success and popularity, the project has expanded in length and number of crossings. A total of 85 level crossings are to be removed by 2025, with 65 level crossings already removed.

4 Program Strategy Development

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4 Program Strategy Development

Problem Statement

Passenger rail service has been running along the Caltrain corridor for over 150 years. Communities and job centers have grown around the corridor since service began, with the Bay Area's population growing by over 113% since the 1960's. According to Caltrain's Business Plan, corridor-wide demand is also expected to increase from 60,000 daily riders (pre-pandemic) to 150,000 – 200,000 weekday riders with the expansion of rail service along with the electrification of the corridor between San Jose and San Francisco. With this growth and change along the corridor, the region needs an updated approach to solving the new circulation and mobility challenges that these impacts will bring.

Weekday riders expected to increase from 60,000 (pre-pandemic) to 150,000 – 200,000.

The overarching issue being addressed by the CCS is this: there is a significant imbalance between the jurisdictions' grade separation ambitions and the current scale of corridor-wide funding, organizational, and delivery approach (**Figure 3)**. For example, there are currently 15 projects across 31 crossings in development along the Caltrain corridor (see **Table 1**).

There is a significant need for additional resources to pay for and implement these 15 projects, despite them addressing just a small fraction of the total crossings in the corridor. Jurisdictions' needs for crossings projects along the corridor is out of pace with the railroad project delivery process and funding realities.

Figure 3 - Current Challenges

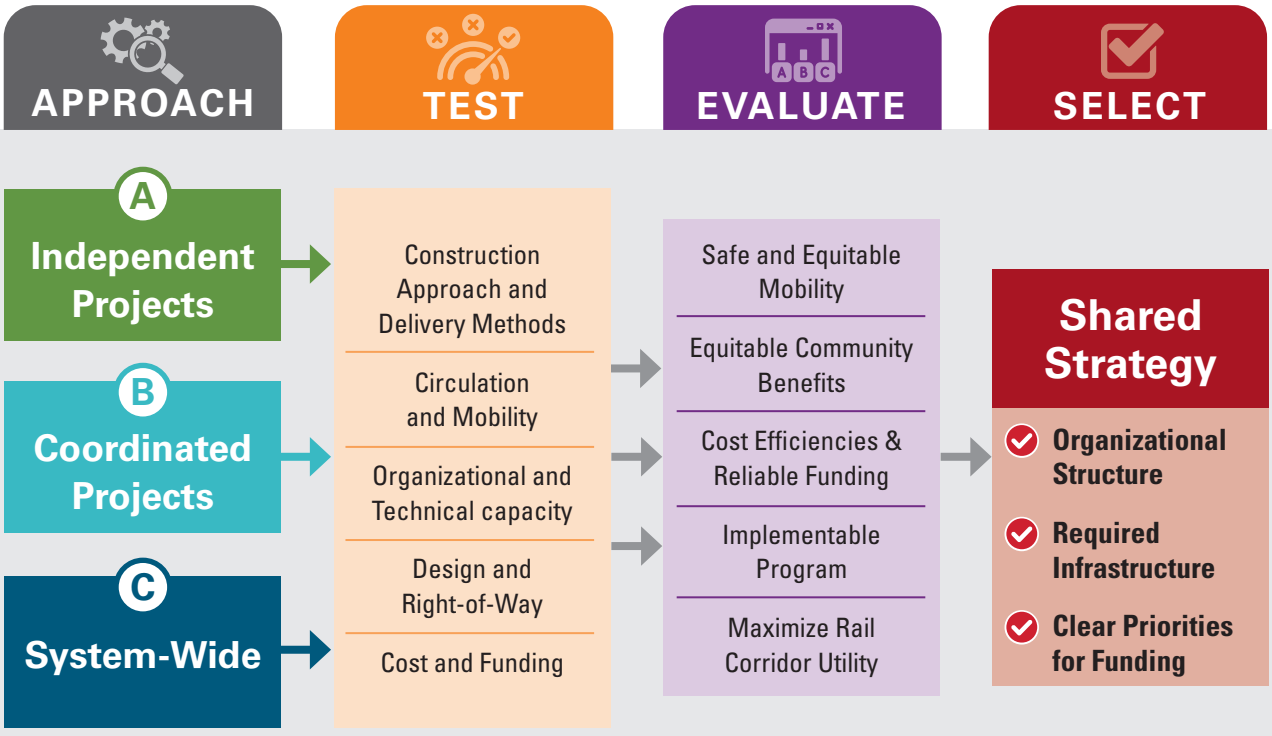
The current process for addressing at-grade crossings is reactive and unpredictable. Projects are dependent upon jurisdictions' initiative to engage Caltrain and develop a funding plan and alternatives analysis. Caltrain's involvement in reviewing initial concepts depends on executing a funding agreement with a project sponsor, and Caltrain does not generally take on project management until after a LPA is identified. Currently, there is no defined process for how each party should address the funding, regulatory, organizational, or delivery aspects of the grade separation projects. While a lack of clarity in the process roles and individual project initiation are existing issues, these are "symptoms" of the larger issue of the lack of a strategic approach.

The CCS is an effort to define a systematic corridor-wide approach to crossings. The strategy aims to align stakeholder ambitions into balance with an implementable program, addressing funding, organization, and program delivery

Methodology and Process

The CCS will utilize a scenario-based approach to develop a shared understanding for how best to address the corridor's at-grade crossings. Exploring different program delivery approaches, the CCS will test against technical topics, evaluate against the program goals, and select which approach best aligns with the shared program strategy **(Figure 4)**. The CCS will evaluate important technical topics through the lens of three different delivery approaches to build consensus on a corridor-wide vision. The delivery approaches were identified through the case studies discussed previously. Each technical topic will be presented to the stakeholder groups to discuss potential benefits or efficiencies between the delivery approaches and the information will be synthesized to develop a shared approach for the CCS.

Figure 4 - Methodology and Process



Delivery Approaches Overview

The case studies and research have resulted in three general approaches that Caltrain and corridor stakeholders could advance: Independent Projects Approach, Coordinated Projects Approach, or a System-Wide Approach. Program components of each approach compared to the current approach status quo are outlined below in **Table 3**.

Table 3 - Delivery Approaches Overview

Program Component	Current Approach/ Status Quo	Approach Ⓐ Independent Projects	Approach Ⓑ Coordinated Projects	Approach Ⓒ System-Wide
Initial Planning	Local jurisdiction with Caltrain concurrence	Local jurisdiction with Caltrain concurrence	Caltrain with local jurisdiction concurrence	Caltrain or Special-purpose entity (SPE) with local jurisdiction concurrence
Environmental Review	Usually Caltrain	Caltrain	Caltrain	Caltrain or SPE
Design	Caltrain	Caltrain	Caltrain	Caltrain or SPE
Construction	Caltrain	Caltrain	Caltrain	Caltrain
Funding Strategy Lead	Local jurisdiction	Local jurisdiction + Corridor-wide understanding of priorities	Caltrain (with local jurisdiction) for defined project limits	Caltrain or SPE (with local jurisdiction) + Corridor-wide prioritization

Approach A: Independent Projects

The Independent Projects Approach is similar to Caltrain's current project delivery approach, addressing each crossing individually as its own singular project. These projects are often initiated and funded by the municipality. This approach does not have a timeline for addressing the corridor's crossings. In order to make the current process more efficient and consistent, roles and expectations between each party would be clearly established from the outset. A corridor-wide understanding of priorities would be required amongst Caltrain and its partners.

Similar case study: Metrolink

Approach B: Coordinated Projects

The Coordinated Projects Approach is a more aspirational delivery approach for at-grade crossings, typically grouping projects together by proximity or priority. This approach strives to have a certain percentage of crossings separated or eliminated by a certain date. This approach would require more regional coordination and funding plans with a more detailed prioritization process. Projects would likely still be initiated by jurisdictions, however with more coordination with Caltrain.

Similar case study: Alameda Corridor - East Project & Long Island Rail Road

Approach C: System-Wide

The System-wide Approach is a comprehensive delivery approach that strives to have all crossing separated or eliminated as quickly as possible. This approach often involves a new centralized entity with the authority to execute the projects. Corridor-wide and regional funding plans would be required, with less involvement from the jurisdictions.

Similar case study: Melbourne, Australia

Technical Topics Overview

Taking a corridor-wide perspective to delivering crossing grade separation projects is complicated and complex. The CCS recognizes that the technical topics being explored are interrelated elements and depend on one another. These components will be examined one at a time, to develop an understanding on how these components will guide the development of the strategy. These technical topics were chosen to identify potential capabilities and restraints around developing a Corridor Crossings Strategy, across the different delivery approaches. The technical topics and objectives of each topic analysis are as follows:

Construction Approach and Delivery Methods

- Identify and compare common grade separation construction methods with respect to cost, duration, required expertise, and program delivery approach
- Identify potential project delivery methods and evaluate their opportunities and challenges from the perspective of the contractor, rail operations, and the local community.

Circulation and Mobility

- Establish baseline conditions for each at-grade crossing including traffic volumes, safety data, gate down time, and other pertinent information.
- Evaluate existing and planned pedestrian, bicycle, auto, and transit access around the corridor.
- Identify potential improvements associated with grade-separation and crossing closure projects.
- Evaluate potential Transit Oriented Development (TOD) and placemaking opportunites.
- Assess how to integrate equitable solutions into the program.

Organizational and Technical Capacity

- Identify challenges and opportunities for program's execution and the ability to deliver each approach.

Design and Right-of-Way (ROW)

- Evaluate potential design alternatives through consideration comparison of location-specific opportunities and constraints.
- Investigate, through localized application, the Right-of-Way impacts associated with each potential design alternatives.
- Identify design opportunities and techniques.
- Evaluate ROW challenges along the corridor.

Cost and Funding

- Review the cost and funding sources of the current crossing projects.
- Research current funing opportunities.
- Develop common understanding of program-level costs and funding opportunities.
- Identify strategy for corridor-wide funding.
- Explore potential costs per project and timeline options for the program.
- Identify opportunities for cost savings through bundling projects and other efficiencies.

Goals/Evaluation Measures

The CCS Program Strategy is aimed at bringing jurisdictions' ambitions into sync with an implementable program and creating the basis for advocacy for corridor funding. To arrive at these targets, the following goals and evaluation measures were developed with Caltrain staff and corridor stakeholders to help guide the program strategy process. Some of the sub-measures may be more qualitative than quantitative, however they will all serve the same purpose by helping guide Caltrain and its stakeholders towards a shared approach to implement for the corridor.

Safe and Equitable Mobility	Equitable Community Benefits	Cost Efficiencies and Reliable Funding	Implementable Program	Maximize Rail Corridor Utility
Eliminate collisions along the corridor	Establish a framework for equitable investments	Facilitate design approaches and innovation that enable corridor delivery	Define clear roles for Caltrain and its partners	Support implementation of adopted service vision
Improve access and circulation, with priority for walking, biking, transit, goods movement, and emergency response	Foster placemaking	Streamline program delivery methods to reduce overall costs	Accelerate construction and reap schedule efficiencies	Sustain service and minimize disruptions during construction
Provide mobility choices during construction	Improve quality of life and reduce environmental impacts for neighboring communities	Leverage existing committed funding and promote new and stable funding sources	Establish clear program corridor objectives for delivery	Promote quality passenger experience and improve reliability
			Organize partnerships for successful program delivery	Leverage value created by grade separations and/or closures

Shared Strategy Recommendations

Caltrain and corridor stakeholders will spend the rest of 2023 analyzing the findings from each technical topic's evaluation and discuss the potential benefits or efficiencies provided by each of the three delivery approaches. After the conclusion of the technical topic evaluations, a series of program strategy workshops will be held to discuss those findings with the goal of identifying a shared delivery approach for Caltrain and its stakeholders to implement to maximize the funding opportunities. Once the delivery approach is agreed to, the CCS will develop an implementation plan for the identified delivery approach with continued coordination with Caltrain, its stakeholders, and the community.

In parallel with this work will be the development of the Crossings Delivery Guide and continued project development activities on the 15 active projects in the Caltrain corridor. There may also be opportunities to identify coordinated funding applications to advance corridor priorities that set up the implementation of the CCS.

A Appendix

Caltrain | Corridor Crossings STRATEGY

Alameda Corridor East

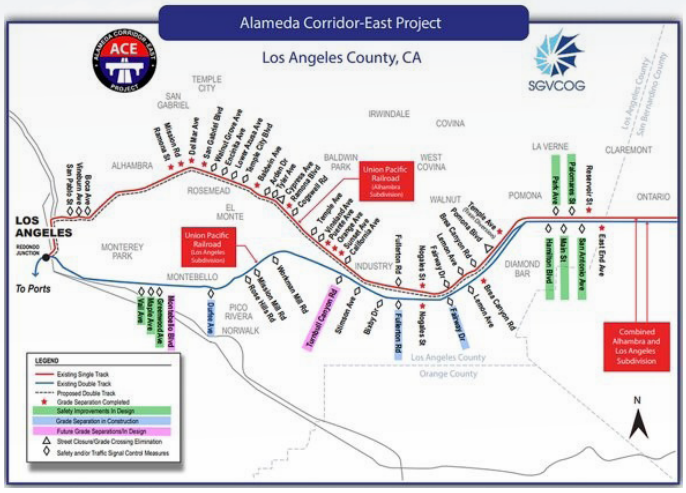
Background

The Alameda Corridor – East Project was established by the San Gabriel Valley Council of Governments (SGVCOG) in Southern California in 1998 as a single-purpose construction authority to implement a construction program intended to mitigate vehicle delays and collisions at rail-highway crossings. In 1997, SGVCOG initiated a feasibility study to assess the condition of the corridor's existing rail crossings in anticipation of planned rail corridor improvements to be completed in 2002, resulting in increased in rail traffic. SGVCOG is a joint powers authority comprised of 31 cities and four counties. The Alameda Corridor – East Project, part of the Metrolink system, was empowered to enter into contracts, employ agents, officers, and employees, to obtain insurance, and to acquire, lease, dispose of, and maintain any necessary properties.

This rail corridor facilitates UPRR freight cargo to and from the ports of Los Angeles and Long Beach. This corridor is one of the busiest freight routes in the United States (US), carrying 16% of all oceangoing containers in the US. Train traffic through this corridor is expected to grow by 150% by 2050. SGVCOG proactively sought to mitigate adverse crossing impacts along this corridor, such as congestion (vehicular and trains) and safety. Given that the efficiency of this corridor has regional, state, and national trade implications, the US Congress designated Alameda Corridor – East as a Project of National and Regional Significance. This designation makes improvement projects along the corridor more competitive for funding.

The Alameda Corridor – East Project spans over 35 miles of track from eastern Los Angeles to Pomona, with projects expected in seven cities' jurisdictions, as shown on the following page. The Alameda Corridor – East Project has identified the need for safety improvements at over 50 at-grade crossings and the elimination of over 20 at-grade crossings.

The Alameda Corridor – East Project has identified the need for safety improvements at over 50 at-grade crossings and the elimination of 20 at-grade crossings.



The improvements were identified in the 1997 Grade Crossing Feasibility Study. Crossing eliminations will be converted to grade-separated crossings. To date, the Alameda Corridor – East Project has completed construction on 14 grade separations, with three more grade separations currently under construction and the remaining three projects in design.

Funding & Prioritization

Funding for the Alameda Corridor – East Project comes from federal and state gas tax and other transportation funds, state Proposition 1B transportation bonds approved by voters in 2006, Los Angeles County Prop C and Measure R sales tax revenues and other local funds, and a railroad contribution from the UPRR typically less than 5% of total funding.

Total committed funds for the Alameda Corridor – East Project add up to $1.825 billion to date. The Alameda Corridor – East Project has received most of its funding from regional (41%) and state (38%) sources, given its regional significance designation. Federal funds comprised 14% of Alameda Corridor – East Project funding, with other sources contributing 7%.

Grade separation and safety projects were addressed incrementally, prioritized based on highest need and lowest cost. The initial set of projects identified in the 1997 Crossing Feasibility Study included up to 20 grade separations, 38 at-grade crossing safety projects, and up to four crossing closures. The general framework for the program included the following principles:

- Candidate projects were screened using threshold criteria to develop initial lists of improvements for further consideration.
- A high-priority, near-term improvement group consisted of a set of low-cost baseline safety improvements that were implemented along the entire corridor.
- Higher capital cost projects (grade separations, road widening, etc.) were evaluated for relative benefit under existing versus future conditions in order to determine whether such projects should be considered near- or long-term in nature.

- Efforts were made to define and implement lower-cost/near-term solutions at locations where high-cost options may ultimately be needed, especially for those where the projected needs are long-term.
- Projects were grouped into geographic units based upon similar conditions and sub-regional traffic flow and rail operation zones. The benefits to crossings within these units were considered in relationship to one another to avoid piecemeal solutions.
- Funding was sought for the entire program of improvements. Simultaneously, efforts were made to obtain funding from a variety of sources. Any projects capable of obtaining funding regardless of the program were implemented with such separate funding.

Stakeholder Considerations

While there was no public opposition to the project during the initial environmental review process, there were some local disagreements regarding the proposed project design. The corridor jurisdictions preferred a lowered trench design, whereas the ports preferred an at-grade railway with standard grade separations (raised cross streets). Ultimately, both elevated and channelized separations have been constructed along the corridor. The residents' attitudes towards the project received fairly limited press coverage, as they were neither the creators nor the primary beneficiaries of the corridor. However, residents acknowledged the economic boost provided by the project, due largely to new jobs and reduced congestion throughout the corridor.

Lessons Learned

The Alameda Corridor – East Project benefited greatly from its geography, being a major trade route for freight cargo to and from the ports of Los Angeles and Long Beach. The regional significance designation expanded funding opportunities through the Los Angeles County Metropolitan Transportation Authority (MTA) and the state of California, making it a unique case study. This designation also helped the Authority garner significant support across the region, amongst cities, counties, and other regional entities. The public was largely indifferent to the project since they were not directly impacted by the costs or benefits, although removing at-grade crossings would decrease travel delays in the area.

Long Island Rail Road

Background

Long Island Rail Road

The Long Island Railroad (LIRR) operates under the umbrella of the Metropolitan Transportation Authority (MTA), which services the greater New York City metro area. The MTA is North America's largest transportation network, serving a population of over 15 million people. The LIRR is the busiest commuter railroad in North America, carrying an average of over 300,000 customers each weekday on 735 daily trains. LIRR service includes over 700 miles of track on 11 different branches, stretching from Montauk (eastern tip of Long Island) to Penn Station in Manhattan. In 2016, the MTA began the LIRR Main Line Expansion project, which consisted of 9.8 miles of new third track, the elimination of eight street-level grade crossings, modifications to seven rail bridges, installation of sound and retaining walls throughout the corridor to reduce train noise, ADA improvements and enhanced stations, new traction power substations, new parking facilities, landscaping, and more. The LIRR's Main Line is the central artery of the commuter rail system in Nassau and Suffolk counties.

Caltrain

A design-build contract was awarded in late 2017. The Main Line Expansion has completed most of its related projects as of November 2022, including all eight grade crossing eliminations. The crossing eliminations consisted of a combination of new roadway underpasses, overpasses, and crossing removals.

Funding & Prioritization

This project has cost $2.6 billion, largely funded from the MTA's capital program budget and long-term MTA debt. The Main Line Expansion project would likely have been a good candidate for FTA funding, however the Governor of New York and MTA leadership intended to "fast track" the project using its own funds. This corridor had been identified by MTA and LIRR as a need to reduce train congestion and enable true bi-directional service during peak hours with a more reliable rail network. MTA used the third track construction as an opportunity to address existing at-grade crossings and other improvements. By bundling these improvements under one programmatic effort, the agency gained significant efficiencies while minimizing the impact on rail operations during construction. Eliminating the eight grade crossings in this corridor in concert with the third rail construction (as opposed to addressing them separately) decreases construction time, cost to taxpayers, and disruption to local communities.

Stakeholder Considerations

MTA and LIRR engaged in an unprecedented community outreach program for the Main Line Expansion project, meeting consistently and frequently with local elected officials, civic leaders, business owners, and residents to discuss the project and elicit feedback. The project made a number of key community commitments, including:

- The use of retaining walls will allow the third track to be placed in the existing LIRR right-of-way. This approach eliminated the need for residential relocations and other imposing community impacts.

- Sound attenuation walls will be erected throughout residential areas to reduce noise levels and protect quality of life standards.
- Environmental controls will be in place throughout the duration of construction to minimize dust, noise and other community disruptions.
- The MTA's and LIRR's ongoing commitment to robust community outreach, including consultation on design aspects, will ensure the public's voices are heard and considered throughout all aspects of the project.

Lessons Learned

The Main Line Expansion project was an intentional, centralized effort that aimed at increasing throughout and efficiency along the rail corridor. LIRR and MTA identified the project as high enough priority to utilize capital program funding to fast track the improvements in just over two years of construction for the 9.8-mile corridor. By combining several improvements into one project package (third track construction, eight at-grade crossing eliminations, station improvements, etc.), MTA decreased the magnitude of impacts to the community and gained significant efficiencies.

Melbourne

Background

LEVEL CROSSING REMOVAL PROJECT

Melbourne is the largest city in Victoria, Australia, with the Melbourne metro area having a population of nearly 5 million in 2021. Due to the size of the metro area and the large population, public transport is a key concern for many residents, and there is a relatively large amount of commuter rail available. As of December 2020, the state-owned commuter rail agency VicTrack owned approximately 1,000 km (~620 miles) of railway, serving primarily commuter rail, but with some sections carrying freight as well. In 2015, there were nearly 170 grade crossings within Melbourne. Originating as a campaign promise in the 2014 Victoria elections, removal of grade crossings became a key issue for Labor Party's Daniel Andrews in the runup to his eventual election victory, vowing to remove 50 of the most dangerous crossings by 2022. This gave the program strong political support with a prominent champion.

First announced in February 2015 and then formally created in May 2015, the Level Crossings Removal Authority (LXRA) was established by the Government of Victoria as an administrative office within the Department of Economic Development, Jobs, Transport, and Resources (DEDJTR) to administer the project—the largest public works project in the history of Victoria. Not only did the LXRA set out to remove level crossings, it also served to improve the rail networks as a whole, including more trains for more frequent service, new train stations, and upgraded signaling. Public amenities such as parks, sidewalks, and bike lanes were also included in new sections of rail as part of the project. In 2019, a reorganization consolidated roles and the project is officially the Level Crossing Removal Project (LXRP), managed by Victoria's Major Transport Infrastructure Authority (MTIA), which is an administrative agency within the Department of Transport (DoT). Due to its success and popularity, the project has expanded in length

and number of crossings. A total of 85 level crossings are to be removed by 2025, with 65 level crossings already removed. The first 50 level crossing removals are deemed LXRP1 and the additional 35 crossings are officially funded as LXRP2.

To manage the program more easily, LXRA established four "program alliances" in 2017 to consolidate multiple grade crossings into single work orders to simplify contracting with the private sector (one of the original alliances has since split into two). In the Australian context, "alliance contracting" describes a form of alternative project delivery by which a public agency works with a group or alliance of private sector parties to deliver a project in a "no blame" context. Projects are allocated to the alliances, who develop a Program Requirement Specifications (PRS) and a Total Outturned Cost (TOC) for each grade crossing. The PRS is confirmed and approved by external stakeholders, and the LXRA agrees to the TOC. If the LXRA determines the TOC to be unsatisfactory, it can reallocate the crossing to another alliance. Once the PRS and TOC are agreed upon, the alliance proceeds with project delivery. Under- and overruns in actual cost are shared between the LXRA and the Alliance up to the alliance's margins (i.e., the alliance cannot lose money in absolute terms).

Funding & Prioritization

Prior to the governmental reorganization at the beginning of 2019 that moved the LXRP under the oversight of the Major Transport Infrastructure Authority, 21 level crossing removals/upgrades were bundled and then distributed to the different program alliances as "packages" of several crossings each under LXRP1. Package One cost $524 million in Australian dollars (AUD) and covered four crossings; Package Two cost $482 million (AUD) and covered another four crossings; Package Three cost $1.6 billion (AUD) and covered nine crossings, five new stations, and numerous signaling and power upgrades; Package Four cost $177 million (AUD) and covered the removal of two crossings. Since establishment of the alliances, MTIA allocated the remaining LXRP1 sites and the additional LXRP2 sites to each of the alliances. As of 2021, the total estimated project cost is approximately $17.3 billion (AUD).

While the original 50 grade crossings were not formally evaluated against all grade crossings in Melbourne, the current prioritization and selection framework developed for the LXRP2 by LXRA and the DoT incorporated four key principles: movement, place, safety, and delivery efficiency. These four principles were used to evaluate all 276 level crossings at the time of analysis and assign a level of need to each category for each site. The highest-ranking sites of each category would then be chosen along with sites that rank high in several categories. Sites were evaluated for the movement category based on the number of trains per hour and the number of vehicles per lane per day. Sites that had at least 10 trains per hour and 4,000 vehicles per lane per day were considered "high need" for the movement category, and sites with more than 17 trains per hour and more than 7,000 vehicles per lane per day were considered "very high need" for the category.

Movement
Across the Network

Sites where excessive delays and unreliability caused by high train frequencies have a broad economic impact

Underpinning factors
Number of trains
–
Volume of traffic

Place
Local access

Sites where high train frequency significantly limits connectivity between communities and impedes access to important facilities

Underpinning factors
Importance of local access
–
Number of Trains

Safety
Incidents and risks

Sites that have a record of incidents or a high risk of incidents

Underpinning factors
safety record
–
Safety risk

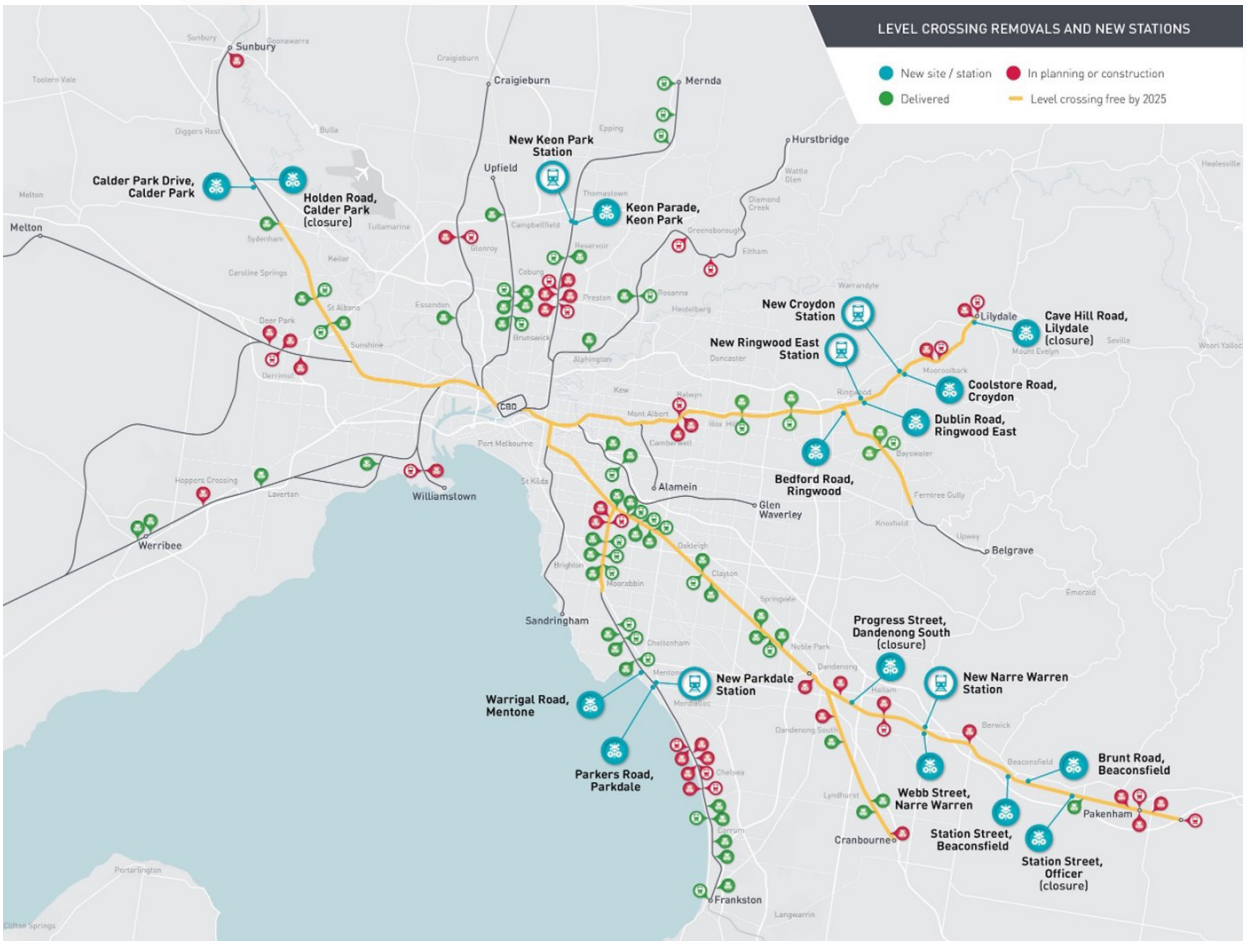
Delivery efficiency

Sites where there is an opportunity to increase investment efficiency and minimize disruption impacts on the community and businesses by combining removals with other projects across the network

Underpinning factors
Project interface
–
Shared rail occupations

Ranking according to the Place category was more qualitative in nature, being based off an existing crossing's impact on pedestrian and bike connections, as well as the impact on the local community's access to services such as schools and hospitals. Assigning a ranking in the Safety category required analyzing primarily crash data provided by the Australian Level Crossing Assessment Model (ALCAM) and VicRoads/DoT, with more weight given to fatal or serious injury crashes while also looking at the predicted frequency of future crashes.

Lastly, Delivery Efficiency effectively provides a bump in ranking to sites that still rank highly in other categories but are also located closely to other high-need sites slated for removal. To determine the grade separation type at the chosen high-need sites, MTIA had a three-stage process: Stage One was to conduct a preliminary assessment of the site and select an "indicative" option, with a cost estimate attached. Stage Two then involved a more detailed site survey and community engagement, and Stage Three was the final recommendation to the Minister for Transport Infrastructure.



Stakeholder Considerations

The LXRP is a massive public works project with a range of stakeholder considerations. There has been some public criticism of the project as a whole, along with site-specific complaints. Some complaints are aesthetic-based, with the elevated sections—nicknamed "sky rail"—impacting nearby property owners. Some criticisms are related to the performance of the grade separations in delivering the promised benefits. However, as none of these projects are more than a few years old, it's too soon to determine from a quantitative perspective if a grade crossing removal has achieved its goal of reducing congestion and increasing safety. Additionally, it appears the majority of public sentiment is positive, especially with the addition of new stations and the refurbishment of aging ones. The political

sentiment has also been positive for the Andrews government, playing a part in his reelection win in 2018 and will likely be a major factor in the upcoming election in November 2022.

Lessons Learned

Following the Victoria Auditor General's Office (VAGO) 2017 audit, and the government office restructuring in 2019, the LXRA has shown with LXRP2 and the final 35 level crossings that a massive public works project can be successful if handled correctly. However, the selection process for the original 50 sites for removal was much less "structured" than the current framework, as reported in the 2017 VAGO report and the 2020 VAGO follow-up. There are now more clearly defined criteria when it comes to site selection, and these parameters can then be applied to future transport projects.

The pre-allocation of project sites to project alliances limited competition between contractors in the private sector, but also opened the lines of communication and encouraged companies to share strategies, since they would not necessarily be competing for the same project. This in turn provided a benefit though economies of scale, where similar designs are applied to multiple sites and cost savings can be shared, benefiting the project as a whole. These are just a few potential benefits that alternative project delivery methods, such as alliance contracting, can provide. Alliance contracting is, as of yet, untested in the United States and the "no blame" approach requires considerable trust that may not be possible in our legal context. However, the spirit of the approach, confirmation of the project specifications, and understanding the total project cost early in the process may create opportunities for Caltrain to explore further.

Metrolink

Background

Metrolink is a public transportation system operated by the Southern California Regional Rail Authority (SCRRA) serving the counties of Los Angeles, Orange, Riverside, San Bernardino, Ventura, and North San Diego, as shown in Figure X. SCRRA is a joint powers authority created in 1991 to plan, design, construct, maintain, and administer the operation of Metrolink regional commuter rail service. Metrolink has 407 miles of unduplicated route miles, or 538 total route miles throughout the service area. SCRRA has significant coordination with other agencies and entities in the region, including with BNSF Railway (BNSF), UPRR, Amtrak, and North County Transit District (NCTD).

The Metrolink system features 457 highway-rail grade crossings. Of these, SCRRA is jointly responsible along with member county transportation authorities for managing the design, construction, operation, and maintenance of over 353 highway-rail and pedestrian-rail grade crossings. The remaining 104 at-grade crossings belong to the Burlington Northern Santa Fe (BNSF) railway, Union Pacific Railroad (UPRR), and North County Transit District (NCTD). The system also features 426 grade-separated crossings (193 under-grade crossings and 233 over-grade crossings).

Design, changes, or modifications to SCRRA's existing and proposed highway-rail grade crossings are subject to CPUC regulations and approvals and certain provisions of the FRA regulations. SCRRA's Board of Directors has passed resolutions strongly discouraging construction of new highway-rail grade crossings and promoting grade separations or closure of existing at-grade crossings where feasible.

Funding & Prioritization

SCRRA's 2020 funding sources vary depending on funding intent. Operating funds largely consist of local sources (62%), followed by farebox revenues (34%) and federal funds (4%). Capital funds largely consist of state sources (66%), followed by federal funds (23%) and local sources (11%). Most of SCRRA's state funding comes from the California Public Utilities Commission Section 190 Program. The State of California has instituted this program to provide funding to highway agencies to separate public highway-rail grade crossings, eliminate existing highway-rail grade crossings, or provide funds to highway agencies to grade separate existing crossings. This funding is based upon a priority list developed by analyzing the hazards related to the crossing. Factors such as traffic demand and accident history play a significant role in this prioritization. When the entire cost of the grade separation is considered, this funding may be a small percentage of the construction costs for the project.

Stakeholder Considerations

SCRRA has five member agencies: Los Angeles County Metropolitan Transportation Authority (METRO), Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC), San Bernardino County Transportation Authority (SBCTA), and Ventura County Transportation Commission (VCTC). The joint powers authority governing the Metrolink system is made up of an 11-member board representing these transportation commissions.

The five member agencies own the right-of-way (ROW) and stations within their respective jurisdictions. This means Metrolink does not have the authority to construct or make decisions regarding infrastructure projects such as grade separations. For example, OCTA's Orange County (OC) Bridges project consisted of eight grade separations constructed by OCTA in partnership with local jurisdictions. OCTA funds its OC Bridges program largely through county sales tax funds, in addition to state and federal funds.

SCRRA does retain responsibility for oversight and coordination to maintain operations and delineates those responsibilities through both a Project Management Manual (primarily internal to Metrolink) and a Grade Crossings Manual, both of which are available publicly on their web site. SCRRA requires highway agencies or contractors building projects to reimburse SCRRA and any other affected operating railroad if construction activities impact operating railroads in various ways.

In addition to the significant regional coordination required with these agencies, Metrolink also shares infrastructure with other entities. BNSF, UPRR, and Amtrak all operate on SCRRA member agency-owned tracks. Conversely, Metrolink also operates on tracks and ROW owned by BNSF, UPRR, and NCTD. SCRRA works with city councils and engages communities for various projects such as grade separations, double-tracking projects, and creating quiet zones. These outreach efforts appear to occur on a single project-by-project basis.

Lessons Learned

Metrolink, or SCRRA, largely addresses their grade separation projects individually, rather than in segments or as a program. This is due to their member agencies owning the stations and right-of-way, providing them the ability to make infrastructure improvements instead of Metrolink. Metrolink has made a verbal commitment to avoid any additional at-grade crossings in their system, expressing their preference for grade separations moving forward. Metrolink also maintains a detailed breakdown of their rail-highway crossings, including various types of crossings and other attributes. The Metrolink system now has nearly as many grade-separated crossings (426) as highway-rail grade crossings (457). Projects have been funded on a project-by-project basis from county, state, and federal sources, and the success of SCRRA member jurisdictions in implementing grade separation projects has been due to the success of receiving discretionary grant funds from multiple sources.