CALIFORNIA
High-Speed Rail Authority

Draft

Business Plan

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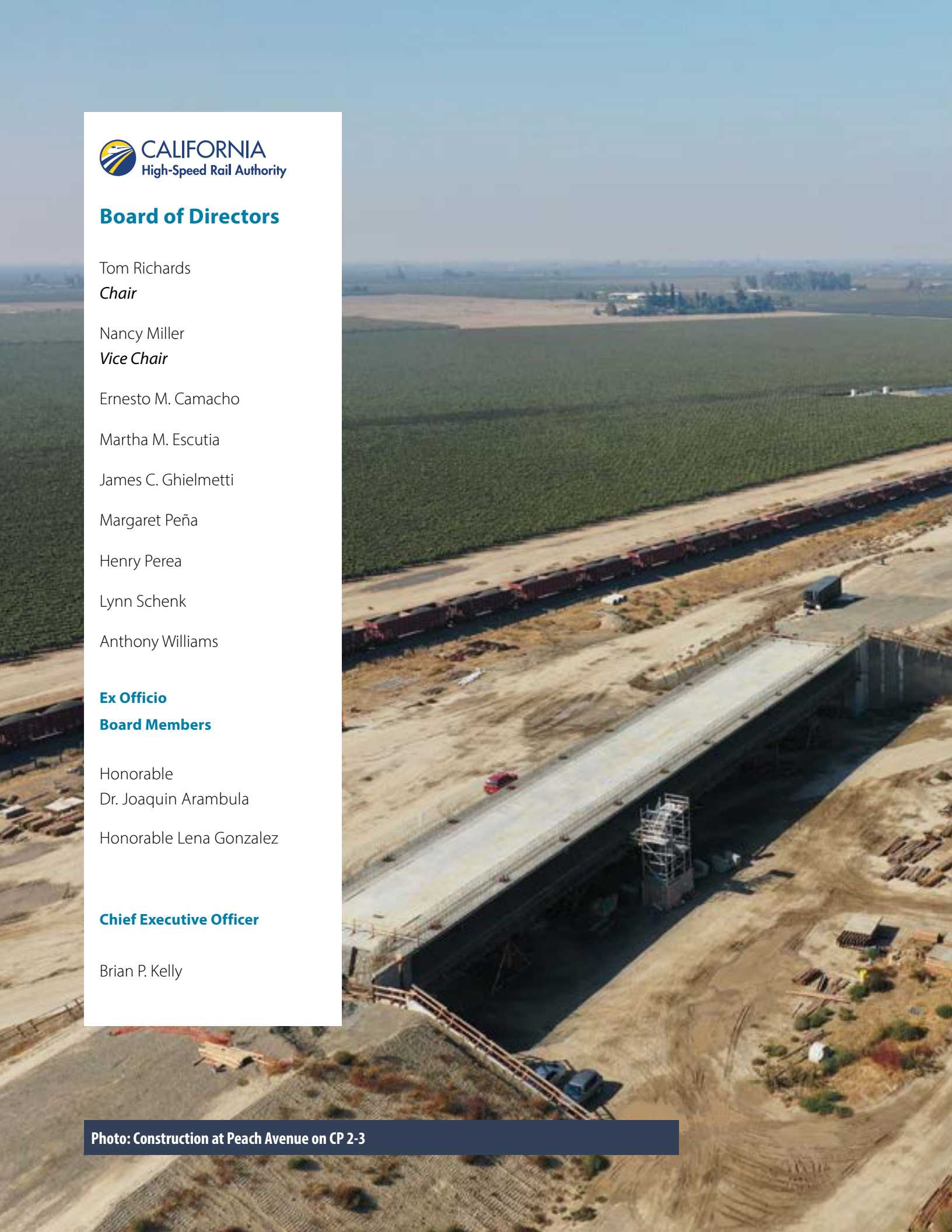

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Photo: Construction at Peach Avenue on CP 2-3

FROM THE CEO

"In the middle of difficulty lies opportunity."

– Albert Einstein

Just 10 months ago, the California High-Speed Rail Authority (Authority) submitted to the Legislature its 2020 Business Plan.

That's right, the 2020 Business Plan was submitted on April 12, 2021, a full year after its original due date—another impact of the COVID-19 global pandemic. Similarly, over the course of the last two years, we have extended public comment periods in our environmental review process to accommodate requests for more time to review documents in the COVID-19 world. Like many other agencies, we have held "virtual" board meetings for nearly two years. And today, more than 90 percent of our staff are teleworking, at least part-time. COVID-19 has impacted how we function, but it has not stopped us from advancing the nation's first electrified high-speed rail project right here in California.

In fact, no state is advancing high-speed rail at the pace California is. California is leading again, building world-class infrastructure that will foster economic prosperity and opportunity, spur job growth and combat climate change. That is something that should not be lost on policymakers—and the opportunity to expand that leadership is upon us.

This 2022 Draft Business Plan is an update on what has occurred over the last ten months affecting our program—progress and opportunities—and management's recommendations to our Board of Directors on how to manage those issues and move forward transparently. This Draft 2022 Business Plan now enters a 60-day public review period. The Board will review management's summary and recommendations, take public input, hear from policymakers, and craft a final 2022 Business Plan to be adopted and submitted to the Legislature by May 1, 2022.

Program Progress

There are three key areas where the Authority is making meaningful progress—construction activities, right-of-way acquisitions and environmental review.

Construction

Chapter 2 of this Draft Plan outlines important areas of progress we are making in the field. In the last three years, we have advanced design from 30% to nearly 100%, increased the number of structures that are either under construction or completed from 19 to 66, and increased the miles of guideway opened for work from 47 miles to 86 miles. Daily construction jobs have tripled between 2018 and today. We are making meaningful progress to complete the first 119 miles of the system, the largest stretch of rail construction anywhere in the country

We have also been very transparent about the challenges associated with executing construction contracts before all the scope was defined and sufficient pre-construction activities were completed. Between 2015 and 2018, after the contracts were awarded, a number of scope changes were made, some of which were driven

by litigation. Other changes were made to address third-party permitting and approval agencies' requirements, responding to concerns of cities and counties, utilities, freight railroads, and irrigation districts. As we noted in the 2020 Business Plan, we are working daily to get all the project scope fully defined and into the contracts so we can continue to perfect construction schedules.

Right-of-Way

Right-of-way acquisition has been a long-reported challenge for the Authority. This, too, is largely the byproduct of entering construction contracts out of sequence (i.e., before the right-of-way is more fully in hand). Early in 2021, we took steps to improve our performance in this area, and the results have been promising.

Specifically, in April, we brought in new leadership to head our right-of-way division; we adopted a more conservative and achievable acquisition schedule; we established 30-, 60-, and 90-day goals; we improved the line of communication between the field and the right-of-way division; and we began mapping and tracking right-of-way status more comprehensively.

The results of these changes have been outstanding. Parcel acquisitions are being completed on a steadier pace each month. The division is now delivering parcels ahead of the revised schedule. As of this writing, 2,067 parcels have been delivered to the construction contractors. For the first time in the program's history, we have met the 90% threshold for number of parcels delivered versus total needed.

Environmental Review

For 5 years, between 2014 and 2019, the Authority did not certify an environmental document beyond that required to begin construction on the 119-mile segment in the Central Valley. Since 2018, the Authority has been focused and driven on completing the environmental work for the entire Phase 1 system connecting San Francisco to Los Angeles/Anaheim. Completing this work is necessary for two fundamental reasons: (1) it is a requirement of the federal funding grant the Authority has with the Federal Railroad Administration (FRA); and (2) it allows the Authority to define the entire Phase 1 system, advance design of all segments, reduce risks, account for all necessary preconstruction work, refine costs, and mitigate impacts, providing important clarity for the communities through which the system travels.

Today, we have environmentally cleared approximately 300 miles, and by July 2022 the Authority is intending to have cleared some 430 miles of the 500-mile Phase 1 system. Achieving these milestones is an essential step in the Authority's strategy to advance the entire statewide program and be competitive for new federal funding opportunities, further described below.

Completing the environmental review process involves years of design and interacting with communities, federal and state regulatory agencies, private entities, and local governments. Through this process, project impacts requiring mitigation—environmental justice community impacts, local government impacts, natural

resources impacts, private property impacts, etc.—are identified for mitigation. These mitigations sometimes require project design changes or other community investments or project changes to offset those impacts. They come with a cost.

We commit to these mitigations in alignment with our Board's policy to improve the communities through which our system travels. The Authority's policy and practice is to complete the environmental work and update the cost estimates once that work is done. The costs are affected because we have better defined the project scope with community and stakeholder input. The project has gained more favor in the communities it impacts because we have committed to certain mitigations that are important to them. In Chapter 5, we detail some specific mitigations we have made in two recently cleared sections and update our cost estimates accordingly.

Opportunities

As Chapter 1 of this report lays out, there has been significant progress and new opportunities to report. The most significant development since the 2020 Business Plan is the re-emergence of the federal government as a funding partner to build the right kind of transportation infrastructure in this era of climate change. The end of 2021 saw the enactment of the "Bipartisan Infrastructure Law," and this year, Congress will consider the "Build Back Better" bill, both of which provide billions of dollars in federal funding for passenger rail projects, including high-speed rail. In addition, in the first year of the Biden Administration, the Authority received nearly a billion dollars back to the program that the previous administration proposed to rescind, and in November 2021, we received a federal RAISE grant of $24 million to advance construction in the City of Wasco.

Coupled with this new federal funding, Governor Newsom has proposed in his FY 2022-23 Budget a $15 billion program of investments in transportation infrastructure statewide, including investments in high-speed rail, local and regional transit projects, bicycle, pedestrian and highway safety projects, new grade separations, and investments in the state's trade corridors to relieve long-festering supply chain problems. At the Authority, we see a tremendous opportunity for the state to develop a federal-state funding program that will enable us to:

- Deliver a *two-track* initial operating segment connecting Merced, Fresno and Bakersfield;
- Invest statewide to advance engineering and design work as every project section is environmentally cleared;
- Make targeted statewide investments in shared corridors that provide immediate benefits to existing operators and prepare these corridors for statewide high-speed rail service; and
- Advance a longer-term funding strategy to extend high-speed rail beyond the Central Valley as soon as possible.

Forging an Agreement on Proposition 1A Funds

The Governor's more robust transportation investment budget proposal this year includes the appropriation of the remaining $4.2 billion in Proposition 1A bond funds to the Authority for purposes of completing our construction work in the Central Valley. As discussed in Chapter 3, the bond funds are the appropriate funds to use to complete that work because they are already approved for that purpose and using them there would allow us to preserve more flexible Cap-and-Trade funds to leverage federal funding for other program purposes and to invest more nimbly as the program progresses and opportunities to match federal funds arise.

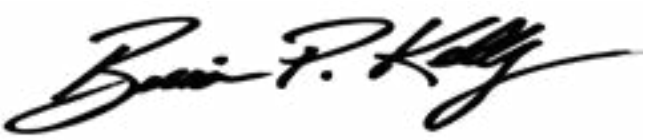
While there has been a lot of focus on the differences between our approach to advancing high-speed rail in California and that proposed by some in the Legislature, there should be no question that the availability of new federal and state funding presents an opportunity to close that divide and agree on investments that allow statewide high-speed rail to move forward in tandem with other high-priority regional projects. We see areas of agreement with some of the ideas and concepts promoted by legislators. For example:

- The 119-mile segment in the Valley now under construction is not an ideal operating segment. Extending past the orchards and into the cities of the Central Valley—Merced, Fresno and Bakersfield—where connections will be made to current and future operators, makes the most sense;
- Developing a single station in downtown Merced (rather than two) is the best way to maximize rail/transit connectivity;
- Advanced design work should commence in segments where the environmental clearances are completed, including in Northern and Southern California;
- Proposed investment of General Fund dollars can assist with projects statewide, including projects with mutual or joint benefits for local or regional projects and the state-sponsored high-speed rail project;
- In the short-term, right-of-way acquisition should primarily be focused on the Central Valley segment connecting Merced, Fresno and Bakersfield; and
- The Link Union Station project should move forward as expeditiously as possible.

Our proposal to advance the project is consistent with these priorities. The fundamental disagreement appears to come down to the question of when to electrify the assets we are constructing. The Authority proposes to electrify the system for true high-speed rail service as soon as possible along the corridor connecting the cities of the Central Valley. Our peer-reviewed analysis shows this approach provides the greatest ridership, travel time, environmental, and revenue benefits at the soonest possible time.

This approach also acknowledges that we have a constrained budget—enough to get a high-speed rail corridor started in the Central Valley, but not yet enough to extend it to the Bay Area and Southern California. For us, this is the first operating segment of electrified high-speed rail, but certainly not the last. As we advance corridors outside of the Central Valley and pursue funding for project expansion, a useful operating segment—the first in the nation—will be providing benefits to Californians who live and travel through the Valley where construction began.

Our mutual goals are to build a modern, sustainable transportation infrastructure and create an equitable clean energy future in California. The Authority looks forward to working with all those that share a genuine interest in developing an electrified high-speed rail system connecting San Francisco and Los Angeles/Anaheim through the communities of the Central Valley, just as the voters approved. We are making important progress to advance the project in the Central Valley, the Bay Area and Southern California. With new federal and state funding available to bridge differences and advance clean, safe and well-connected passenger rail services, the opportunity is now to further California's leadership in building the transportation infrastructure of tomorrow. Let's seize this moment and get on with the work ahead.



Brian P. Kelly
Chief Executive Officer

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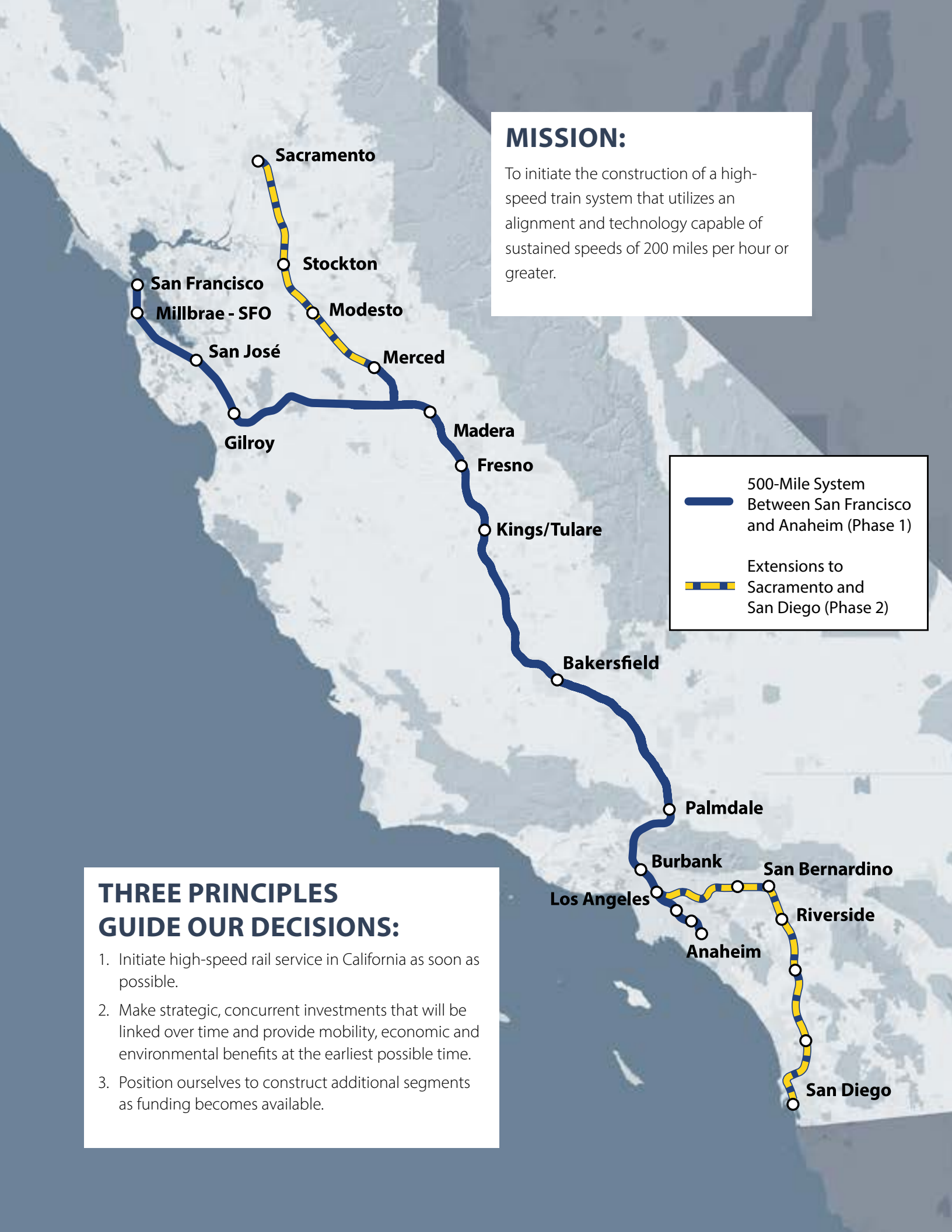
MISSION:

To initiate the construction of a high-speed train system that utilizes an alignment and technology capable of sustained speeds of 200 miles per hour or greater.



THREE PRINCIPLES GUIDE OUR DECISIONS:

1. Initiate high-speed rail service in California as soon as possible.
2. Make strategic, concurrent investments that will be linked over time and provide mobility, economic and environmental benefits at the earliest possible time.
3. Position ourselves to construct additional segments as funding becomes available.

CHAPTER 1

UPDATES AND HIGHLIGHTS

Introduction

This Draft 2022 Business Plan differs from previous business plans and reflects two fundamental developments that have occurred since the publication of the 2020 Business Plan 10 months ago.

First, new opportunities have been created by historic transportation funding levels established in the federal Bipartisan Infrastructure Law and by Governor Newsom's proposed 2022 budget. Additionally, the proposed Build Back Better Act, currently under consideration in Congress, includes specific funding for high-speed rail through a Passenger Rail Improvement, Modernization, and Emissions Reduction Grant Program. Billions of dollars in new funding will allow California to make progress in delivering a modern, electrified, integrated statewide passenger rail network with high-speed rail as its backbone. New state and federal funding will enable the Authority to do what many have advocated – to invest dollars statewide to advance the program, make capital investments to improve mobility and advance the connectivity of high-speed rail with existing passenger rail providers.

New, more stable funding provides the opportunity for:

- Eliminating consideration of a single-track option on initial service between Merced, Fresno and Bakersfield;
- Advancing design statewide after each project section is environmentally cleared, preparing them for future construction funding;
- Making targeted investments statewide to provide early benefits and advance future connectivity, particularly in shared corridors.

Examples of these types of investments include:

- Northern California: continuing our partnership with Caltrain to electrify its commuter rail corridor between San Francisco and San José and working with Union Pacific Railroad (UPRR) to expand passenger electrification all the way to Gilroy.
- Southern California: early grade separations in the Burbank to Los Angeles shared corridor where Metrolink and Amtrak Pacific Surfliner services currently operate and where high-speed trains will run in the future.
- Central Valley: joint funding for a new, single Merced Multimodal Station where regional Altamont Corridor Express (ACE) and intercity San Joaquins services will connect with high-speed rail at one location.

Second, COVID-19 has affected the timing and cadence of our business plans. Given that our 2020 Business Plan was submitted to the Legislature just 10 months ago, this Draft 2022 Business Plan is designed to provide an update on what has transpired since then. It also provides adjustments to the capital cost estimates for segments with recently approved environmental documents. A more comprehensive analysis will be included in the 2023 Project Update Report, due to the Legislature in March 2023. We designed this Draft 2022 Business Plan to serve as a bridge between the 2020 Business Plan and the 2023 Project Update Report.

Exhibit 1.0: Map of Environmental Status and Progress

Distances based on preferred alternatives identified and subject to final environmental documentation

The map at the start of this chapter shows the statewide high-speed rail system, as well as our mission and the three principles that guide our decisions and work efforts.

Building on the Authority's mission and guiding principles, new funding will allow us to:

1. Deliver an electrified two-track initial operating segment connecting Merced, Fresno and Bakersfield as soon as possible.
2. Invest statewide to advance engineering and design work as every project section is environmentally cleared.
3. Leverage new federal and state funds for targeted statewide investments.
4. Develop a funding strategy to extend high-speed rail beyond the Central Valley and to the Bay Area as soon as possible.

Where We Are, Where We Are Going

Below is an update on developments since the 2020 Business Plan was issued 10 months ago, plus a snapshot of what lies ahead.

Central Valley: Advancing Construction, Managing Risks, Advancing Design to Merced and Bakersfield

As with all other mega infrastructure projects, the California high-speed rail project is being built in phases with available funding. This phased, or "building block," approach will allow the state to provide electrified passenger service, starting in the Central Valley, as soon as possible.

Central to our "building block" implementation strategy is delivering an initial electrified high-speed rail segment between Merced and Bakersfield for passenger service. We are advancing the first building block, the 119 miles of civil construction in the Central Valley, where structures and guideway construction can be seen today. In the last year, we have substantially completed all major design elements for the 119-mile Central Valley Segment, established a third-party task force to advance first-order utility work by resolving critical outstanding issues, and developed a conservative and achievable right-of-way schedule. We are focused on managing risks, negotiating contract changes necessary to fully define project scope, and setting achievable completion milestones.

We will initiate procurements in February 2022 to advance design on the 33-mile extension north from Madera to Merced, the 19-mile extension south from Poplar Avenue to Bakersfield and the four Central Valley stations. This will include mapping right-of-way, performing geotechnical investigations, identifying utility relocations, conducting value engineering and assessing risk. This information will allow us to clearly define project scope accounting for third-party scope changes made between 2015 and 2018. It will also allow us to refine cost and schedule estimates and identify any schedule constraints.

We will follow our recently established Staged Project Delivery process, which is bringing greater rigor and oversight to our work. Advancing design, mapping right-of-way, and conducting geotechnical investigations will allow us to better understand engineering and construction issues, risks, and potential costs. This effort will continue statewide as environmental clearances are complete segment by segment.

More information about the status of Central Valley construction is provided in Chapter 2, Regional Updates.

Environmentally Clearing the 500-Mile Statewide System

As shown on **Exhibit 1.0**, 291 miles of the high-speed rail alignment have been environmentally cleared to date, a 144% increase since 2019. This includes a contiguous stretch between Merced and Palmdale plus the Burbank to Los Angeles section in Southern California.

By mid-2022, we anticipate taking to the Board of Directors, for its consideration, the final Records of Decision on our two Northern California sections, San Francisco to San José and San José to Merced. Once the Board takes action, a total of 422 miles will be environmentally cleared. Our last two project sections, Palmdale to Burbank and Los Angeles to Anaheim, will be advanced in 2023.

To make progress on the full 500-mile statewide system, it is our intent to undertake additional design work on each project section as it is cleared, which will depend on whether funding is available. Three sections in Southern and Northern California involve complex tunneling work, so advancing geotechnical investigations will provide much greater clarity on construction methods and cost estimates. Similar to undertaking additional design work on the project sections, our ability to conduct these geotechnical investigations depends on whether funding is available.

More information on the Northern and Southern California project sections is in Chapter 2, Regional Updates.

Updating the Program Baseline Budget

The Authority is deferring adoption of an updated Program Baseline Budget until action by the Legislature on our $4.2 billion appropriation request for the remaining voter-approved Proposition 1A funds. As an interim step, in December 2021, the Board of Directors added $2.3 billion to the previously approved $15.6 billion Baseline Budget to advance work on specified activities consistent with the budget discussed in the 2020 Business Plan.

More information about the Program Baseline Budget is provided in Chapter 3, Funding the Program.

Developing Funding Strategies

We are currently evaluating the additional funding made available through the Bipartisan Infrastructure Law, the Governor's proposed transportation funding plan, and other potential funding sources. We see great potential to invest funds in a way that can simultaneously advance this program while improving broader transit and rail services and connectivity with high-speed rail. Through this effort, we are developing a grants strategy to further the priorities discussed in this chapter. We will also work with our federal, state and Bay Area partners to begin developing a coordinated funding and financing plan so steps can be taken to extend beyond the Central Valley into the Bay Area and connect these two economic regions.

More information on funding is in Chapter 3, Funding the Program.

Organizational Changes that Ground Decisions in a Comprehensive Risk Framework

Our 2020 Business Plan discussed two specific organizational changes, which we have implemented, to better recognize, manage and mitigate the risks inherent in a project of this complexity:

- **Enterprise Risk Management:** We established an Enterprise Risk Management program, which involved creating a Risk Management Office and a cross-functional Enterprise Risk Committee comprised of Authority executives.
- **Staged Project Delivery:** We are implementing this new project development and delivery framework to bring more structure and rigor as projects move through the planning, design and construction stages. This approach will help us better understand and manage risks before awarding contracts and starting construction.

More information on our Enterprise Risk Management and Staged Project Delivery programs can be found in the ***2020 Business Plan***, Chapter 6, Refocusing the Enterprise on Risk Management.

In 2021, we implemented two additional organizational changes:

- **Reformed Right-of-Way Division:** We established new leadership and a more realistic approach to acquiring right of way for the Central Valley. The number of parcels acquired each month have increased and stabilized, resulting in high priority parcels being delivered on a reliable schedule. We have now delivered 90.4% of the 2,286 parcels identified for the 119 miles of construction in the Central Valley.
- **Revamped Change Control Process:** In September 2021, the Board of Directors approved establishment of a Change Control Committee to clarify roles and responsibilities, to bring more rigor to decision-making and more consistency to documenting the change order process. The Authority also modified its Delegation of Authority policies to increase transparency and oversight by the Board in the use of contingency and contract change orders that exceed $25 million.

What's to Come in the 2023 Project Update Report

Over the course of 2022, the Authority will work to move forward on funding, project development and project delivery, and we will inform the Board of Directors, the Federal Railroad Administration, the Legislature, our stakeholders and the public on our progress. A comprehensive update on the following activities and developments will be presented in the Authority's 2023 Project Update Report to the Legislature.

Funding Strategy

In 2022, we anticipate action by the California Legislature on our pending Proposition 1A appropriation, which will lay the foundation for developing a new funding strategy. Our strategy will also be informed by our evaluation of new and existing federal funding and financing programs and any new state public transportation funds that the Legislature might approve that would provide opportunities for funding joint benefit investments that further state, regional or local priorities.

Updated Program Baseline Budget and Schedule

Once the Legislature and the Newsom Administration conclude discussions related to the infrastructure elements of the budget, including the appropriation of remaining Proposition 1A bond funds to advance project construction, the Authority Board of Directors will consider an updated and revised Program Baseline Budget. This will enable budget discussions—which may affect scope and resources—to conclude and will allow the Authority to finalize commercial settlements with construction contractors, accommodate all remaining scope, and evaluate Track and Systems bids. Concluding these activities will enable a full and complete Program Baseline Budget.

Design of Central Valley Stations/ Merced and Bakersfield Extensions

The additional budget authorized by the Board of Directors in December 2021 included funds to advance design on the Merced and Bakersfield extensions, plus four Central Valley Stations – Merced, Fresno, Kings/Tulare and Bakersfield. These procurements will be initiated in February 2022, and we anticipate awarding contracts in mid-2022. This work will help set the stage for delivering customer service on an electrified initial operating segment between Merced and Bakersfield.

Completing Environmental Records of Decision

Over the course of 2022, every project section except Palmdale to Burbank and Los Angeles to Anaheim in Southern California will come before the Authority Board of Directors for environmental approval and certification. The final two Southern California sections will to be advanced in 2023. As we reach each milestone, we will assess whether there are funds available to advance design and project configuration, completing Stage 3 of our Staged Project Delivery process. The Southern and Northern California corridors are complex. They involve tunneling, construction through urban areas, airport connections, plus operating in shared corridors and connecting at multimodal stations. Continuing design activities will help to advance these project sections to be prepared once future funding is identified for construction.

New Ridership/Revenue Model and Forecasts

In coordination with the California State Transportation Agency and Caltrans, the Authority's Early Train Operator is developing a new, more detailed ridership forecasting model that allows for greater understanding of the connectivity with regional and local connecting services and integration with the ***State Rail Plan***.

The new ridership model will:

- Account for travel on high-speed rail by people visiting the state, not just California residents;
- Allow the Authority to better assess travel demand on shorter sections of the system; and
- Provide information on how different fare structures and types of service affect ridership demand and revenue.

Updated ridership and revenue forecasts generated by the new model will be presented in the 2023 Project Update Report to the Legislature.

Updated Capital Cost Estimates

Over the course of 2022, we will be updating cost estimates for the Northern and Southern California project sections and other project elements. The updated estimates will be informed by final scope decisions reflected in the environmental Records of Decision (RODs). These estimates will also be informed by additional risk analyses, value engineering, or project construction and delivery considerations that may be considered prior to advancing design as part of the Staged Project Delivery process.

This Draft 2022 Business Plan includes updated estimates for the Bakersfield to Palmdale project section, which was environmentally cleared in 2021, and the Burbank to Los Angeles section, which was cleared in January 2022.

These new estimates reflect scope changes that the Authority made based on extensive interactions with communities, regulatory agencies and stakeholders.

For example, scope changes in the Bakersfield to Palmdale section addressed the visual effects to the César E. Chávez National Monument/Nuestra Señora Reina de La Paz National Historic Landmark, in Keene. They also included enhanced noise barriers through the city of Tehachapi and added stream restoration and safety enhancements along the Pacific Crest Trail. The new estimates also reflect design and mitigation refinements south of Hollywood Burbank Airport that were designed to minimize residential and commercial disruptions and to allow for direct air-rail intermodal connectivity at the airport. Additional updates to the estimates will be included in the 2023 Project Update Report to the Legislature.

Photo: Fog over the San Joaquin River Viaduct

CHAPTER 2

REGIONAL UPDATES

Introduction

This chapter provides updates on our progress in advancing the statewide system in three regions: the Central Valley, Northern California and Southern California. Within each region, high-speed rail will connect to urban and regional public transportation services, particularly at multimodal hubs, to enhance access and mobility throughout California as shown in new regional connectivity maps on the following pages. The regional maps show high-speed rail routes and stations, as well as connections to existing and planned transit services and major airports. The Central Valley section provides an update on current construction progress and the Authority's plan to develop a line connecting Merced, Fresno and Bakersfield for initial high-speed passenger service.

Northern and Southern California regional overviews feature updates on our collaboration with regional partners and the regional bookend projects that the Authority is helping fund. Mobility, community and environmental benefits are also featured including travel times between regions that show how quickly passengers will travel up and down the state.

More detailed project section overviews include facts about each section and the status of environmental reviews. Key attributes, such as travel times between key destinations and more details about the local benefits are also featured, including the system's effect on air quality. When the full 500-mile system is operational, we project a reduction of 2 million metric tons of carbon each year, which is equivalent to taking 432,000 cars off the road annually. More localized projections of emission reductions resulting from people shifting from gas-powered cars and planes to zero emissions high-speed rail trains are included in the project section summaries. The status of each section in the Authority's recently implemented Staged Project Delivery process, summarized below, is also indicated.

Staged Project Delivery

When the Authority originally initiated project-level environmental reviews, the 500-mile high-speed rail line was split into a series of shorter project sections to manage the planning and environmental clearance process more effectively. We described the Staged Project Delivery process in detail in the 2020 Business Plan. Each project section overview includes an exhibit showing the current stage of development in that process, which consists of seven stages:

- Stage 1 – Project Initiation
- Stage 2 – Environmental
- Stage 3 – Configuration Footprint
- Stage 4 – Early Works
- Stage 5 – Procurement
- Stage 6 – Construction
- Stage 7 – Closeout

High-Speed Rail Connectivity

Electrified high-speed trains traveling at speeds of more than 200 miles per hour will connect California's cities, making a trip between Los Angeles and San Francisco in under three hours, as required by statute. They will be part of a modern, integrated passenger rail network.

High-speed rail will provide the backbone of high-speed service that will increase connectivity between statewide, regional and urban services. Convenient connections between systems will allow people greater access to more destinations that currently take hours to get to by existing options.

The next three exhibits show where high-speed rail service will connect to other transit services when the full 500-mile system is operational and other assumed future capital investments are made by regional and local transit agencies.

Central Valley Connectivity

High-speed rail will connect with a network of rail and bus services at Merced, as shown in **Exhibit 2.0: Central Valley Connectivity Map**. Adding high-speed rail will reduce travel times through the Central Valley by nearly 100 minutes.

- Merced will serve as a "Northern California Gateway" to Sacramento, the Bay Area and other San Joaquin Valley destinations including:
    - Amtrak's San Joaquins rail service toward Oakland and Sacramento;
    - Altamont Corridor Express (ACE) to Dublin/Pleasanton and San Jose and a planned future connection to Sacramento; and
    - Bus services in the Central Valley, including Fresno Area Express and other bus connections to Visalia, Hanford, Stockton, Sacramento and Yosemite National Park.
- Kings/Tulare riders will connect with:
    - Bus services to the Central Coast, Visalia, Hanford, Lemoore, Corcoran and Kettleman City.
- Bakersfield passengers will be able to connect to:
    - Bus services to Santa Barbara and Las Vegas, Nevada.

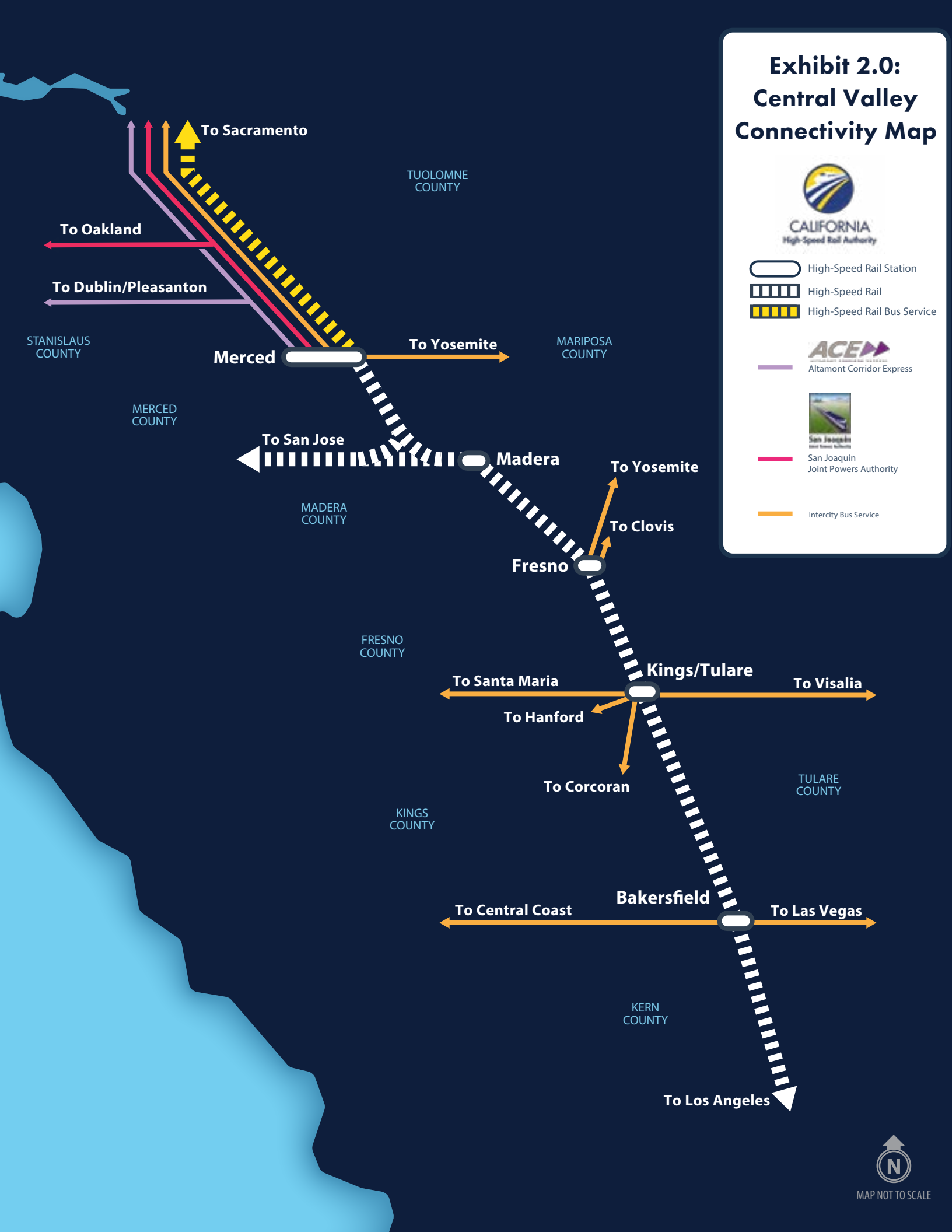


Exhibit 2.0:
Central Valley
Connectivity Map
CALIFORNIA
High-Speed Rail Authority
High-Speed Rail Station
High-Speed Rail
High-Speed Rail Bus Service
ACE
Altamont Corridor Express
San Joaquin
Joint Powers Authority
Intercity Bus Service
To Sacramento
To Oakland
To Dublin/Pleasanton
TUOLOMNE
COUNTY
STANISLAUS
COUNTY
Merced
To Yosemite
MARIPOSA
COUNTY
MERCED
COUNTY
To San Jose
Madera
To Yosemite
MADERA
COUNTY
To Clovis
Fresno
FRESNO
COUNTY
Kings/Tulare
To Santa Maria
To Visalia
To Hanford
To Corcoran
TULARE
COUNTY
KINGS
COUNTY
Bakersfield
To Central Coast
To Las Vegas
KERN
COUNTY
To Los Angeles
N
MAP NOT TO SCALE

Bay Area Connectivity

As the Authority has worked to bring high-speed rail to Northern California and the Bay Area, we have formed a variety of partnerships across the region. These partnerships have resulted in joint efforts that are providing immediate benefits to communities while also laying the groundwork for high-speed rail service in the future.

PLAN BAY AREA 2050

In 2021, the Metropolitan Transportation Commission (MTC) adopted Plan Bay Area 2050, the Bay Area's long-range plan. This plan includes more than $7 billion in regional discretionary funds to help bring high-speed rail to the Bay Area and invest in other projects in the rail corridor between San Francisco and Gilroy. This was the first time that a region's long-range plan proposed investing regional discretionary funds in high-speed rail and positions us to leverage state, federal and regional funds to advance the program in Northern California.

CALTRAIN ELECTRIFICATION

Caltrain Electrification is a critical bookend project that is modernizing the corridor between San Francisco and San Jose. The project has almost completed its major construction work and is moving toward the system integration phase. This will include the arrival of the first electric trains that are expected to begin testing on the corridor this year. The project is now expected to be completed in 2024 when modern electric trains will whisk passengers down the Peninsula, providing a preview of what electric high-speed rail service will look like in the future.

25TH AVENUE GRADE SEPARATION PROJECT (SAN MATEO)

In September 2021, the Authority and its partners in San Mateo County completed the 25th Avenue Grade Separation Project making it the first bookend project open to the public. This project is improving lives now by separating the rail corridor from the roadways at 25th, 28th and 31st avenues and improving safety for pedestrians, cyclists and motorists. The project provides an example of how local, regional and state funds can be leveraged to construct major improvements for our communities.

SALESFORCE TRANSIT CENTER AND DOWNTOWN EXTENSION

The Salesforce Transit Center, which will be high-speed rail's northern terminus in San Francisco, is open to the public. The Authority is working with partners, led by the Transbay Joint Powers Authority, to advance the Downtown Extension project toward construction. The project will connect the Salesforce Transit Center to the existing rail corridor. In 2021, the Downtown Extension project was accepted into the federal Capital Investment Grants program and is actively moving forward under a multi-agency integrated program management team.

DIRIDON INTEGRATED STATION CONCEPT PLAN

In San José, the Authority is a partner in an effort to reimagine Diridon Station as an integrated, multimodal transit hub. This work is in the planning stages with a concept developed in 2020 and a business case now underway for how the program of projects can advance to the next stages of development.

Exhibit 2.1: Northern California Bay Area Connectivity Map shows the network of rail and transit systems that will connect with high-speed rail in the Bay Area. With one transfer, passengers will be able to connect to the region's extensive transit network, as well as to the San Francisco International Airport (SFO) at the Millbrae-SFO Station.


Martinez
To Sacramento
To Stockton and Merced
MARIN COUNTY
Richmond
Antioch
CONTRA COSTA COUNTY
Salesforce Transit Center
Oakland
ALAMEDA COUNTY
SAN FRANCISCO COUNTY
4th and King/Townsend
OAK
Dublin/ Pleasanton
To Stockton and Merced
SFO
Millbrae-SFO
SAN MATEO COUNTY
Berryessa/North San Jose
SJC
San Jose-Diridon
SANTA CLARA COUNTY
To Merced and Los Angeles
Gilroy
To Salinas and Monterey
MAP NOT TO SCALE
Exhibit 2.1: Northern California Bay Area Connectivity Map
CALIFORNIA High-Speed Rail Authority
High-Speed Rail Station
High-Speed Rail
Amtrak Capitol Corridor
San Francisco Muni
Bay Area Rapid Transit
Caltrain
VTA Light Rail
Altamont Corridor Express
AMTRAK
Amtrak San Joaquins
Intercity Bus Service
Proposed Passenger Rail Service to Monterey County

Southern California Connectivity

Southern California has four of the 10 largest cities in the state and the Authority continues to invest in regional projects that lay the foundation for high-speed rail service. Activities are already underway that will provide improved transportation choices for the more than 23 million people that call Southern California home.

SOUTHERN CALIFORNIA REGION PROJECT SECTION PROGRESS

As of January 2022, the Authority Board has approved a Record of Decision on two Southern California Final Environmental Impact Report/ Environmental Impact Statements (EIR/EIS) – Bakersfield to Palmdale and Burbank to Los Angeles – setting the stage for pre-construction activities to begin. Within the next two years, environmental clearance will be complete on all four Phase 1 project sections.

TUNNELING

Approximately 33 to 39 miles of tunnels through the Tehachapi and San Gabriel Mountains will be required in Southern California. This will provide a more direct and much faster connection through this mountainous terrain between the Los Angeles basin and the Central Valley.

PROPOSITION 1A FUNDING AND RAIL PARTNERS

The Authority is providing $1.3 billion of Proposition 1A funds and other funding to support infrastructure investments in Southern California. In collaboration with regional stakeholders, the Authority completed funding agreements for the following projects: $18 million for the environmental review of the Link Union Station Project (Link US) and $76.7 million to the Rosecrans/Marquardt Grade Separation Project. Preliminary work has begun on the Rosecrans/Marquardt Grade Separation Project, which is expected to be completed in 2024. The Authority has also committed $423 million for the Link US Phase A run-through track and station improvements project.

STATION PLANNING AND DEVELOPMENT

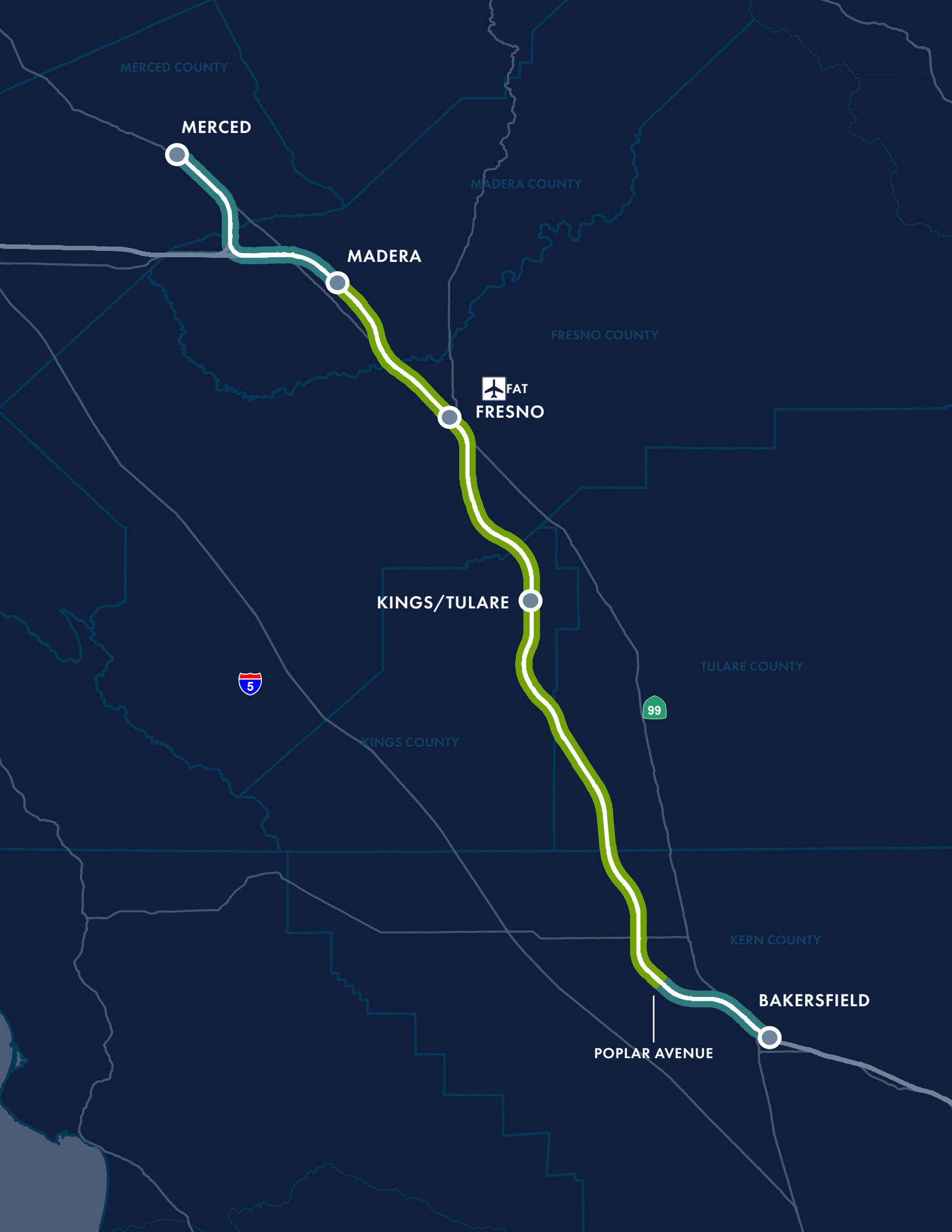
The Authority continues to work with local partners to develop station area plans based around proposed high-speed rail centers. For example, the City of Palmdale has completed its planning around the high-speed rail station to prioritize transit-complementing land use, and next steps will include advancing the planning and design of an integrated facility.

Los Angeles Union Station (LAUS) is Southern California's primary transportation hub. The Link US project plans to transform LAUS into a modern transit and mobility hub. Key components include a new platform for high-speed rail, new rail communications, signals and tracks, and run-through tracks over the US-101 freeway to optimize passenger operations at LAUS.

The Anaheim Regional Transportation Intermodal Center (ARTIC) is a state-of-the-art station featuring Metrolink, Amtrak, regional buses and local transit services and considered the first station built to serve high-speed rail. ARTIC provides easy access to Angel Stadium, Honda Center, and the Disneyland Resort.

Exhibit 2.2: Southern California Connectivity Map shows connectivity to the extensive transit network in Southern California. This region is served today by multiple transportation agencies providing service from Palmdale, where there is a planned connection to Brightline West high-speed rail, to San Diego.


To Fresno and San Francisco
Bakersfield
To Central Coast
To Las Vegas
KERN COUNTY
To Lancaster
To Las Vegas
Palmdale
Victor Valley
To Santa Clarita
LOS ANGELES COUNTY
VENTURA COUNTY
SAN BERNARDINO COUNTY
To San Luis Obispo
Burbank Airport HSR
BUR
Ventura
San Bernardino
Rancho Cucamonga
Los Angeles Union Station
ONT
Norwalk/Santa Fe Springs
Riverside
LAX
Fullerton
LGB
Anaheim ARTIC
RIVERSIDE COUNTY
ORANGE COUNTY
SNA
Perris
SAN DIEGO COUNTY
Oceanside
San Diego
Exhibit 2.2: Southern California Connectivity Map
CALIFORNIA High-Speed Rail Authority
High-Speed Rail Station
High-Speed Rail
brightline
Planned High-Speed Rail
Brightline West
Intercity Bus Service
Coaster
Oceanside to San Diego
Amtrak Pacific Surfliner
METROLINK
Metrolink Lines
Metro
Metro Rail/Metro Bus
N
MAP NOT TO SCALE


MERCED COUNTY
MERCED
MADERA COUNTY
MADERA
FRESNO COUNTY
FAT
FRESNO
KINGS/TULARE
TULARE COUNTY
5
99
KINGS COUNTY
KERN COUNTY
BAKERSFIELD
POPLAR AVENUE

CENTRAL VALLEY

The 119-mile Central Valley Segment will initially serve as the testing and certification track for the nation's first electrified high-speed rail system. We will extend the 119 miles to a nearly 175-mile line from Merced to Bakersfield for initial passenger rail operations. This is the first step toward completion of the full 500-mile statewide system.

Benefits

Connectivity

- The Authority is working with the California State Transportation Agency, Altamont Corridor Express, the San Joaquin Joint Powers Authority and the City of Merced to develop a new multi-modal **Merced Station** linking high-speed rail service to various urban and regional providers at one location.
- The **Fresno Station** will connect to Fresno Area Express, Amtrak, Greyhound and Yosemite Area Regional Transit Services, providing broad regional access, including to the Fresno Yosemite International Airport. The City of Fresno and the Authority are continuing ongoing detailed access planning and early site activation efforts to prepare for the station.
- We are working with county and city partners to hone a regional access vision at the **Kings/Tulare Station**. The focus on transit access includes consultation with partners such as Visalia Transit, Kings Area Rapid Transit, and the San Joaquin Joint Powers Authority.
- We signed a Memorandum of Understanding with the City of Bakersfield with a focus on delivering the **Bakersfield Station** in a way that realizes the vision articulated in the "Making Downtown Bakersfield" plan as well as our station area goals. Over the past year, we have focused on access and connectivity so that the station will evolve into a thriving multimodal transit hub.

Jobs

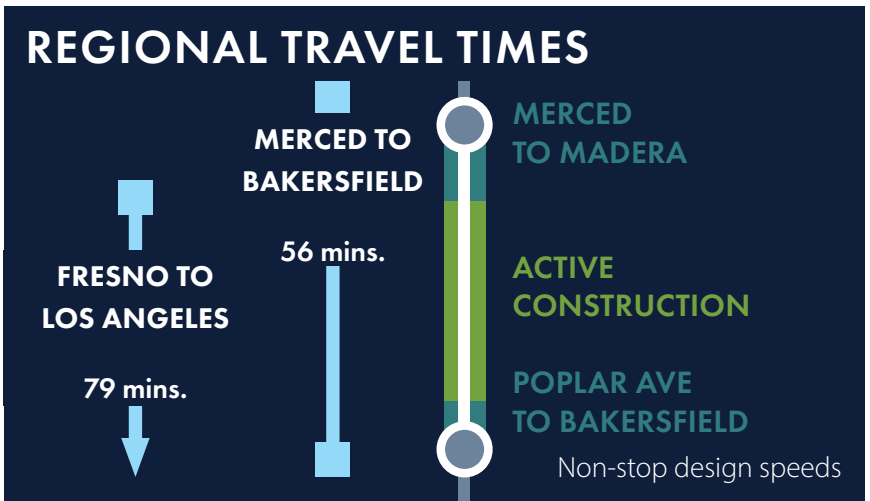
- Currently, more than 7,300 jobs have been created building high-speed rail in the Central Valley.
- Ongoing construction will continue to contribute to the economic stability of the Central Valley, producing about 116,000 projected job-years in the Merced to Fresno project section and about 87,000 projected job-years in the Fresno to Bakersfield project section through construction completion.

Greenhouse Gas Savings

- Zero emissions trains will reduce GHG emissions (CO_2e) by up to 456,000 – 565,000 metric tons per year by 2040 in the Merced to Bakersfield line, which is equivalent to emissions from roughly 122,000 passenger vehicles driven for one year.

Community Benefits

- Providing an average of 1,000 construction jobs/day throughout the Central Valley on the first 119 miles of civil construction.
- Secured $24 million in additional federal funding for crucial safety, efficiency and construction projects in and around Wasco, including a State Route 46 improvement project and funding toward a clean-up project related to new farm-worker housing.
- Completed six agreements and memorandums of understanding for community investments in Madera County, the cities of Chowchilla and Madera, and the community of Fairmead, including elementary school bus services, sewer/water improvements and other facility investments.



Central Valley Construction Update

This Draft 2022 Business Plan focuses on where we are today with construction of the initial 119-mile Central Valley segment between Madera and Kern counties. Since 2018, the Authority has made significant progress on the first 119 miles of construction; at that time, only 30% of the design was complete and construction was underway on 19 structures and 47 miles of guideway. Today, more than 70% of construction is complete on Construction Package 4, with about 50% of construction complete on Construction Package 1 and Construction Package 2-3. We are now past the midpoint of construction and are working to finalize scope elements based on final design refinements, and resequencing construction activities to mitigate schedule impacts and actively manage risk.

The 119-mile Central Valley Segment is divided into three construction packages:

- Construction Package 1: A 32-mile segment between Avenue 19 in Madera County to East American Avenue in Fresno County includes the iconic San Joaquin River crossing;
- Construction Package 2-3: A 65-mile segment from the terminus of Construction Package 1 at East American Avenue to one mile north of the Tulare and Kern county line; and
- Construction Package 4: A 22-mile segment from the terminus of Construction Package 2-3 to Poplar Avenue in Kern County.

As we have substantially completed all major design elements for the 119-mile Central Valley Segment (100% design will be complete by the second quarter of 2022), we can resolve cost and schedule disputes with contractors, address utility relocation and right-of-way needs, and complete third-party agreements.

In 2018, we procured approximately half of the parcels needed for construction; today, we have delivered 90.4% of the parcels needed. This progress has allowed our contractors to expand construction across the Central Valley, resulting in stable construction jobs rising from approximately 300 per day to more than 1,000 per day.

We continue to advance efforts to finalize scope and schedule and obtain full project definition. We are also advancing right-of-way acquisition in a more predictable, stable and reliable manner. We are dedicating resources to advance first-order utility work by resolving critical outstanding issues and agreements with utilities and railroads, so all scope is identified and included in the construction contracts. This involves implementing the following key steps to achieve full construction management of our Central Valley work:

- Define full project scope, including third-party designs and agreements;
- Include finalized scope, cost and schedule into contracts by executing any required contract changes; and
- Provide project updates to the Authority's Board of Directors, stakeholders and community members.

Exhibit 2.3 shows our progress in six key areas for each construction package.

Exhibit 2.3: Progress in Key Areas in the Construction Packages (Data as of 12/31/2021)

	CP 1	CP 2-3	CP 4
Design Completed	95.0%	98.2%	100%
Right-Of-Way Parcels Delivered to Contractors*	92.8%	89.3%	84%
Utility Relocations Commenced	68.0%	58.9%	83.7%
Structures Complete/ In Progress	79.0%	59.2%	100%
Miles of Guideway Complete/ In Progress	50.0%	73.8%	100%
Overall Contract	71.5%	67.0%	76.1%

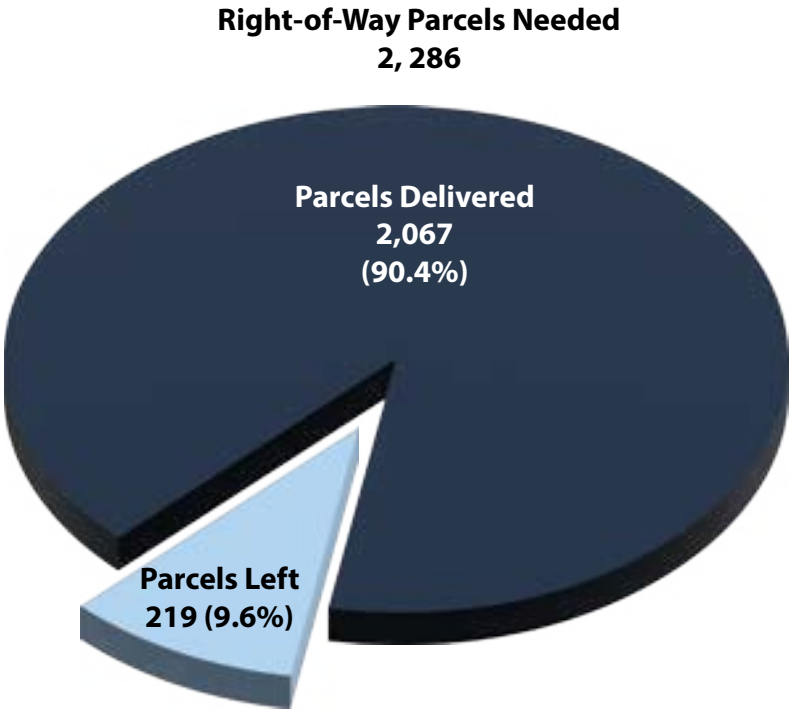
**Data as of February 2, 2022*

Delivering Right-of-Way Parcels

After seeing the right-of-way acquisition numbers come in below expectations for a few consecutive months in early 2021, management intervened. Senior management established new leadership over the Division of Real Property in April, set more conservative and reliable delivery goals, established short-, mid- and long-term objectives for the division, and improved communication between construction and the Division of Real Property leadership in Sacramento to better understand needs and delivery expectations.

Although these changes affected project schedules somewhat, the results are outstanding. Right-of-way parcels are now being delivered at a steadier and more reliable clip than before. We have met parcel-delivery expectations for eight consecutive months, and as of this Draft 2022 Business Plan's publication, we have 90.4% of the necessary parcels delivered, as shown in **Exhibit 2.4**. We will be close to completion by the end of 2022. For the first time in several years, we can say that right-of-way acquisition is on a steady and reliable path.

Exhibit 2.4: Right-Of-Way Parcel Status (Data Through February 2, 2022)



Advancing Structures and Guideway

Completing the civil construction in the Central Valley involves building 119 miles of guideway—the surface that supports and physically guides the high-speed trains—and 93 structures, which include bridges, viaducts and grade separations.

The new grade separations that the Authority is building represent a significant investment to increase rail safety. In the Central Valley, the high-speed rail system will be fully grade-separated, which is essential to safety because the trains will travel at speeds in excess of 200 miles per hour in this region. Grade separations not only create important safety benefits for communities, they also yield environmental and economic benefits including improving access to employment centers and jobs, reducing greenhouse gas emissions and air pollutants from idling vehicles, and reducing noise due to the decreased need for signals from train horns.

In 2021, we made progress by advancing or completing several structures, including the Garces Highway Viaduct, north of Wasco in Kern County, which has a span of approximately 102 feet and is just over 52 feet wide. The 4,700-foot San Joaquin River Viaduct, completed in December, will cross the river and also allow high-speed trains to safely cross over the Union Pacific Railroad tracks. Its highly visible arches will represent the northern gateway of high-speed rail into the city of Fresno.

Exhibits 2.5 and **2.6** show the construction status of the guideway and structures, a portion of which is identified as "construction pending". This indicates that some pre-construction activities are still being completed before construction can begin. Examples include environmental permits, executed third-party agreements, right-of-way acquisition and/or conveyance to contractors, and construction work plans.

Exhibit 2.5: Structures Status
(Data Through December 2021)

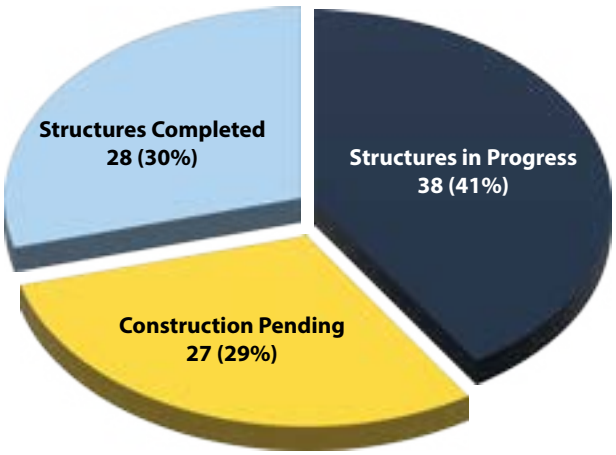
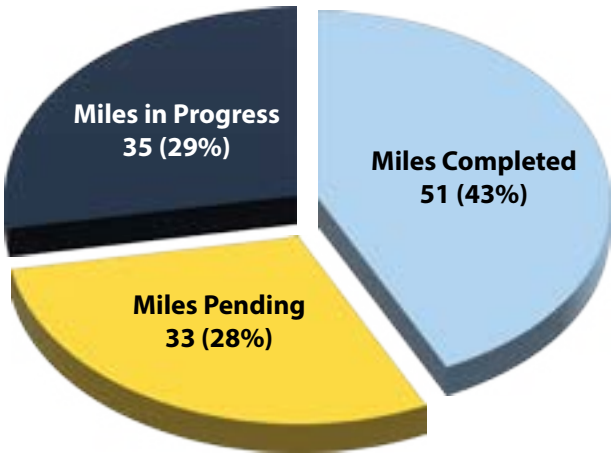


Exhibit 2.6: Guideway Status
(Data Through December 2021)



Advancing Merced and Bakersfield

Over the last two years, we conducted a series of studies to assess the merits of initiating high-speed passenger service in the Central Valley to address a range of questions raised by the Board of Directors, the California High-Speed Rail Peer Review Group, members of the Legislature and other stakeholders. We evaluated the potential ridership, revenue and operational savings of introducing interim service between Merced and Bakersfield in the Central Valley, compared to two other corridor options, one in Northern California and one in Southern California.

The review concluded that there would be "significant value in interim high-speed rail services" when connected to the existing state passenger rail network.

Today, the 171-mile trip from Merced to Bakersfield takes 2.5 hours by car and approximately 3 hours by intercity passenger rail (with only seven roundtrips per day and shared-use tracks with freight service). Introducing high-speed rail service will:

- Cut travel time in half, reducing trip times between Merced and Bakersfield by 90 to 100 minutes;
- Create faster, more frequent and more on-time service uninterrupted by freight movements; and
- Improve access and connectivity to other California destinations through better connections to the Bay Area and Sacramento with Altamont Corridor Express (ACE) and San Joaquins services in the north at a shared-use station in Merced and connections with Thruway Bus Service at Bakersfield for travel to Southern California.

The increased speed and frequency of service will contribute to significantly higher ridership in the corridor and on connecting services. Forecasted ridership could increase to 8.8 million passengers in 2029 (doubling ridership over 2017 levels). The reviews also concluded that, when compared to the two other corridors evaluated, the line connecting Merced, Fresno and Bakersfield:

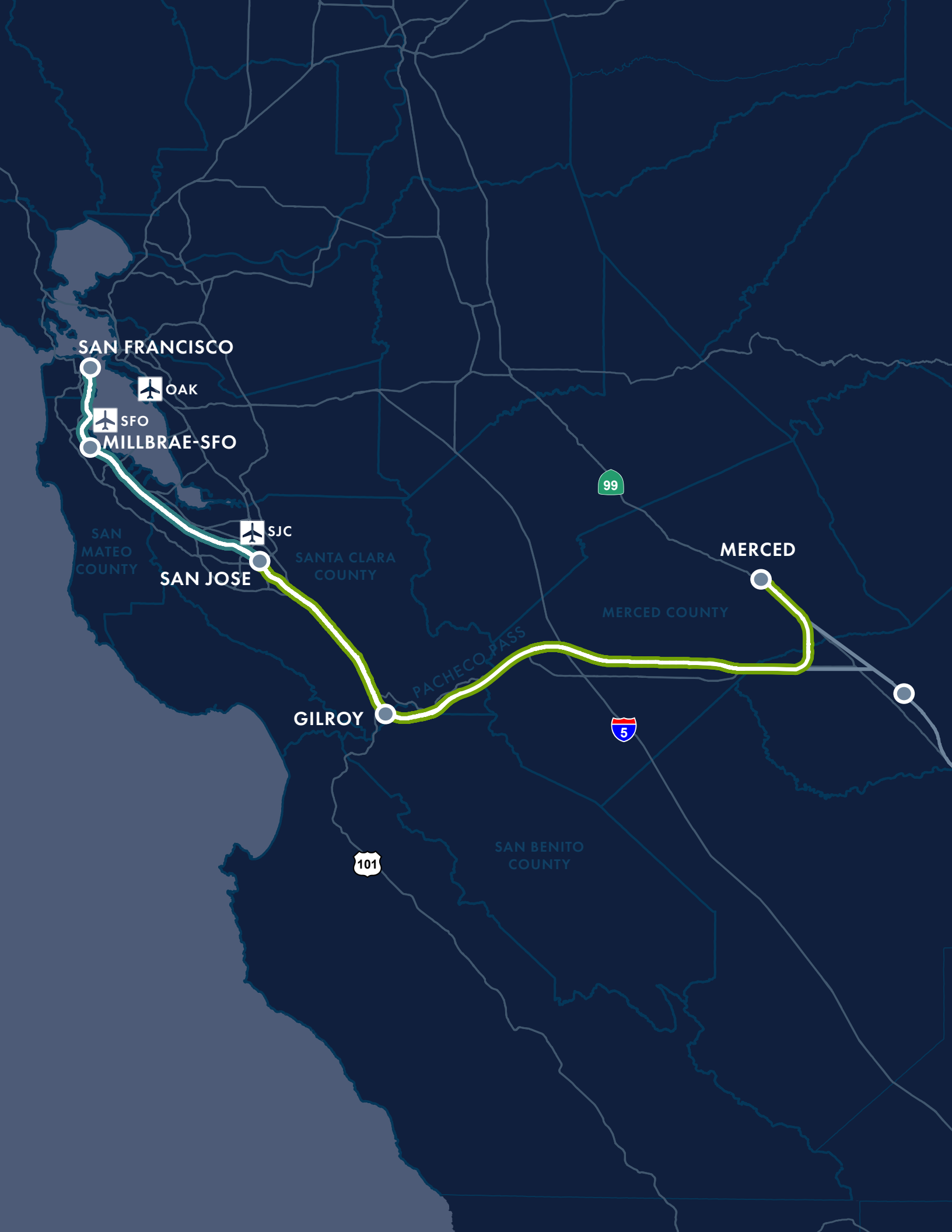
- Yields $117.2 million in additional system revenues from passenger fares;
- Reduces 284 million annual vehicle miles traveled (VMT); and
- Reduces 50,000 more metric tons in greenhouse gas (GHG) emissions (equivalent to emissions from 10,874 passenger vehicles driven for one year).

In coordination with the California State Transportation Agency and Caltrans, the Authority's Early Train Operator is developing a new ridership forecasting model that will allow updated forecasts for the Initial Operating Segment linking Merced, Fresno and Bakersfield. These updated forecasts will be included in the 2023 Project Update Report.

Given these results and the fact that environmental reviews are complete, we are advancing to the next phase of development. In early 2022, design contracts will be released for the Merced and Bakersfield extensions and the four Central Valley Stations in accordance with the Staged Project Delivery process. Advancing station designs will clarify a number of issues with local stakeholders including station site boundaries and station access projects across all modes—bikes, pedestrian and transit.

New federal funding will also enable the Authority to invest dollars statewide to advance the program, make capital investments to improve mobility and advance the connectivity of high-speed rail with existing passenger rail providers. This could include eliminating consideration of a single-track option on initial service between Merced, Fresno and Bakersfield; or provide joint funding for a new, single Merced Multimodal Station connecting regional and high-speed rail services at one location. Armed with better information once additional design is complete and funding is clear, we will consider when and how best to move forward with future construction.

Rendering: Downtown Fresno Station


SAN FRANCISCO
OAK
SFO
MILLBRAE-SFO
SJC
SAN JOSE
SAN MATEO COUNTY
SANTA CLARA COUNTY
99
MERCED
MERCED COUNTY
PACHECO PASS
GILROY
5
101
SAN BENITO COUNTY

NORTHERN CALIFORNIA

Work is well underway on bringing high-speed rail to Northern California and major milestones are coming up in 2022. Similar to the rest of the statewide system, there are components of the system at all stages of project development in Northern California. Together, these building blocks are forming the components that will become the high-speed rail system in the region.

Benefits

Completing the portions of the high-speed rail system in Northern California and connecting them to the over 100 miles that are already under construction in the Central Valley will be a game changer for both regions and the entire state.

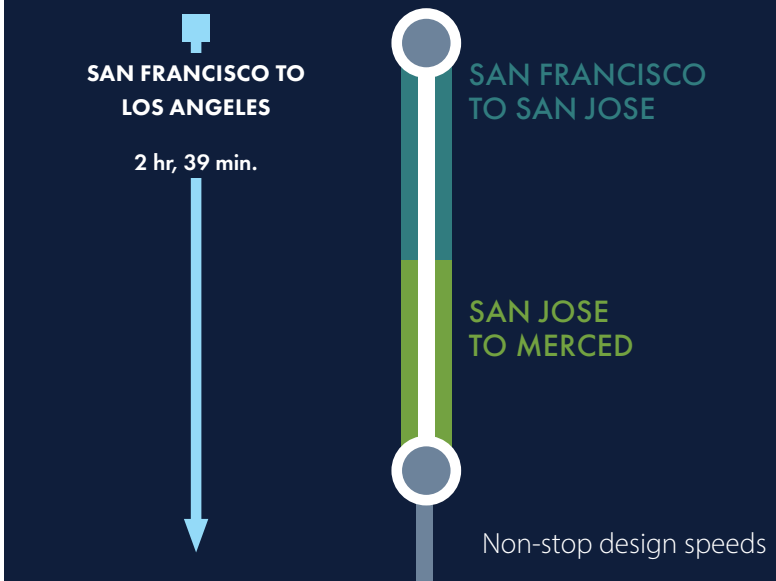
High-speed rail will dramatically reduce travel times between the Bay Area and the Central Valley (e.g., a trip from San Jose to Fresno will be around one hour), allowing for more connections, more economic opportunities and more options for where both companies and people can locate. Fast, reliable and seamlessly connected travel will take thousands of cars off the road and help the state meet its aggressive greenhouse gas emissions reduction targets.

When the system is extended to Southern California and all three regions are fully connected, the benefits will be magnified. By capturing both the long-distance trips between the major metropolitan areas and the medium-distance trips between them and the Central Valley, the complete Phase 1 system will transform what it means to travel around California. As the backbone of an integrated statewide rail and transit network, the high-speed rail system will allow for trips and connections that are not possible today.

Next Steps in Northern California

After close to a decade of studies and plans, the Authority is now on track to complete environmental clearance of the high-speed rail system in Northern California by summer 2022. This is a major milestone that will allow the Authority to further advance design (including geotechnical investigations) and pre-construction activities (such as third-party agreements and strategic right-of-way acquisition) while pursuing new federal funding opportunities to build more of the system. Building on these milestones and the partnerships that have been developed over many years, the Authority is poised to take major strides toward the vision of high-speed rail in the Bay Area.

REGIONAL TRAVEL TIMES



Project section distances based on preferred alternative identified and subject to final environmental documentation.

PROJECT SECTION

SAN FRANCISCO TO SAN JOSÉ

The San Francisco to San José project section will connect the communities of San Francisco, San Mateo and Santa Clara counties to the rest of the state. High-speed rail will share electrified tracks with Caltrain in a blended service configuration. Building on the electrification project, environmental clearance for the necessary additions for high-speed rail service in this corridor is expected in the summer of 2022.

Benefits

Community and Connectivity

- This project section includes connections to transit services across the Bay Area through intermodal hubs at the **Salesforce Transit Center**, the **Millbrae-SFO Station** and **Diridon Station**.
- Immediate benefits to communities are being provided through the Authority's investments in the Caltrain Electrification project and the 25th Avenue Grade Separation project, which was completed last fall.
- The Authority is working with partners in San Francisco to advance the Downtown Extension project to complete the connection from the existing rail corridor to the Salesforce Transit Center.

Jobs

- Approximately 24,000 projected job-years through construction completion.

Greenhouse Gas Savings

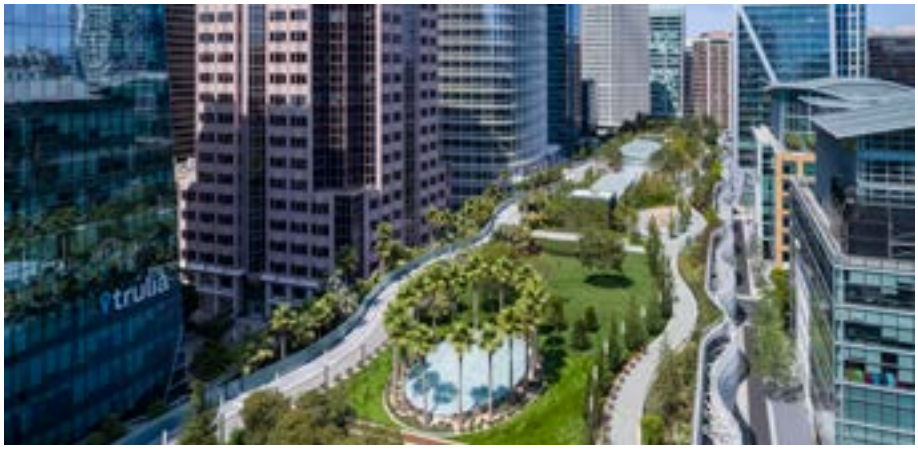
- Zero emissions trains will reduce GHG emissions (CO_2e) by up to 134,000 – 151,000 metric per year by 2040, which is equivalent to emissions from roughly 32,000 passenger vehicles driven for one year.

TRAVEL TIME

Non-stop design speed

29

Minutes



Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Initiation	Environmental	Configuration Footprint	Early Works	Procurement	Construction	Closeout

Project section distances based on preferred alternative identified and subject to final environmental documentation.

PROJECT SECTION

SAN JOSÉ TO MERCED

The San José to Merced project section will provide a critical rail link between Silicon Valley and the Central Valley. This section will extend the electrified, blended system from San José to Gilroy, allowing for increased Caltrain service to South Santa Clara County. The connection through Pacheco Pass will involve major construction work, including the single longest tunnel in the entire statewide system at 13.5 miles. An environmental Record of Decision is expected in spring 2022.

Benefits

Community and Connectivity

- This project section will offer connections to other services at the **Diridon Station** and the **Gilroy Station**. These connections will include Caltrain, Bay Area Rapid Transit, Altamont Corridor Express, Capitol Corridor, Amtrak, VTA Light Rail and bus, and connections to coastal communities on the Monterey Peninsula.
- Electrifying the rail corridor between San José and Gilroy is a joint-benefit investment that will allow for Caltrain to increase its service to South San José and Southern Santa Clara County, fulfilling a long-term goal of those communities.
- The Authority has worked with environmental justice communities across the project section to identify and incorporate community improvements (such as bike/pedestrian overcrossings in South San José and Gilroy and park and school improvements in San José) that will provide benefits to low-income and minority communities along the rail corridor.
- In sensitive wildlife areas, such as Coyote Valley, Pacheco Pass and the Grasslands Ecological Area, the Authority has incorporated project elements and mitigations to ensure the corridor allows for wildlife movement (and in many cases improves today's conditions), that endangered species are protected, and that habitat preservation and conservation are a key component of the project in these areas.

Jobs

- Approximately 118,000 projected job-years through construction completion.

Greenhouse Gas Savings

- Zero emissions trains will reduce GHG emissions (CO_2e) by up to 385,000 to 470,000 metric tons per year by 2040, which is equivalent to emissions from roughly 102,000 passenger vehicles driven for one year.

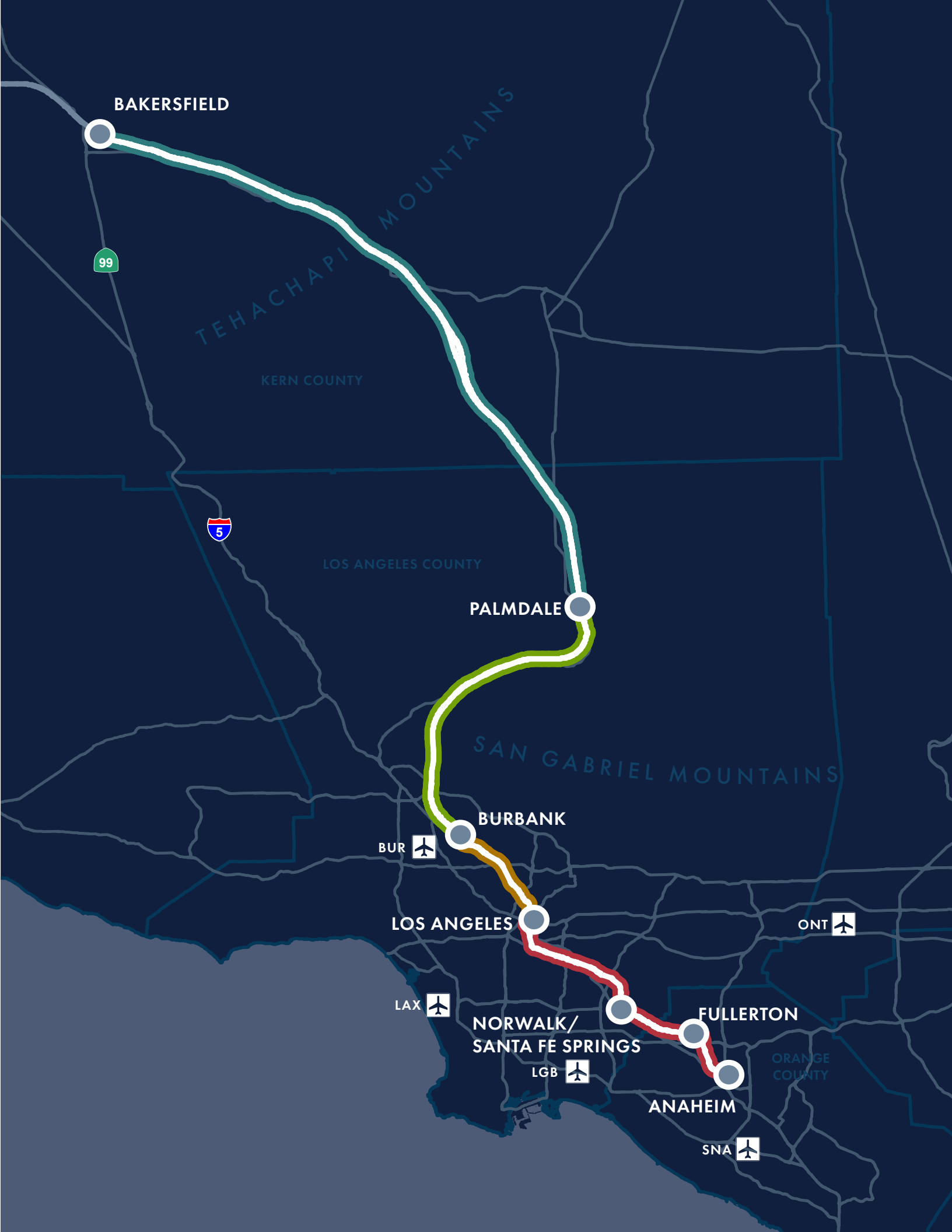
SAN JOSÉ to FRESNO TRAVEL TIME

Non-stop design speed

51

minutes

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Initiation	Environmental	Configuration Footprint	Early Works	Procurement	Construction	Closeout


BAKERSFIELD
99
TEHACHAPI MOUNTAINS
KERN COUNTY
5
LOS ANGELES COUNTY
PALMDALE
SAN GABRIEL MOUNTAINS
BURBANK
BUR
LOS ANGELES
ONT
LAX
NORWALK/
SANTA FE SPRINGS
LGB
FULLERTON
ORANGE
COUNTY
ANAHEIM
SNA

SOUTHERN CALIFORNIA

The Southern California megaregion is home to the southern terminus of the high-speed rail system. Activities are already underway that will provide improved transportation choices for the more than 23 million people that call Southern California home.

Benefits

We dedicated $1.3 billion in Proposition 1A funds and other funding to support investments in Southern California projects. This includes extensive track and station upgrades of **Los Angeles Union Station** and significant new rail construction to allow service to pass through the station so trains can continue traveling south.

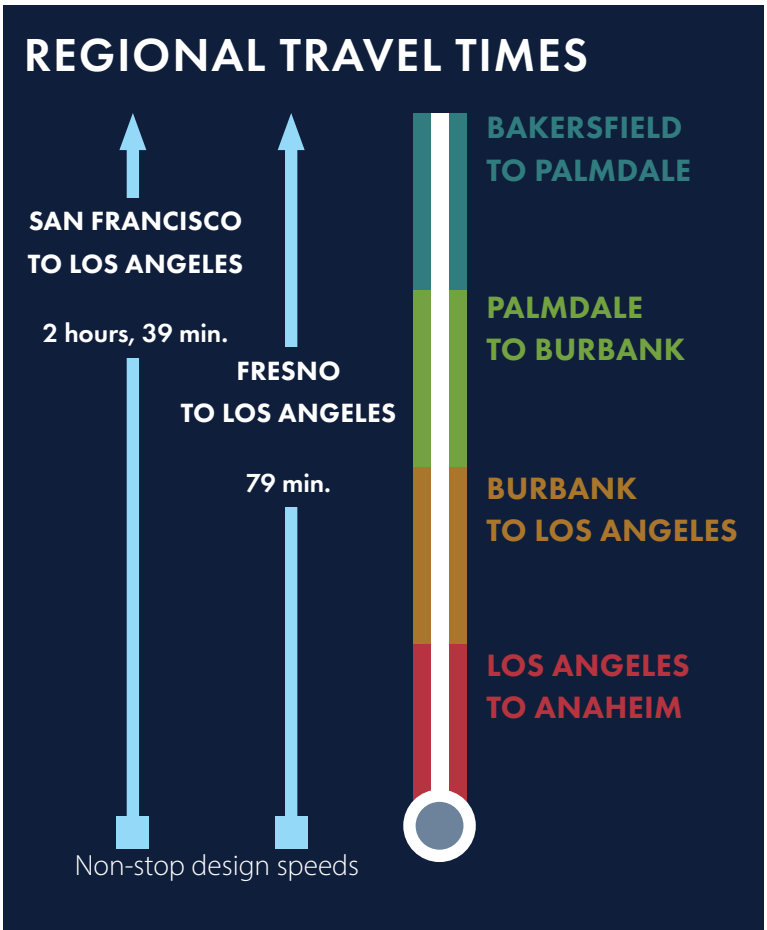
We contributed $76.7 million to the Rosecrans/ Marquardt grade separation; work began on this project in 2021 with the goal of eliminating what was once rated as one of the most hazardous grade crossings in California by the California Public Utilities Commission.

In collaboration with regional stakeholders, we have committed funds to the following projects:

- $18 million for the environmental review of the Link Union Station (Link US) Project.
- $423 million for the Link US Phase A run-through track and station improvements.

Community Benefits

- New grade crossings along the corridor that improves air quality, local safety, traffic circulation and emergency response times.
- Improved air quality by shifting people from cars and planes to high-speed trains running on clean, renewable energy.
- Faster travel times and more convenient ways to link between existing and future transportation networks.
- Stimulate job growth across the state – with construction jobs now and maintenance and operation jobs to come. Investing in transportation infrastructure has been key to making the state an economic powerhouse.




65
178
BFL
Bakersfield
377,917 Pop.
79 MILES
119
223
99
166
MHV
58
14
138
138
5
PMD
Palmdale
169,450 Pop.
150
126

PROJECT SECTION

BAKERSFIELD TO PALMDALE

The Bakersfield to Palmdale project section connects the Central Valley to the Antelope Valley, closing the existing passenger rail gap over the Tehachapi Mountains. This is an historic opportunity to build infrastructure enabling passenger rail to carry people through the Tehachapi Mountains in a fraction of the time it takes today. This section crosses some of the most complicated terrain along the statewide system, requiring innovative engineering, and will include nine tunnels through the Tehachapi Mountains for a total of 10.8 miles. The environmental Record of Decision is complete.

Benefits

Connectivity

- The Authority and the City of Bakersfield entered into a station-area planning agreement for the downtown **Bakersfield Station** that will continue revitalization efforts and guide future development, connecting high-speed rail to Amtrak, Greyhound, Golden Empire Transit (GET), Kern Transit and Orange Belt Stages.
- The **Palmdale Station** will serve as a multimodal transportation center. It will connect Metrolink, local bus, commuter bus and potential Brightline West high-speed rail service to Las Vegas. The City of Palmdale has completed its planning around the station to prioritize transit-complementing land use, and next steps will include advancing the planning and design of an integrated facility.

Jobs

- Approximately 139,000 projected job-years through construction completion.

Greenhouse Gas Savings

- Zero emissions trains will reduce GHG emissions (CO_2e) by up to 268,000 – 331,000 metric tons per year by 2040, which is equivalent to emissions from roughly 71,000 passenger vehicles driven for one year.

TRAVEL TIME

Non-stop design speed

23

minutes

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Initiation	Environmental	**Configuration Footprint**	Early Works	Procurement	Construction	Closeout

Project section distances based on preferred alternative identified and subject to final environmental documentation.

PROJECT SECTION

PALMDALE TO BURBANK

The preferred alternative for the Palmdale to Burbank project section includes two tunnels (13 and 14 miles each) through the San Gabriel Mountains, providing a faster rail connection between the Antelope Valley and the Los Angeles Basin. This segment will also provide a link from Los Angeles to Palmdale and access to the future Brightline West high-speed trains to Las Vegas. A draft environmental document will be released this year with a Record of Decision in 2023.

Benefits

Connectivity

- The Palmdale to Burbank project section connects the Antelope Valley to the San Fernando Valley, bringing high-speed rail service to the urban Los Angeles area with a new modern rail line that dramatically reduces travel time.

Jobs

- Approximately 133,000 projected job-years through construction completion.

Greenhouse Gas Savings

- Zero emissions trains will reduce GHG emissions (CO_2e) by up to 134,000 – 164,000 metric tons per year by 2040, which is equivalent to emissions from roughly 35,000 passenger vehicles driven for one year.

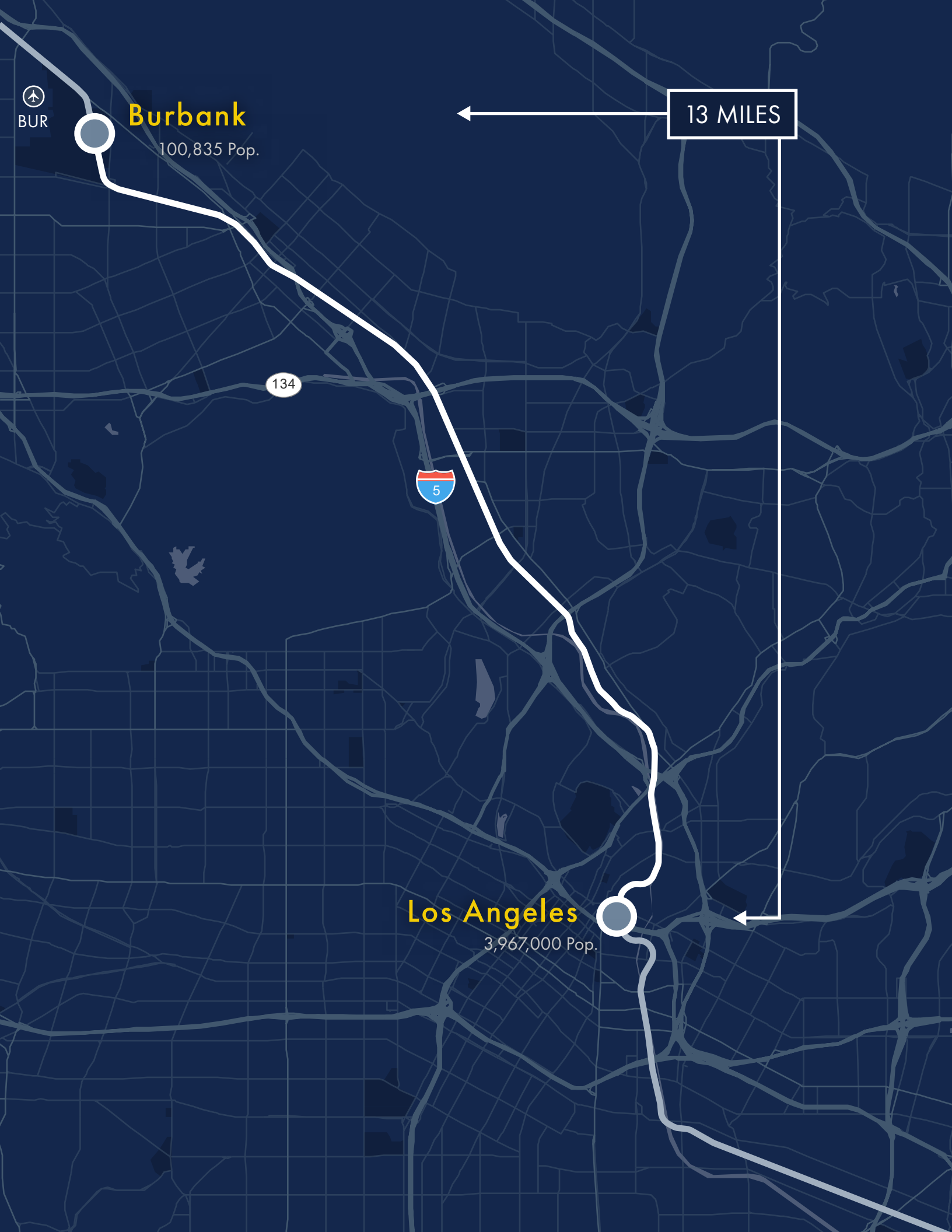
TRAVEL TIME

Non-stop design speed

13

minutes

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Initiation	Environmental	Configuration Footprint	Early Works	Procurement	Construction	Closeout


BUR
Burbank
100,835 Pop.
13 MILES
134
5
Los Angeles
3,967,000 Pop.

PROJECT SECTION

BURBANK TO LOS ANGELES

The Burbank to Los Angeles project section connects two key multimodal transportation hubs, the Hollywood Burbank Airport and Los Angeles Union Station (LAUS). This section serves as an integral part of Southern California's urban rail corridor, providing a link between Los Angeles and the statewide transportation network. An environmental Record of Decision was completed in January 2022.

Benefits

Connectivity

- The **Burbank Airport Station** will connect high-speed rail to Amtrak, Burbank Bus, Metro and Metrolink, providing the first high-speed rail/commercial airport intermodal connection in the United States. It also provides a link to the Regional Intermodal Transportation Center (RITC), a three-level, 850,000 square foot facility that serves multiple modes of transportation, including airport public parking, rental cars, regional buses and bicycle.
- The high-speed rail station in Los Angeles will be located at **Los Angeles Union Station** in the downtown area with connections to local, regional and national transit services, including Amtrak, Greyhound, Metro, Metrolink, LADOT local DASH and LAX FlyAway services.
- Infrastructure will accommodate high-speed rail, Metrolink and other passenger rail volumes as envisioned in the 2018 State Rail Plan.

Jobs

- Approximately 26,000 projected job-years through construction completion.

Greenhouse Gas Savings

- Zero emissions trains will reduce GHG emissions (CO_2e) by up to 42,000 – 50,000 metric tons per year by 2040, which is equivalent to emissions from roughly 10,000 passenger vehicles driven for one year.

TRAVEL TIME

Non-stop design speed

13

minutes

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Initiation	Environmental	Configuration Footprint	Early Works	Procurement	Construction	Closeout

Project section distances based on preferred alternative identified and subject to final environmental documentation.

PROJECT SECTION

LOS ANGELES TO ANAHEIM

The Los Angeles to Anaheim project section connects Los Angeles and Orange counties from Los Angeles Union Station to the Anaheim Regional Transportation Intermodal Center (ARTIC). Adding high-speed rail tracks enhances this shared urban rail corridor by improving both safety and operations. This section connects high-speed rail to popular tourist destinations including the Disneyland Resort, Major League Baseball's Angel Stadium of Anaheim and the Honda Center, home of the Anaheim Ducks professional hockey team. An environmental Record of Decision is expected in the fourth quarter of 2023.

Benefits

Connectivity

- The high-speed rail station in Anaheim will be located at **ARTIC**, a new state-of-the-art station connecting to Metrolink, Amtrak, Anaheim Resort Transportation and Orange County Transportation Authority local transit services.
- High-speed rail stations planned for **Norwalk/Santa Fe Springs** and **Fullerton** will further connect high-speed rail in Southern California to Metro, Metrolink and other local and regional transit.

Jobs

- Approximately 23,000 projected job-years through construction completion.

Greenhouse Gas Savings

- Zero emissions trains will reduce GHG emissions (CO_2e) by up to 39,000 – 42,000 metric tons per year by 2040, which is equivalent to emissions from roughly 9,000 passenger vehicles driven for one year.

TRAVEL TIME

Non-stop design speed

46

minutes

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Initiation	Environmental	Configuration Footprint	Early Works	Procurement	Construction	Closeout

Rendering: Fresno Station

CHAPTER 3

FUNDING THE PROGRAM

Introduction

We believe that there are significant new funding opportunities for the program stemming from the federal Bipartisan Infrastructure Law, as well as a range of other programs that could provide long-term sources of revenue to fund the construction of future project sections. Governor Newsom emphasized the state's commitment to clean transportation investments by proposing almost $15 billion in his budget for programs and projects that align with climate goals, advance public health and equity, and improve access to opportunity. These additional state funds will competitively position California to pursue federal funds.

The Governor's budget proposes $4.2 billion in voter approved Proposition 1A bond funds for high-speed rail, $6.2 billion in General Funds for investments that include transit, port-related infrastructure, and active transportation, and an appropriation of $4.5 billion in new federal formula funds. Along with more robust Cap-and-Trade revenues, these combined federal and state revenues can fund design and construction activities necessary to advance the high-speed rail Program statewide, and important regional and local transit projects around the state.

This chapter provides information related to two aspects of the delivery of the high-speed rail program. First, we provide an update for the sources of funds that are currently available to the Authority, which will be applied to construction that is already ongoing or planning activities that have been budgeted. Second, we discuss funding sources that the Authority has identified, but not secured, to progress construction of the program in all regions of the state.

Fiscal Year 2021-2022 Program Expenditure Update

The Authority's Board of Directors historically adopts an annual fiscal year budget and a multiyear Program Baseline Budget after the approval of a new Business Plan. In September 2021, the Board approved the 2021-22 fiscal year budget. However, the adoption of an updated Program Baseline Budget, last updated in June 2020, has been deferred pending action by the Legislature on the $4.2 billion Proposition 1A appropriation which was requested as part of the Governor's Revision Budget in May 2021. Legislative action on this appropriation, along with the other transportation investments proposed by the Governor, is anticipated in 2022.

Pending that appropriation, in order to move forward on specific program elements in 2022, the Board approved an Interim Program Baseline in December 2021. Most of these elements were identified in the Program Baseline recommendation in the 2020 Business Plan, which was adopted by the Board in April 2021.

This Interim Program Baseline will fund continued construction of the 119-mile Central Valley Segment, including track and systems; completion of all remaining environmental documents; reimbursements to partners on regional bookend projects; advancement of design for the Merced and Bakersfield extensions and the Central Valley

stations; and program support procurements. It also reflects the receipt of a new $24 million federal RAISE Grant awarded to the Authority in November 2021 for the Wasco State Route 46 Improvement Project.

Table 3.0 summarizes the changes that were approved by the Board of Directors in December 2021.

Table 3.0: December 2021 Interim Program Baseline Cost Summary

Request	($ in millions)	Summary
June 2020 Program Baseline	15,636	Existing Baseline Budget (including contingencies)
Construction Change Orders and Construction Package 4 Contingency Update	1,283	Net cost changes to base scope consistent with 2020 Business Plan and adjustments to reflect updated risk for Construction Package 4
State Route 46/New Federal RAISE Grant	76	$24 million Wasco federal RAISE grant award; $76 million total project cost
Subtotal: Construction	16,994	
Enhanced Scope to Advance Design - Merced and Bakersfield Extensions/ Stations	155	To advance design work for these two extensions and for the Merced, Fresno, Kings/Tulare and Bakersfield stations
Enhanced Scope for Program Wide Support Enhancements	787	Support for all aspects of the program (Early Train Operator, legal and financial contracts); primarily for re-procurement of Project Delivery Support contract.
Total: Construction and Program Delivery	17,937	Modified Budget Authorization (including contingencies)

Note: Totals may not sum due to rounding

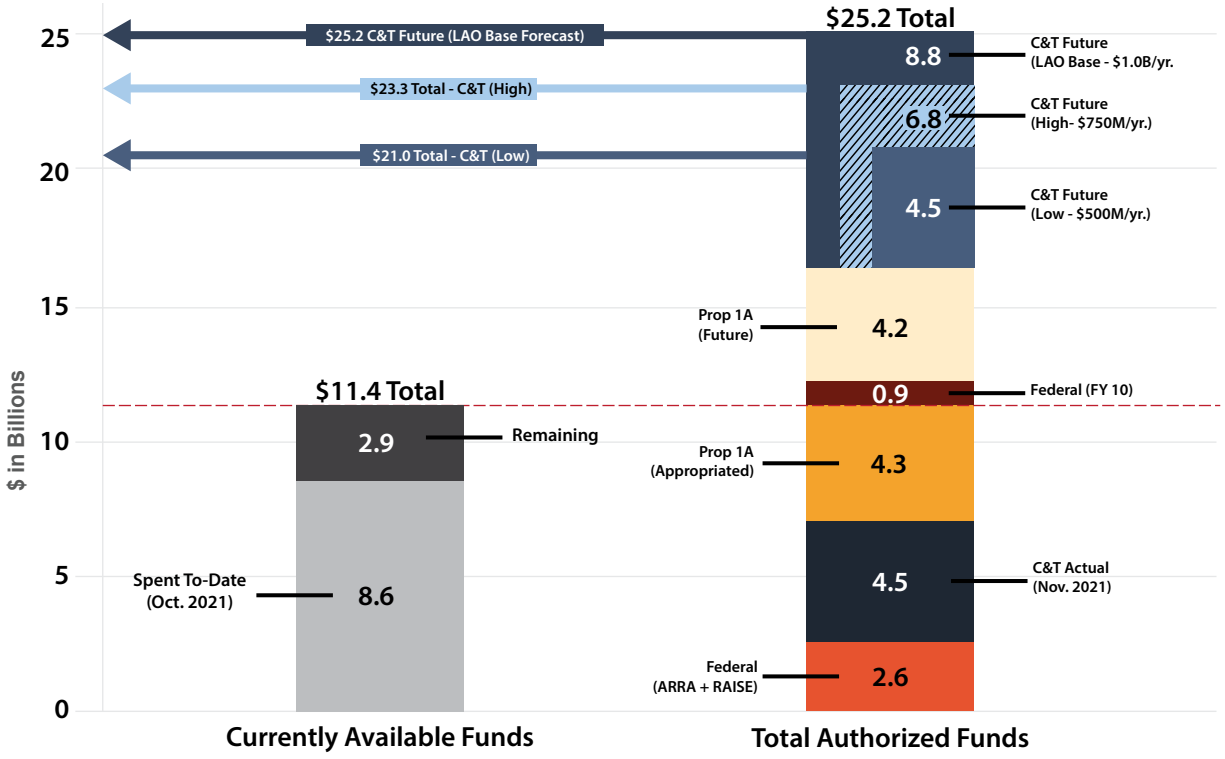
This Interim Program Baseline is only a partial update to the 2020 Program Baseline and is based on information known at this time. The following items will be monitored and brought back to the Board of Directors for further adjustments to the Program Baseline Budget as warranted:

- Action by the Legislature on the $4.2 billion Proposition 1A appropriation request;
- New federal grant awards;
- Completion of commercial settlements and other issues in Construction Package 1 and Construction Package 2-3 contracts;
- Track and Systems bids; and
- Advancing design on project sections in Northern and Southern California.

Current Funding

This section provides an overview of the current and projected funding available to the Program through 2030, as shown in **Exhibit 3.0**. The total amount of identified revenue for the capital program is currently estimated in the range of $21.0 billion to $23.3 billion, assuming Cap-and-Trade annual revenue scenarios of $500 million and $750 million per year. In addition, we are including a funding scenario that leverages and extends the Legislative Analyst's Office's (LAO) Cap-and-Trade base revenue forecast[1] of approximately $1.0 billion in FY22-23, resulting to $25.2 billion in total funds through 2030.

Exhibit 3.0: Currently Available and Authorized Funding



Note: Totals may not sum due to rounding

Current State Funding

The Authority has secured funds from two State sources: Proposition 1A bond funds and Cap-and-Trade funds. No General Fund dollars are allocated to the high-speed rail project.

PROPOSITION 1A

In line with the Governor's 2022 Budget, the 2022 Draft Business Plan recommends $4.2 billion in bond funds be appropriated to complete delivery of the 119-mile Central Valley Segment. In addition to expanding the labor workforce on the project and providing funds for cashflow needs, dedicating the remaining bond funds to their intended purpose of project construction will allow the Authority to use the more flexible Cap-and-Trade funds for other program priorities over time, including matching new federal funds.

Cap-and-Trade funds will make California more competitive for new federal grants, as they are flexible to be the match for a broader set of federal grant programs and a wider range of high-speed rail project elements. Proposition 1A funds are less desirable for federal grant match due to provisions in the bond act that limit expenditures and create a lengthy process to access bond funds. The Proposition 1A funds would be dedicated to keeping men and women working to complete Central Valley construction.

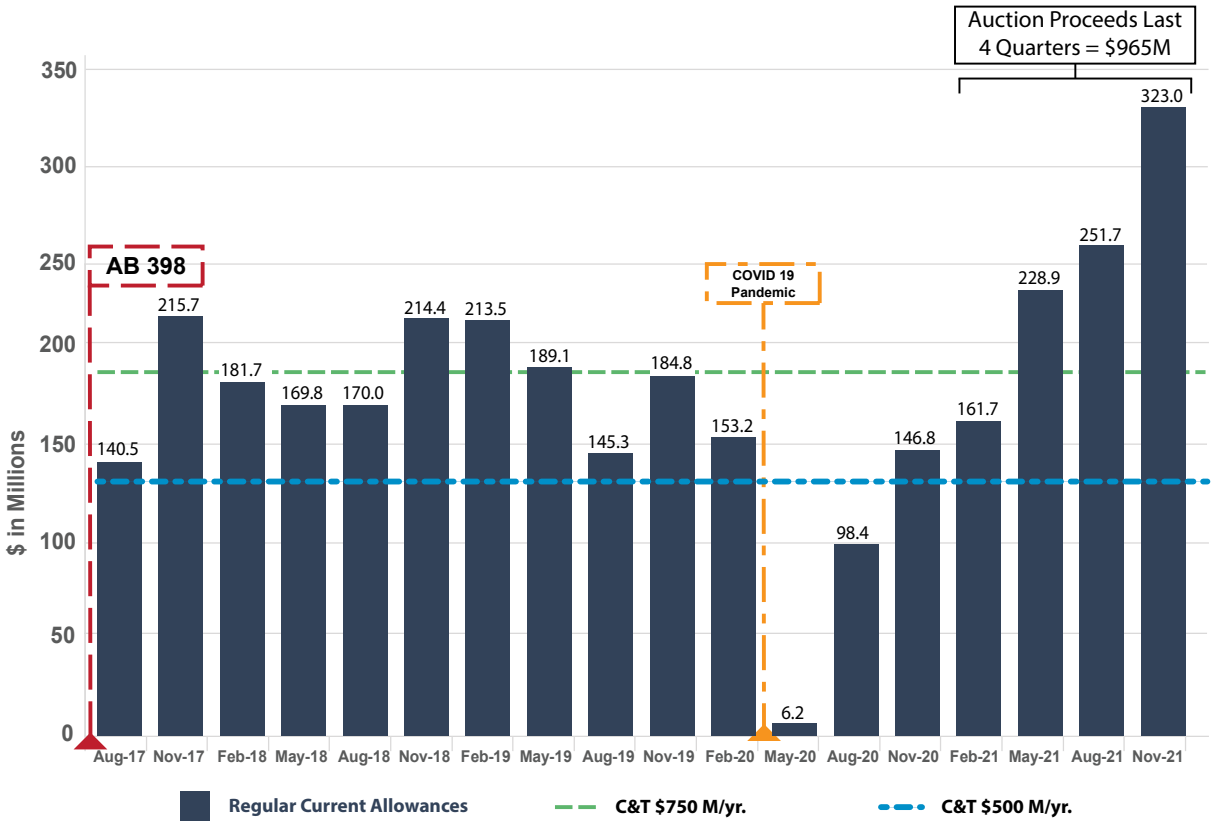
CAP-AND-TRADE

The Cap-and-Trade Program, a trading system of carbon-emissions allowances, covers approximately 80 percent of California's Green House Gas (GHG) emissions and is a central policy that underpins the California Air Resources Board's Scoping Plan to reducing GHG emissions by 40 percent from 1990 levels by 2030. The California Air Resources Board implements the program and oversees the quarterly auctions, which are a long-term source of funding for the high-

speed rail project and for regional transit and rail projects statewide. The Authority has a continuous appropriation of 25% of Cap-and-Trade auction receipts, after adjustments.

As shown on **Exhibit 3.1**, the last four auctions have yielded $965 million in Cap-and-Trade total revenues for the Authority, a strong recovery from recent COVID-19 pandemic induced market volatility. Through the November 2021 auction, the Authority has received a total of $4.5 billion in Cap-and-Trade funds.

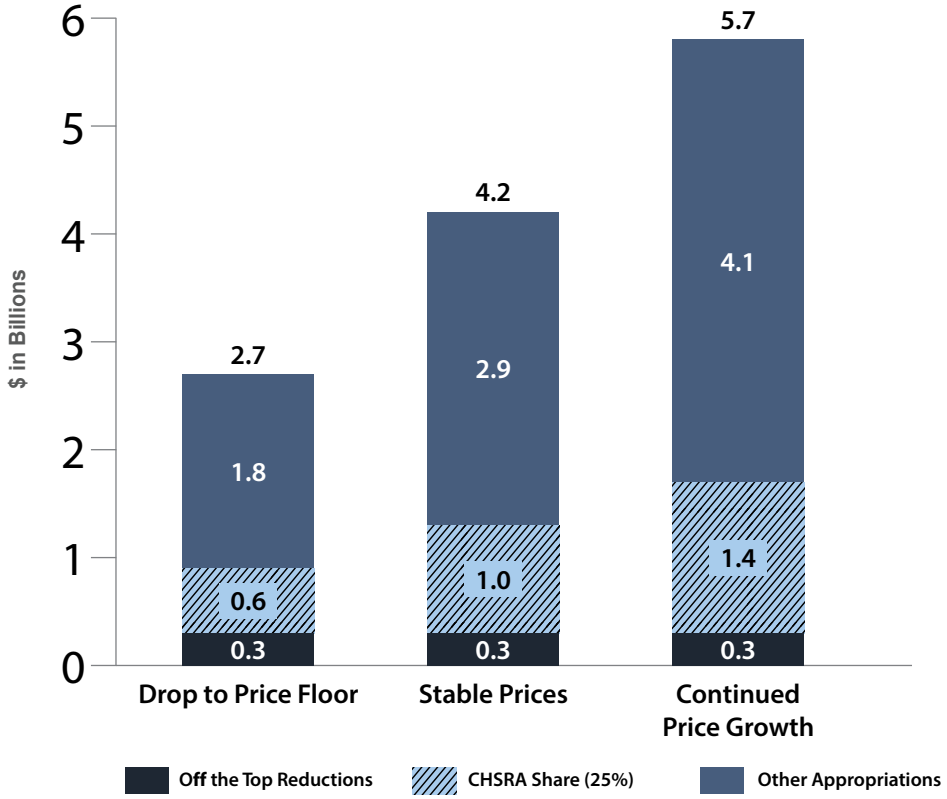
Exhibit 3.1: Quarterly Cap-and-Trade Auction Proceeds for High-Speed Rail ($ in Millions)



As seen in **Exhibit 3.1**, the past three Cap-and-Trade quarterly auctions, Cap-and-Trade revenues have been significantly above the Authority's established high range of $750 million per year. This development is highlighted in the recently released Legislative Analyst's Office (LAO) *Cap-And-Trade Auction Update and GGRF Projections*[2] report which contains three Cap-and-Trade revenue forecasts under various allowance price scenarios (see **Exhibit 3.2**):

1. **Drop to Price Floor (LAO Low Forecast).** Allowance prices drop to the quarterly auction floor price beginning February 2022, resulting in revenues totaling $3.7 billion in FY21-22 and $2.7 billion in FY22-23.
2. **Stable Prices (LAO Base Forecast).** Allowances are assumed to remain relatively stable beginning February 2022, resulting in revenues totaling $4.5 billion in FY21-22 and $4.2 billion in FY22-23.
3. **Continued Price Growth (LAO High Forecast).** Allowance prices increase to $40 in 2022 and $43 in 2023, resulting in revenues totaling $5.1 billion in FY21-22 and $5.7 billion in FY22-23.

Exhibit 3.2: Annual Auction Revenue Under Different Allowance Price Scenarios



In this plan, we have included a scenario that leverages and extends the Legislative Analyst's Office's Cap-and-Trade Base Forecast, which translates to around $1.0 billion per year after subtracting "off the top" adjustments for wildfire protection and AB 398 fire prevention fee and manufacturing tax revenue back-fills. Building on these forecasts, the Authority has undertaken further analysis to understand how the Cap-and-Trade auctions might perform in the future. There is reason to believe that higher Cap-and-Trade revenues could be expected as the price of allowances has continually increased:

- In the February 2020 quarterly auction, the last auction before the COVID-19 pandemic, Cap-and-Trade current allowances sold at $17.87 per allowance.
- In the November 2021 quarterly auction, Cap-and-Trade current and futures allowances sold at $28.26 and $34.01 per allowance, respectively.

Demand for allowances seen in the 2021 auction cycles, demonstrated in current and future prices, indicate a market expectation that allowance settlement prices will continue to be high through 2030. This is because both the volume of participants and the demand has grown. Industry analysts are now including forecasts through 2050, which aligns to California GHG emissions reduction goals, and demand and price forecasts continue to rise through this period. This indicates that Cap-and-Trade revenues for the Authority should be strong for the long term and provide significant contributions to current and future program build out, as well as providing state match for new federal funding grants.

Current Federal Funding

The Authority has received approximately $3.5 billion in federal funding commitments to complete environmental review for the Phase 1 system and to construct the 119-mile Central Valley Segment between Madera and Poplar Avenue. Of this:

- $2.5 billion was from the federal American Recovery and Reinvestment Act of 2009 (ARRA) and;
- $929 million was appropriated by Congress from Fiscal Year 2010 (FY10) Transportation, Housing and Urban Development funds.

These funds were awarded to us by the Federal Railroad Administration (FRA) through federal grants. This federal partnership was instrumental in enabling us to advance the program into construction. The $2.5 billion in ARRA funding was fully expended before the statutory deadline and in compliance with the FRA grant requirement. In January 2022, the FRA fully approved the Authority's state match, about 12 months ahead of the deadline.

Per the terms of the federal grant agreement, the $929 million of FY10 funds, along with $360 million of state matching funds, are scheduled to be the last funding required to complete the federal grant scope of work. In 2021 the Authority worked with FRA to extend the period of performance under the grant to 2026, adding electrification and systems into the scope of work.

RAISE Grant Award

In November 2021, the United States Department of Transportation awarded a $24 million Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant to the Authority. The funds will be used for crucial safety, efficiency and construction projects in and around the City of Wasco. This grant helps bring improvement, safety, environmental justice, and economic development to a historically disadvantaged community and further demonstrates the federal government's support for this Program.

Current Partnerships and Local Funding

The Authority has partnered with other transportation agencies on investments in shared corridors, matching Authority funds with other federal state and local funds to bring early benefits to existing passenger rail systems and future benefits for high-speed rail. We successfully combined state, regional, local and federal sources to fund the Caltrain Electrification Project, the Link Los Angeles Union Station (Link US) Project, the completed 25th Avenue Grade Separation Project in San Mateo, and the Rosecrans/Marquardt Grade Separation Project in Los Angeles. Together these projects have combined budgets of over $3 billion.

Summary of Projected and Expended Funding to Date

Table 3.1 summarizes the total forecasted funding for the project through 2030, how much has been expended through October 2021, and the total remaining funds available. Consistent with our

assumptions, the table shows a range for future Cap-and-Trade funds. It also shows the remaining Proposition 1A dollars available to the program.

The Authority's ability to use the remaining Proposition 1A funds requires an appropriation by the Legislature and completion of the statutorily required funding plan (Section 2704.08 (d), California Streets and Highways Code). The 2022 Governor's Budget requests the appropriation of these bond funds by the Legislature in early 2022.

Table 3.1: Summary of Total Funding Available and Total Funds Expended as of October 31, 2021 ($ in Billions)

Funding Source	Total Funding A	Total Expended* B	Total Remaining** C = A - B
Federal Funds			
ARRA Construction	2.1	2.1	0.0
ARRA Planning	0.5	0.5	0.0
FY10 + RAISE	1.0	0.0	1.0
State Funds			
Proposition 1A Project Development	0.6	0.6	0.0
Proposition 1A Central Valley Segment Construction	2.6	2.6	0.0
Proposition 1A Bookends	1.1	0.3	0.8
Proposition 1A for future Construction Appropriation	4.2	0.0	4.2
Cap-and-Trade Received through November 2021	4.5	2.5	2.0
Subtotal	16.3	8.6	7.8
Future Cap-and-Trade***	4.5 to 8.7	0.0	4.5 to 8.7
Total	**21.0 to 25.2**	**8.6**	**12.5 to 16.7**

Note: Totals may not sum due to rounding

*Excludes administration and other state operations expenditures

**A portion of this funding may be directed to administration and state operations

***Future Cap-and-Trade funding assumes a low of $500 million to a LAO Base of $1,000 million per year from 2022 to 2030 (9 years)

Future Funding

The passage of the Bipartisan Infrastructure Law heralds the beginning of a sustained federal-state partnership in the development of California's high-speed rail program. The program can now be developed in much the same way the interstate highway system and regional public transit systems have been built in our state: through a series of multiyear federal, state, and regional investments that build out a network in a phased approach.

When Proposition 1A was approved by California voters in 2008, a key assumption behind the measure was that it demonstrated California's commitment to a high-speed rail network and would engender a partnership with the federal government that would allow for sustained additional investment over many years. Federal legislation adopted over the past year validates that assumption and gives the state the opportunity to leverage its investment of Proposition 1A and Cap-and-Trade Funds.

As we pursue additional federal funds, California will benefit from having matching dollars from Proposition 1A and Cap-and-Trade funds. We will

be uniquely positioned to leverage those state funds with significant federal investments in both the short and long term. This is enhanced by the alignment between California and federal government policy goals to pursue world-class mobility and reduce greenhouse gas emissions. The recently proposed funding allocations to this program in the Governor's Budget emphasize this clearly, with a total of $14.9 billion investments proposed for both high-speed rail and other clean transportation projects around the state. The appropriation of these new state dollars by the Legislature, including the Proposition 1A dollars, will help maximize California's competitiveness in securing significant federal grant funds.

The Authority is uniquely positioned to leverage these federal investments because:

- The project is advancing now – construction is progressing in the Central Valley and significant progress is being made to environmentally clear the full 500-mile system, with the intent to advance design as each section is cleared.
- We can match federal dollars with California funds – California has the most advanced high-speed rail project in the nation and is ready to put federal dollars and matching funds to work now.
- We can partner with other state and regional projects of significance – the high-speed rail system is the backbone of a modern, integrated passenger rail network that will improve statewide mobility for all.
- A federal-state partnership enables Californians to realize the goal of a truly connected state. It will also demonstrate how these investments can help achieve critically important greenhouse gas and pollution reduction goals.

A Partnership Approach

The Authority will work closely with the California State Transportation Agency, as well as regional and local partners, to present a unified justification for a connected California mobility plan to the federal government. A coordinated effort can deliver core programs throughout the state and will likely yield the best results. To this end, our future funding approach priorities will be guided by:

- Delivering a high-speed rail operating segment and advancing work on delivering the rest of the system by completing environmental clearances and advancing design.
- Developing an integrated statewide approach that leverages funding in a coordinated way, to maximize benefit in the short term while building a connected, integrated system with safe, efficient high-speed rail travel at its core.
- Providing immediate benefits in the form of safety and air quality enhancements, improvement of current regional services, end-to-end journey ticketing, and comparative advantages over both car and air by both cost and time savings.

Opportunities for Federal Funding

A key component of maximizing new federal funding is to align available funds to well-suited program components and then identifying and securing the non-federal funding match. The Authority has identified over $57 billion in funding from the Bipartisan Infrastructure Law for which the Authority is eligible to compete. For the purposes of federal funding program identification, we have established different categories:

CAPITAL FUNDING FOR CORE ELEMENTS OF THE SAN FRANCISCO TO ANAHEIM HIGH-SPEED NETWORK

Programs in this category could be used by the Authority to advance our immediate priorities of commencing high-speed service between Merced, Fresno and Bakersfield as soon as possible (providing capital funding for Merced and Bakersfield extensions with two tracks), advancing design work on all remaining project sections, and for initial capital funding to support the high-speed connection to the Bay Area.

These programs include the Federal-State Partnership for Intercity Passenger Rail (F-S PIPR) Grants, and the National Infrastructure Project Assistance Program (NIPA) for "Megaprojects". Additionally, the proposed Build Back Better Act includes specific funding for high-speed rail through the Passenger Rail Improvement, Modernization, and Emissions Reduction Grant Program (PRIME).

Table 3.2 displays the primary Bipartisan Infrastructure Law programs for which the Authority plans to apply.

Table 3.2: Bipartisan Infrastructure Law Grant Programs ($ in Billions)

Competitive Grants Program	Eligibility/Purpose	Appropriated	Additional Authorization	Total
Federal-State Partnership for Intercity Passenger Rail Grants (F-S PIPR) (excluding the Northeast Corridor set-aside)	High-speed rail and all intercity rail expansion projects Multi-year commitments possible	$12.0	$4.1	$16.1
Consolidated Rail Infrastructure and Safety Improvements (CRISI)	Capital projects that will improve passenger and freight rail transportation systems in terms of safety, efficiency, or reliability	$5.0	$5.0	$10.0
National Infrastructure Project Assistance Program (NIPA) (Megaprojects)	Broad eligibility for different types of infrastructure	$5.0	$10.0	$15.0
Local and Regional Project Assistance Program (L&R) (RAISE Grants)	Invest in roads, rail, transit and port projects to achieve national objectives	$7.5	$7.5	$15.0
Nationally Significant Multimodal Freight and Highway Projects (INFRA Grants)	Fund highway and freight projects of national and regional significance Available for rail/highway crossing projects	$3.2	$6.0 (Authorization) and $4.8 (Contract Authority)	$14.0
Federal Railroad Administration Railroad Crossing Elimination Program	Highway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods	$3.0	$2.5	$5.5

Key to Terms:

Appropriated - Funds are appropriated in the legislation.

Authorized - Funds can only be released upon future appropriation by Congress.

Contract Authority - Funds come from the Highway Trust Fund and do not require appropriations to be released

CAPITAL FUNDING FOR TARGETED PROGRAM INVESTMENTS

Programs in this category will support planning and construction of more targeted projects such as stations, rail-highway crossings in specific areas, and improvements to shared use corridors. For these types of projects, the Authority may be the sole applicant or may partner with another state agency, a local government or regional transportation agencies to advance applications for funding. These programs will support the Authority's goal to make concurrent investments throughout the state as work advances on the core high-speed elements of the program. These programs include the Local and Regional Project Assistance Program (L&R) (also called Rebuilding American Infrastructure with Sustainability and Equity (RAISE)), Nationally Significant Multimodal Freight and Highway Projects (also called Infrastructure for Rebuilding America (INFRA)), and Consolidated Rail Infrastructure and Safety Improvements (CRISI). In the case of shared corridors, our regional partners may also apply for Federal Transit Administration Capital Investment Grants for projects that will benefit regional rail in the short term and high-speed rail in the long term.

OTHER POTENTIAL FUNDING SOURCES

The California high-speed rail program touches on a range of adjacent federal policies such as energy grid resilience, renewable energy, broadband connectivity and social equity as well as partner transportation agencies. There are a range of programs outside of what might be conventionally thought of as high-speed rail funding that the Authority could apply to that could provide near-term benefits and that advance a range of policy objectives.

Optimizing Federal Funds With Matching Funds

Federal funding generally comes with a requirement for a non-federal match. This could be comprised of state, regional, county, city and private funds, often combined together as we have successfully demonstrated on our regional bookend projects. As part of our future funding strategy, we are analyzing opportunities for matching funds. Currently identified funding sources, such as Cap-and-Trade and Proposition 1A, can provide the Authority's match for federal grants that the Authority will apply for starting in 2022. In a similar vein, the Governor's proposal for $6.2 billion in General Funds for regional rail, transit, port-related infrastructure and active transportation will benefit projects statewide as they compete for federal funds.

With an ongoing federal commitment to building high-speed rail in the United States, the potential future funding opportunities discussed below could provide the match for longer-term federal funding to extend high-speed rail beyond the Central Valley to the Bay Area as well as to further advance high-speed rail investments in Southern California.

Extending State Cap-and-Trade Funding

Over several business plans we have discussed the benefit of extending the Cap-and-Trade program. This would not only provide long-term revenue for the Authority but also provide additional funds for wider California social and climate policies, such as local transit and wildfire prevention, that are funded through other programs. Extending the Cap-and-Trade Program to 2050 would generate between $40 billion to $80 billion in additional funding for the state's Greenhouse Gas Reduction Fund and could provide an additional $10 billion to $20 billion in future funding for high-speed rail.

These projections are based on total state Cap-and-Trade revenues generating between $2 billion (Authority's Low Case) to $4 billion (LAO Base Case) per year and the Authority maintaining its current 25 percent continuous annual appropriation. With a Cap-and-Trade extension, we would likely accelerate access to these funds through financing which would provide funds earlier so that we could put them to work sooner to help build out the system. To facilitate an efficient financing, the Cap-and-Trade Program would need to be enhanced in three critical ways:

1. Non-impairment of appropriations to the California High-Speed Rail Authority.
2. Extension of the Cap-and-Trade program through 2050.
3. State Minimum Guarantee of Annual Funds for California High-Speed Rail Authority.

An extension and potential financing of Cap-and-Trade represents the next tranche of state funding to match the range of federal investments that the Authority expects to receive. Additionally, the Authority would work with the United States Department of Transportation on financing programs such as the Transportation Infrastructure Finance and Innovation Act (TIFIA) and the Railroad Rehabilitation and Improvement Financing (RRIF). As stated above, these funds could be effectively combined with ongoing federal funds to extend high-speed rail to the Bay Area and further advance high-speed rail investments in Southern California. Creating a strong and stable revenue stream on the state side provides the strongest possible indication to the federal government that the Authority is ready to take full advantage of its funding programs.

Local and Regional Funding

Funding opportunities multiply in shared corridors where passenger rail service is provided by regional rail operators today and the corridors will be shared with high-speed service in the future. In these cases, broader opportunities exist for local and regional funding to match a broader suite of federal grant programs. Seeing this opportunity, the Metropolitan Transportation Commission adopted the Plan Bay Area 2050 Final Blueprint. This $1.4 trillion plan includes capital improvements, such as electrification, grade separations and other modernization projects. It also includes more than $7 billion of investments along the Caltrain/high-speed rail shared corridor that prioritize dual-purpose investments from south to north that help to connect high-speed rail to the Bay Area.

Rendering: High-speed rail station in the Central Valley

Additionally, the high-speed rail system will generate regional and local value. As such, we could also seek funding linked to this value by focusing on station area value capture and the appreciating real estate values that the system will help create. The full value of the asset will be realized by using innovative methods of value capture, such as secondary use of the system's right-of-way to provide fiber-optic communication connectivity. Many of these secondary uses align closely to state and federal policies. Ancillary revenues and transit-oriented development will provide further sources of funding that can contribute to system expansion or other costs which may be accessed through partner agencies or directly.

Private-Sector Finance

We continue to monitor opportunities for private sector investment. However, as we have discussed before, we are not yet at the point of being able to use private sector finance as a component of project funding. This is largely due the size and complexity of the projects being undertaken and the forecast time to revenue-positive service, that means that the conventional requirements of private sector investment cannot yet be achieved. One thing is clear, private sector partners will participate when risk is more refined and reduced and when ridership/revenue estimates are also updated and refined. To get there, it is essential that the Authority pursue its plan to advance design work where environmental clearances are complete and that we update our ridership model and forecasts in 2022. There will be a right time for private finance and at that point we expect to see significant demand for investment into the system.

MONETIZING THE SILICON VALLEY TO CENTRAL VALLEY LINE

A fundamental goal of the program is to create a commercially successful and financially sustainable high-speed rail system. Once the Silicon Valley to Central Valley line is built and in operation, it will become a viable commercial enterprise, generating revenue, and rapidly producing positive cash flow. Upon demonstrating a level of operational maturity, this positive cash flow can be monetized through financing and private investment, which can then help fund future development of the system. As demonstrated in other high-speed rail markets, including California/Nevada's Brightline West project, private-sector operators are expected to invest a considerable amount to own the rights, through a concession, to the long-term operations of a commercially viable high-speed railway. Its value will be greatest when its profitability is proven.

Funding A High-Speed Rail Megaproject

California's high-speed rail program is unique in its magnitude and its complexity for the United States. We are funding and implementing it in the same way that high-speed rail systems have been, and continue to be, developed throughout the world. Specifically, we have a clear, long-term vision and a long-term plan for implementing that vision. We are advancing it through a series of phases allowing for incremental extensions. That is the implementation strategy that we laid out in our 2012 Business Plan and that we continue to follow. We recognize that, given its magnitude, all the funds will not be available in one single installment and that we will have to build the system sequentially, demonstrating progress and value incrementally. We are in the process of doing this and looking to the next step in this program while focusing on delivering the current elements of it.

Photo: Fresno River Viaduct in Madera County

CHAPTER 4

STRENGTHENING RISK MANAGEMENT

Introduction

As with any megaproject or large-scale capital program, risk is inherent in the work. Actively managing risk is critical to objectively frame and guide decision making at all levels of the organization and to achieve the program's strategic objectives. The Authority continues to work toward enhancing and expanding the scope of risk management, integrating across all levels of the organization, and supporting the mitigation of key risks from specific projects up to the enterprise level. By establishing a process of continuous improvement, identifying what has worked well and what could be improved upon, the Authority's risk management function seeks to reduce risk impacts and maximize opportunities.

Enterprise Risk Management Mission
Foster a risk-aware culture to focus decisions on the proactive management of risks to support the Authority in achieving its statewide goals and objectives

Enterprise Risk Management Vision
Our vision is an organization where every decision is informed and guided by a sound understanding of risk as the risks relate to achieving the Authority's objectives

Objectives of Enterprise Risk Management

We are continuously improving the Authority's risk management processes, tools and methods to manage risk and make decisions.

A key objective in developing the Enterprise Risk Management program is to align the Authority's risk management processes to the 20 principles of the Committee of Sponsoring Organizations of the Treadway Commission risk framework: Enterprise Risk Management – Integrating with Strategy and Performance.

More detailed objectives of the program include:

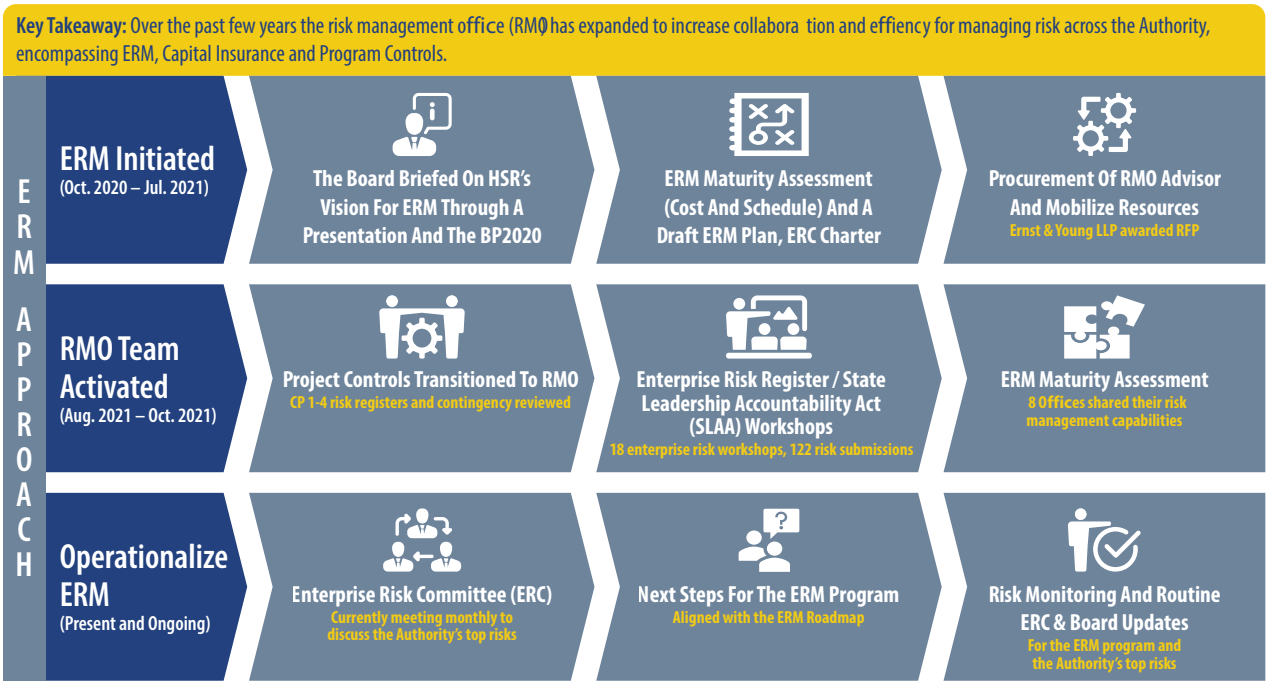
- Proactively identifying and monitoring key risks (opportunities, threats and outside risks) associated with the Authority's objectives;
- Establishing risk processes and a cadence for risk coordination and reporting;
- Aligning offices and programs to coordinate risk responses to reduce negative risks and take advantage of positive risks;
- Enhancing communication of risks and opportunities throughout the organization, both internal and external;
- Enabling the Board of Directors and the Enterprise Risk Committee to fulfill their risk oversight responsibilities; and
- Developing a risk-awareness culture, with a focus on proactive mitigation.

Progress Since the 2020 Business Plan

The Authority has made progress on several fronts.

1. **Conducted a Maturity Assessment:** The Risk Management Office completed a two-part maturity assessment focusing on cost, schedule and budget risk management. A comparison of the current state to the desired future state allowed the development of a series of program next steps.
2. **Established the Enterprise Risk Committee:** Formalized the Enterprise Risk Committee membership and formalized the charter, which includes monthly meetings to review, discuss and monitor action plans on the Authority's top risks. The risk office now facilitates monthly Enterprise Risk Committee meeting where members discuss key risks across the Authority.
3. **Identification of Enterprise Risks:** Workshops were conducted across the Authority to identify and assess risks to each office. This exercise helped form the Authority's baseline enterprise risk register.
4. **Conducted Targeted Risk Reevaluations:** Throughout the Authority, available risk registers were evaluated for completeness and process alignment. A series of recommendations were provided to improve risk management at the Authority.
5. **Advanced a Plan:** Staff worked on furthering an Enterprise Risk Management Plan and vision for the program using the roadmap described in **Exhibit 4.0**. The plan was shared with Authority executives and adopted by the Enterprise Risk Committee.

Exhibit 4.0: Enterprise Risk Management Roadmap



The Enterprise Risk Management Roadmap

The programs next steps are aligned to each component of the target operating model, which includes Leadership, Governance, People & Organization, Processes, Data & Analytics, and Technology, as described in the 2020 Business Plan. This includes assessing risks within each risk category – Enterprise, Program and Project Delivery, and Unknown Future Risks – and prioritizing them into one of four phases: immediate, near-term, medium-term and long-term:

- The **immediate**, foundational actions related to governance, communication and operationalizing the Enterprise Risk Committee have been completed.
- In the **near-term,** the planned steps include formalizing roles and responsibilities across the organization that will support accountability for identified risks, increasing awareness of the program, documenting formal policies and procedures, and operationalizing metrics to actively monitor the top risks.
- In the **medium-term,** the risk office will monitor and make formal recommendations based on the key metrics and associated thresholds/limits, the reporting cadence will be strengthened and lessons learned from near-term activities will enable further enhancements across the program.
- In the **long-term**, as the program matures, the Authority will have a fully functioning risk office that will work with all functional units to mitigate risks. Activities will include proactive training and enhancing the capabilities of the organization to expand the risk awareness culture of the Authority.

The primary objective of risk program staff is to support the Authority in the identification and management of Enterprise Risks, Program and Project Risks as well as Unknown or Emerging Risks. Some examples of these risks are detailed below.

Enterprise Risks

Several types of risk fall under the category of enterprise risks.

Funding Risks

Funding uncertainty continues to be a significant risk and opportunity for the Authority. Moving into 2022 and beyond, the Authority could receive a significant amount of new federal funding and receive appropriations needed from the California Legislature. As described in Chapter 3, Funding the Program, funding to complete the remaining Phase 1 system and the Silicon Valley to Central Valley line has yet to be identified. The current revenues are sufficient to complete the Central Valley Segment, the bookend investments in Northern and Southern California, and all environmental documents for Phase 1.

Currently, the state is utilizing two major funding sources for the high-speed rail program. The first and primary source is Proposition 1A bond funds, and the second is Cap-and-Trade funding (this includes both a one-time appropriation and the ongoing 25% appropriation of Cap-and-Trade proceeds through 2030 from the state's market-based auction system).

The main project funding risk to the remaining $4.2 billion in Proposition 1A funds is obtaining the appropriation from the Legislature. The primary risk to Cap-and-Trade funding is that receipts are volatile, and proceeds can be lower than forecasted. Cap-and-Trade is an auction-based revenue source that is contingent upon

market factors; as such, it is difficult to predict with certainty the results of future auctions. This creates challenges when planning for a multi-year project that is dependent on Cap-and-Trade revenues. Chapter 3, Funding the Program, details how the Cap-and-Trade auctions recovered in 2021.

The Authority's largest two funding agreements with the Federal Railroad Administration (FRA) total approximately $3.5 billion. The Authority's primary federal funding source is the American Recovery and Reinvestment Act Grant (ARRA). The Authority exhausted ARRA funds and has matched 100 percent of the state funds necessary to meet its ARRA match obligation. The Authority's second largest grant is the Fiscal Year 10 Grant (FY10). These funds are anticipated to be accessed around summer of 2024 and will be expended prior to the grant deadline of December 2026.

Chapter 3, Funding the Program, identifies various potential funding sources to complete the Silicon Valley to Central Valley line and, ultimately, the remaining San Francisco to Los Angeles/Anaheim system. New sources of funding identified in Chapter 3, including, potentially, the Build Back Better Act, present an opportunity to fund portions of the program. There is a risk that not all identified future funding sources will be secured. The Authority is in the process of refining its strategy for securing funding for all defined priority projects. By working closely with stakeholders, sister agencies, the California State Transportation Agency and the federal government, we believe that we can access significant funds that can advance the program throughout the state.

Litigation Risks

A program of this nature will experience many different legal risks. These include potential litigation and adjudicatory administrative processes related to project funding, environmental clearances, property acquisition and contract disputes. Previous litigation already affected the Central Valley Segment construction costs and schedules.

PROPOSITION 1A LEGAL CHALLENGE

John Tos, et al. v. California High-Speed Rail Authority – Third District Court of Appeal, filed May 2019

The lawsuit is related to two Proposition 1A bond funding plan actions approved by the Board of Directors for the San Francisco to San José corridor electrification project and the Central Valley construction segment. These funding plans allow Proposition 1A bonds to be sold and the funds used for these capital projects. The lawsuit alleges that the Legislature violated the California Constitution when it passed Assembly Bill (AB) 1889 (2016) because AB 1889 materially modified Proposition 1A without voter approval.

AB 1889 states that a corridor or usable segment is "suitable and ready for high-speed trains to operate immediately or after additional planned investments are made on the usable segment and passenger train service providers will benefit from the project in the near-term". Plaintiffs asked the court to declare AB 1889 unconstitutional. Plaintiffs also alleged that the two funding plans approved by the Authority, and the associated independent consultant reports, failed to meet several of the requirements of Proposition 1A.

In November 2018, the Superior Court ruled in the Authority's favor, finding that AB 1889 was constitutional. Plaintiffs conceded that if AB 1889 is valid, the funding plans are also valid. All parties stipulated to enter a final judgment in the Authority's favor. The case was appealed by Tos, et al, in May 2019.

The court of appeal issued a decision in favor of the State and the Authority on November 30, 2021,

finding that the California Constitution does not prohibit alterations of a bond law approved by the voters for a complex public works project, like the high-speed train system, which do not divert funds from, interfere with, or destroy the "single object or work ... distinctly specified" in the law. Appellants have filed a petition for review with the California Supreme Court, challenging the appellate court decision.

The Authority is confident that it will prevail in any future litigation touching on these areas.

Future Litigation

Given the magnitude of the project and the broad base of stakeholders, we recognize that similar litigation on other project sections or new litigation may arise in the future. As the program advances, the Authority will work closely with affected stakeholders to address issues before they become formal lawsuits. In addition, we will continue the practice of using alternative dispute resolution processes, such as mediation or arbitration, where possible.

PROPOSITION 1A COMPLIANCE WITH PROPOSED INTERIM SERVICE BETWEEN MERCED AND BAKERSFIELD

The Authority recognizes that its implementation strategy for interim high-speed rail service connecting Merced, Fresno and Bakersfield may expose the Authority to potential litigation over Proposition 1A compliance. The risk comes from the fact that Proposition 1A asks the Authority to develop funding plans that show that passenger service provided by the Authority, or pursuant to its authority, will not require an operating subsidy. Opponents of the project suggest that the Authority's implementation strategy violates that language in the Bond Act and the High-Speed Rail Act.

The Authority believes that there will be no violation of the subsidy language because the Authority's implementation strategy for the Central Valley segment is to lease its track and rail cars to another public entity that is already providing passenger rail service in the Central Valley. During this interim service period, the Authority will not be responsible for operating costs and, therefore, will incur no subsidy for its operation. The entity leasing the assets from the Authority will bear the revenue risk as it pays a fixed lease fee and receives revenue from the operations and a lower than current subsidy from the state.

This service would be structured similarly to the way the Legislature has structured the bookend projects. For example, Proposition 1A monies are currently being used to electrify the Caltrain corridor, and Caltrain receives public subsidies. In the same way, the Authority's approach proposes that the current subsidy being paid in the Central Valley will continue, although at a much lower amount for other services that will lease assets from the Authority. This will put completed infrastructure into service with greater benefits to passengers while the interim service is being run.

The Authority is confident that it will prevail in any future litigation touching on these areas.

LEGAL CHALLENGES TO AUTHORITY ENVIRONMENTAL REVIEWS

The act of issuing final environmental documents may expose the Authority to potential litigation over compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Opponents of the project will argue that the documents do not meet the legal requirements of those laws. Authority staff meet extensively with stakeholders to try to come to an understanding of what the law requires with the goal of coming to an agreement that avoids litigation. The Authority recognizes that based on the complexity of various federal

and state environmental laws, the depth of the environmental documents and very invested environmental stakeholders, future litigation over these documents is likely.

Stakeholder Support Risks

As the project continues to grow in size and duration, the Authority runs the risk of wavering support. It is of the utmost importance that the program continues to maintain support by highlighting the benefits, enhancing its relationships with local communities and other stakeholders through outreach programs, and maintaining open and clear communication with legislative bodies at all levels.

Clearly defining the benefits of the project is critical to maintain stakeholder support at the local, regional and national levels. Development of this system has direct impacts on employment by creating vast number of jobs, reducing greenhouse gas emissions and providing sustainable travel for the future. These benefits should be reiterated as a constant reminder of the positive impact of this program. Additionally, the Authority has an obligation to maintain a strong reputation as a pioneer in developing the first high-speed rail system in the United States. Public support of the Authority is directly affected by the perception of the communities impacted, and as such, any potential changes impacting these communities must be communicated and impacts be fully vetted.

Maintaining dialogue and communication with legislators, community leaders, agencies and all stakeholders, from local to federal to international, is imperative to maximize the understanding and support of the Authority and its work. Open and transparent continuous communication is critical when working with these external parties.

Ridership/Revenue Risks

As stated in the 2020 Business Plan, ridership revenues projections are based on the most up-to-date models and assumptions. However, there is always uncertainty due to unknowns and the potential longer-term pandemic impacts. The revenue generated by the lease of assets to the San Joaquin Joint Powers Authority, which will obtain a third-party operator of the initial high-speed rail service, will cover the management and maintenance costs of relevant Authority infrastructure and assets incurred during the first years of operation. As the program matures, positive cash flows will be needed to cover operations and maintenance costs while sustaining the lifecycle of the infrastructure and to be incompliance with Proposition 1A requirements. The Authority continues to work with the Early Train Operator to refine demand modeling for more comprehensive forecasting tools to update and enhance assumptions for connectivity in the state and to review short-term changes to travel markets and Authority ridership potentials in California.

Equipment and Technology

Technology provides significant benefits including increased productivity, cost efficiency, enhanced communication and numerous other advantages. It also introduces its own risks. The Authority proactively manages its technology risks by ensuring systems are updated and patched as recommended and hardware is refreshed to maintain optimal efficiency. Cyberthreats are mitigated through multiple controls, including continuous network monitoring, endpoint protection, access management, vulnerability management, and security and privacy awareness training for all staff. In addition, technologists work with program partners to enhance existing applications and/or implement new solutions to address business needs.

Environment and Climate Change

California is experiencing average temperature increases and more frequent, intense heat events which are anticipated to continue. The changing climate may result in an increase in the frequency, severity and extent of wildfires, changes in the intensity of precipitation events and sea-level rise. The Authority has undertaken analysis to illustrate the exposure of the system to a range of climate stressors and developed adaptation and mitigation measures to address system risk. This analysis and the planned adaptation measures, which look at both system design and operational approaches, is assembled in the Climate Adaptation Plan.

Organizational

The Authority continues to work to attract and retain the best talent to support the organization. If the Authority is unable to effectively establish and fill needed positions, it will be ill-equipped to fulfill program requirements, meet objectives in a timely manner, comply with state and federal mandates and support its mission-critical activities. The Authority's Budget Branch, within the Financial Office, works with leadership to develop and justify needs for staffing increases and to fully support the program's workload and needs. The team also participates in early engagement discussions with the California Department of Finance on staffing needs and maintains an ongoing dialogue to address staffing concerns while actively monitoring current resources and changes to resource needs. Furthermore, the Authority continues to refine roles and responsibilities of its employees and consultants to drive accountability and efficiency.

Program and Project Delivery Risks

As noted in previous business plans, responding to the ongoing challenges of building the first high-speed rail system in the United States is a constant effort by the Authority. Construction in the Central Valley continues and other sections are nearing environmental completion, each presenting its own risks associated with reaching key milestones. Realizing the schedule goals are critical to meeting programmatic delivery goals. With an organizational awareness always focused on key risks, the Authority continues to actively manage and mitigate risks related to active construction and across other functional areas such as environmental, engineering, and procurement.

Construction

As construction continues in the Central Valley, the largest risks facing the delivery of these segments is the ongoing coordination of third-party agreements and transfer of right of way. Construction timelines are largely contingent upon delivery of these items and could be negatively impacted if delivery milestones are not met. The Authority continues to proactively review schedules and expedite work on the critical path through monitoring and coordinating efforts with the contractors. Additionally, the Authority has reviewed and increased the contingency amounts to best align with the program's needs and improved oversight and coordination through the creation of a program wide third-party task force led by Infrastructure Delivery to help solve stakeholder-management issues.

Inflation and supply chain issues continue to be a risk. As highlighted in a June Association of General Contractors alert, increasing costs are leading directly to increased construction costs. Although the globe continues to rebound from

the COVID-19 pandemic and ramp up raw material production, higher costs may be passed through to the Authority through higher bid prices. The Authority will continue to monitor costs and impacts and make the necessary adjustments to minimize impacts.

Also due to the complexity of the work, change orders necessary to cover any scope or schedule changes present a risk. If the Authority does not effectively implement and adhere to newly established change order procedures, then the program will experience delays and the contractors may file claims for additional compensation, resulting in funding gaps and schedule impacts.

Right-of-Way Acquisition

The decision to move into construction prior to finalization of right-of-way acquisition posed a substantial risk to the design and construction of the system, directly impacting schedules, changes in scope, and costs. Although the Authority continues to mitigate risks where possible, some risks to construction remain:

1. Coordination with stakeholders statewide to resolve a diversity of interests;
2. Property size, location, use, impacts and the type of acquisition make each process unique; and
3. Court processing time variability—an impact from the pandemic that was not expected.

The Authority has, and continues to have, the opportunity to develop meaningful relationships with landowners impacted by the project. For those parcels where negotiations with the owner are not successful, the eminent domain process is used, impacting the overall turnover timeline. The Authority is continuing to work with the program construction management teams to focus on the delivery of parcels on the critical path to minimize impacts to the schedule. Currently, the Authority has delivered 90.4% of the parcels needed for Central Valley construction.

Third-Party Agreements

The Authority continues to actively manage risks associated with third-party agreements. Although agreements between utilities, railroads, municipalities and agencies continue to be negotiated and executed, the potential for delays to the program schedules, changes in scope to accommodate third-party requirements, and additional budget to complete construction remain high. Regular program reviews, including leadership of both the Authority and the affected third party, seek to reduce the impact and alleviate any impasse.

Environmental Review and Permitting

At the close of 2021, environmental review, as required under CEQA and NEPA, were still underway for five of the eight segments of the Phase 1 program. Fresno to Bakersfield, Merced to Fresno and Bakersfield to Palmdale completed CEQA and NEPA in October 2019, September 2020 and August 2021, respectively. Burbank to Los Angeles was approved by the Authority Board in January 2022, and the San José to Merced and San Francisco to San José project sections will be considered by the Board for approval in April and June 2022, respectively. The final two project sections are still undergoing Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) preparation and are expected to be released for public circulation and comment in 2022.

The preliminary engineering supporting environmental review provides sufficient design detail to support coordination with local, state and federal agencies, as well as members of the public who provide substantial comments during the public review period and during the Authority's

stakeholder coordination and outreach process. As the Authority receives comments on the preliminary design, the Authority is then able to modify the project in ways to reduce the adverse effects of the project and better integrate the project into the communities that the project will serve.

The Authority continues to work with many agencies and stakeholders as part of the environmental approval process. These agencies and stakeholders have important regulatory roles and expertise in ensuring that specific environmental resources are evaluated, considered, and protected. Consistent with that role, these agencies and stakeholders provide valuable input and coordination throughout the environmental review process and the subsequent permitting process.

The environmental review process is a critical opportunity for members of the public and all stakeholders to understand and comment upon the Authority's design, anticipated construction, and likely operational impacts. As the project sections advance through the environmental review and permitting process, the Authority may be obligated to refine or revise the project to avoid issues or reduce effects. These changes may require in additional coordination, design and supplemental environmental review resulting in delay or additional cost. The Authority remains highly committed to our responsibility to collaborate with these stakeholders to find balanced and equitable solutions.

Program and Project Delivery

Through formal adoption of our Staged Project Delivery process, the Authority identifies the necessary preconstruction and coordination activities prior to awarding future contracts and commencing early work packages. As projects complete the environmental stage, design will advance to a configured footprint, assessing value engineering opportunities to reduce cost and maintain travel time goals. This will allow the Authority to complete the pre-construction work to plan for row acquisition, utility relocation and ultimately move to construction as funding becomes available.

Opportunities based on lessons learned present themselves in all aspects of project development, including engineering, right-of-way acquisition, third-party agreements, procurement, contracting, and estimating. Improved and more detailed project design will lead to reduced risk through enhanced preliminary engineering, right-of-way acquisition and geotechnical investigation prior to procurement for construction. By progressing project sections through the stages and identifying troubled areas, the Authority can more adequately reduce risks and increasing oversight, accountability and transparency to project development and delivery. As designs are further refined, risk staff continue to work closely with the project teams to develop and refine mitigations and to identify and understand these technical risks.

There are still many challenges and risks facing the Authority due to the complexity of the upcoming project sections. Major construction works at the Pacheco Pass, through the Tehachapi mountains, and the Brisbane light maintenance facility will present their own set of challenges. Through the Staged Project Delivery process, value engineering and configuration management, many of these risks can be and have been mitigated.

Engineering

As the Central Valley continues through construction, engineering continues to address the significant challenges, such as tunnels, bridges

Photo: Drone photo of Wasco Viaduct in Construction Package 4

and guideway through areas of high seismicity, mountainous terrain, hazardous material and areas of environmental requirements, associated with developing a project of this magnitude.

This enterprise knowledge will also be carried through to the Design Criteria Manual, including a more robust interdisciplinary interface, and other refinements that will limit risk during the design and construction phases.

Procurement

The Authority is advancing work as environmental documents are completed. In 2022, several contracts will be advancing to complete work on existing construction, including procuring a track and systems contractor to develop the rail infrastructure including the trackwork, signaling, communication, electrification, and maintenance facilities and station designs. In addition, engineering design contracts will be released for the Merced and Bakersfield extensions to advance preliminary design. Risks may be faced on these additional contracts, such as cost pressures, limited pool of proposers and competition, and dependencies on the delivery of the current construction packages and the turnover of those projects, including the availability of work sites. The transition from construction of the civil infrastructure to the track and systems contractor requires close coordination as to not negatively impact the delivery of the program.

Moreover, the Authority is reviewing the procurement of the high-speed rail trains and is updating the procurement documents. The Authority is evaluating the risks associated with the procurement schedule while considering impacts to the overall program. When procuring the high-speed rail trains, the Authority will review any risks associated.

Unknown Future Risks

Unknown risks are an unknown issue occurring at an unknown time and are inherent in all capital projects. These risks can be more detrimental than known risks, as they are difficult to create a formal response plan and can surface when least expected. To best address unknown risks, a series of systems, structures and people have been established to work proactively with all teams across the program to uncover and define these risks so they can be evaluated and mitigated. Additionally, the risk team proactively manages the contingency used to offset the costs of these risks, so when they do occur, the Authority is able to respond in a timely manner.

Enterprise Risk Management, when combined with the Staged Project Delivery processes, assists with the early identification of risks associated with future projects. This allows for early identification and the development of plans to manage and mitigate those risks.

Photo: Worker tool belt at the Cedar Viaduct

CHAPTER 5

FORECASTS AND ESTIMATES

Introduction

Due to the COVID-19 pandemic, the 2020 Business Plan was released less than one year ago, in April 2021. As a result, the forecasts and estimates provided in the 2020 Business Plan have not changed except for the capital cost adjustments summarized below. Further updates will be included in the 2023 Project Update Report, to be released in March 2023.

The forecasts and estimates prepared for the 2020 Business Plan and, where updated in this chapter, were developed pursuant to the Business Plan statutory requirements and include:

- Capital cost estimates (shown in a range);
- Ridership and revenue forecasts (high, medium and low);
- Operations and maintenance (O&M) cost estimates (high, medium and low);
- Life cycle cost estimates (high, medium and low);
- Cash flow estimate (high, medium and low); and
- A breakeven analysis (prepared with a Monte Carlo analysis to evaluate three scenarios).

To prepare its forecasts and estimates, the Authority has to make assumptions regarding the phasing of the system. However, because full funding has not been identified, assumptions are used only for the purpose of preparing an estimate and are for illustrative purposes only. Detailed methodologies and assumptions for all forecasts are included in supporting technical documents posted on the Authority's website.

Since the 2020 Business Plan was released, two Southern California project sections, Bakersfield to Palmdale and Burbank to Los Angeles, were environmentally cleared with Records of Decision. The capital cost estimates for these two project sections now reflect decisions made as part of the environmental clearance process. The estimates now reflect the final scope identified in the Records of Decision. The scopes in each section have changed since the preliminary preferred alternatives were identified in 2018. The changes are based on extensive interactions with local governments, community organizations, private entities, federal and state regulatory agencies and other stakeholders. Although the scope changes and mitigations have increased the costs estimates for these two sections, they are now better integrated into the communities through which they will travel.

For example, scope changes in the Bakersfield to Palmdale section addressed the visual effects to the César E. Chávez National Monument/Nuestra Señora Reina de La Paz National Historic Landmark, in Keene; enhanced noise barriers through the city of Tehachapi to protect local communities; and added stream restoration and safety enhancements along the Pacific Crest Trail. These changes better integrate the alignment within these valued historic and natural community settings. The updated estimates now reflect further design and mitigation refinements from an added tunnel/trench approach south of Hollywood Burbank Airport. These refinements were designed to minimize residential and commercial disruptions and to allow for direct rail-air intermodal connectivity at the airport. As the Authority moves forward with advanced design work, we will continue to refine the estimates and evaluate ways to deliver the project as efficiently as possible.

Capital Cost Estimates for Full 500-Mile System

This 2022 Business Plan reflects two cost updates:

- A FY 2021-2022 Program Expenditure Update adopted by the Board in December 2021, summarized in Chapter 3, Funding the Program; and
- Updated cost estimates reflecting scope changes adopted in the Bakersfield to Palmdale and Burbank to Los Angeles project section Records of Decision in August 2021 and January 2022, respectively (as discussed above).

An updated Capital Cost Basis of Estimate Report has been prepared for the 2022 Business Plan. These cost changes are an interim update and were not incorporated into the O&M, Life Cycle or Breakeven analyses for this report. All other technical methodologies, assumptions and results remain unchanged. Future legislative reports will continue to progressively update cost estimates as the remaining four environmental Records of Decision are approved. These cost updates will then be incorporated in future forecast and estimate analyses.

Developing Business Plan Cost Estimates

Business Plan estimates will differ from the environmental estimates included in draft and final environmental documents. Estimates developed for environmental documents reflect a larger project footprint and are also based on project section boundaries that may overlap with each other. When added together, this can result in "double counting" costs. The section cost estimates developed for Business Plans are specific to each project segment and do not overlap. Business Plan estimates also incorporate alternative design and construction measures developed through a series of workshops where design/scope refinement options, cost trends and other design and construction factors specific to each geography were evaluated.

The capital cost estimates are shown in ranges, based on a specific scope, the level of design completed and a general understanding of risk. The level of design for sections beyond the 119-mile Central Valley Segment are still at the preliminary design stage. As environmental reviews proceed, designs continue to advance and evolve through collaboration with stakeholders and the public, resulting in changes in scope and further understanding of potential risks. The cost ranges are meant to capture both potential risks and design refinements; significant changes in scope may affect the range.

The ranges are also based on estimate classifications established by the Association for the Advancement of Cost Engineering (AACE) International and vary depending on the complexity of the project scope elements, maturity of underlying technical baseline information and the inclusion of appropriate contingencies. The ranges assume a general level of risk based upon each project section's level of development, which was applied as an overlay to the estimate.

Cost estimates are presented in Year of Expenditure dollars (YOE$) which are used in capital cost estimates for public infrastructure projects where construction spans multiple years. Year of expenditure dollars illustrate the effect of projected inflation on costs over a projected delivery schedule. For purposes of preparing these estimates, the Authority assumes that the project is financially unconstrained (i.e., that the funds needed to build the project are available when they are needed). Specifically, we assume that after the environmental Records of Decision, the projects advance through design and then complete construction. Escalation factors are applied to the estimates to build the year of completion estimates.

Current Estimates to Complete the Statewide System

This section presents the estimates to complete the entire Phase 1 system from San Francisco to Los Angeles/Anaheim in Year of Expenditure dollars (YOE$). The estimates in **Table 5.0** assume that the program is financially unconstrained and are based on phasing that assumes connecting the Central Valley to the Bay Area first, followed by connecting south to the Los Angeles Basin.

Table 5.0 reflects the two changes described above. First, it summarizes the estimates for the currently funded program based upon the Interim Program Baseline approved by the Board of Directors in December 2021 (which is discussed in Chapter 3, Funding the Program) and the redistributed costs associated with the Merced to Bakersfield Line. Second, it reflects updated costs for the two Southern California sections where environmental Records of Decision were recently completed (Bakersfield to Palmdale and Burbank to Los Angeles). All other costs are unchanged. The changes to the project section costs and how they are derived are detailed in the Capital Costs Basis of Estimate Report at ***https://hsr.ca.gov/wp-content/uploads/2022/02/2022_Business_Plan_Basis_of_Estimate_Final_with_Signoff_A11Y.pdf***.

Table 5.0: Full Phase 1 Program Cost Estimate ($ in Millions YOE)

Segment	Low	Base	High
Merced To Bakersfield Line			
Interim Program Baseline, Expenditure Authorization	—	17,937	—
Trainsets (2 each)	—	390	—
Merced and Bakersfield Extensions (Single Track, 4 stations)*	—	3,071 to 4,514	—
Merced to Bakersfield (Second Track)	—	1,106	—
Northern California			
San Francisco to San José	1,307	1,649	2,123
San José to Gilroy	2,162	3,194	4,633
Gilroy to Carlucci Road (connection to Central Valley)	7,871	10,397	12,789
Central Valley Wye Balance	1,842	2,240	2,601
Advance Design Costs	—	213	—
Southern California			
Bakersfield to Palmdale	14,703	18,379	22,239
Palmdale to Burbank	12,635	16,775	24,428
Burbank to Los Angeles	2,201	2,935	3,405
Los Angeles to Anaheim	2,478	2,918	3,352
Advance Design Costs	—	382	—
Other System Costs			
Heavy Maintenance Facility Balance	433	481	529
Trainset Balance	4,161	4,643	5,084
Phase 1 Cost Range	**72,297**	**86,710 – 88,153**	**105,129**

*Merced and Bakersfield Extension costs are shown in a range pending advance design work.

Note: Numbers may not sum due to rounding.

Exhibit 5.0 shows the construction cost estimates and the schedule for completing environmental review for the full 500-mile system by project section. The estimates represent the base costs shown in **Table 5.0**.

Service and Ticket Assumptions

The Early Train Operator (ETO) and the Authority continue work with stakeholders and other rail passenger service providers to refine ridership, revenue, and operating plan assumptions for the proposed Silicon Valley to Central Valley Line and subsequent extensions. This includes ticket price assumptions. The methodology and assumptions have not changed from the 2020 Business Plan.

Initially, the Merced to Bakersfield Line service is anticipated to be operated by the San Joaquin Joint Powers Authority, which currently provides Amtrak service from Sacramento to Bakersfield. Initially, ticket prices are assumed to be comparable to current intercity rail pricing. Once operations are expanded beyond the Central Valley, ticket prices will ultimately be set by the train operator contracted to provide that service. For current planning purposes, the Authority has assumed that pricing would be competitive with other modes of travel, including car and airline travel. Generally, future ticket prices are assumed to be roughly 80% of the cost of a typical plane ticket. The future operator may choose to also incorporate service class, time-of-day, distance, frequency of use and other fare policy measures as seen typically in airline and transit industry today.

Interim service between Merced and Bakersfield is expected to build the market and demand for high-speed rail service. It is anticipated this will generate higher beginning ridership results once the line connects to the larger Bay Area population and employment. The 2020 Business Plan also included a revised service assumption for the Silicon Valley to Central Valley Line that included the addition of the Merced to Bakersfield Line. Both the augmented Silicon Valley to Central Valley Line (with Merced) and the Phase 1 services are forecast to continue to demonstrate significant net revenue performance.

For a complete summary of the service assumptions used for the 2020 Business Plan, please see the Service Planning Methodology Technical Supporting Document at ***https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Service_Planning_Methodology.pdf***.

Exhibit 5.0: Environmental Schedules and Cost Summary by Segment[1]

NORTHERN CALIFORNIA[2]

San Francisco to San José

43 miles
Capital Cost: $1.6 billion
EIR/EIS: Q2 2022

San José to Carlucci Road

88 miles
Capital Cost: $13.6 billion
EIR/EIS: Q1 2022

CENTRAL VALLEY

Merced to Madera [3]

33 miles
Capital Cost: $2.3 billion*
EIR/EIS: Complete

*Includes partial funding for Central Valley Wye

Madera to Poplar Avenue [3]

119 miles
Capital Cost: $13.9 billion
EIR/EIS: Complete
Funded/Under Construction

Poplar Avenue to Bakersfield [3]

19 miles
Construction Cost: $1.3 billion
EIR/EIS: Complete

Central Valley Wye Balance

28 miles
Capital Cost: $2.2 billion
EIR/EIS: Complete

SOUTHERN CALIFORNIA[2]

Bakersfield to Palmdale

79 miles
Capital Cost: $18.4 billion
EIR/EIS: Complete

Palmdale to Burbank

41 miles
Capital Cost: $16.8 billion
EIR/EIS: Q1 2023

Burbank to Los Angeles

13 miles
Capital Cost: $2.9 billion
EIR/EIS: Complete

Los Angeles to Anaheim

31 miles
Capital Cost: $2.9 billion
EIR/EIS: Q4 2023

Notes:

1. Final segment miles dependent on completion of environmental documents. Estimates do not include HMF or trainsets except for Merced to Bakersfield line.
2. Additional statewide funding:
   a. Caltrain Electrification- $714 million
   b. San Mateo Grade Separation- $84 million
   c. Rosecrans/Marquardt Grade Separation- $77 million
   d. Los Angeles Union Station- $423 million
3. This exhibit has been updated to correct the capital cost estimate for the Madera to Poplar Avenue project segment to $13.9 billion, which was incorrectly reported as $15.2 billion when the original draft report was released. Cost estimates are for single-track; an additional $1.1 billion is required to add second track on the Merced to Bakersfield line.

Ridership and Revenue Forecasts

Ridership and revenue forecasts remain the same as developed for the 2020 Business Plan (the forecasts for the Merced to Bakersfield line were peer reviewed for the 2020 Business Plan and were deemed "reasonable" by the reviewers. Updates will be developed in 2022 and will be presented in the 2023 Project Update Report to the State Legislature). In summary, the initial model runs used were based upon opening years of 2029 and 2033 for the Silicon Valley to Central Valley Line and 2033 and 2040 for Phase 1 System. The Silicon Valley to Central Valley ridership forecast was further refined based on a revised 2031 opening date. In addition, ridership and farebox revenue forecasts also reflect the initial ramp-up of the Merced to Bakersfield operations' impact on riders' perception and awareness of future Silicon Valley to Central Valley and Phase 1 services.

The ramp-up factors below remain the same as those developed for the 2020 Business Plan, which include implementation of an initial Merced to Bakersfield service, are shown in **Table 5.1.**

Table 5.1: Ramp-up Factors (in Percent)

Ramp-up Application	Year 1	Year 2	Year 3	Year 4	Year 5
Ridership Silicon Valley to Central Valley Line	50	68	86	97	100
Revenue Silicon Valley to Central Valley Line	49	66	84	96	100
Ridership Phase 1 Increment	68	79	89	97	100
Revenue Phase 1 Increment	63	75	86	96	100

No major changes to the assumptions have occurred, and trip times and fare assumptions remain identical to those used for 2020 Business Plan. For a more detailed discussion of the 2020 Business Plan results, see the Ridership and Revenue Forecasting Technical Supporting Document at ***https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Ridership_and_Revenue_Forecasting.pdf***.

As the program advances and transitions from feasibility and planning to implementation and operations, a higher level of detail analysis is required to define operational and service parameters. This includes an understanding of the connectivity with regional and local connecting services. The ETO has managed the development of a new detailed ridership forecasting model. This new model will serve the longer-term needs of the Authority and future operating partners. It will be completed in early 2022 and be used as part of reporting starting with the 2023 Project Update Report.

The new model will:

- Reflect visitation demand from outside of California and consideration of related potential future rail ridership;
- Assess short intercity rail corridors and shorter sections of the high-speed rail system;
- Evaluate incremental extensions of the high-speed rail project beyond the Central Valley Segment between Merced and Bakersfield;
- Integrate rail and transit corridors and related rider benefits;
- Provide sensitivity to differentiated service and fare structures of rail services; and
- Incorporate updated 2019 base year data and user behavior.

Along with the development of base case forecasts, the team will also perform sensitivity tests to assess the responsiveness of the model to a range of variables and to identify key risks to future forecasts.

Ridership and Revenue Risk Analysis

The 2020 Business Plan risk analysis considered the same risk variables as the 2018 Business Plan but applied to the new ridership analysis for the 2020 Business Plan. The risk analysis conducted for the 2020 Business Plan continues the use of the following risk variables based on the PFAL external review:

- Reliability of high-speed rail—capturing uncertainty around on-time reliability;
- Travel time in autonomous vehicles—measuring the disutility of time spent in an automobile and considers how travel choices might change with autonomous vehicles;
- Visitor travel—including out-of-state trips from tourism, business and other travel;
- Induced travel—including trips that would not have otherwise been made without the increased connections created by the high-speed rail system; and
- An enhanced penalty applied to long-distance high-speed rail trips that require long access/egress travel time.

For more detailed information on these results, see the Ridership and Revenue Risk Analysis Technical Supporting Document at ***https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Ridership_and_Revenue_Risk_Analysis.pdf***.

Silicon Valley to Central Valley Results

Tables 5.2, 5.2.1 and **5.2.2** provide the ridership and revenue results for the Silicon Valley Central Valley line. These results reflect one month of Silicon Valley to Central Valley operations in 2031 and one month of Phase 1 operation in 2033. In addition, the future YOE$ assumes an escalation of 3 percent per year from June 2019.

Table 5.2: Silicon Valley to Central Valley High, Medium and Low Ridership by Year (Riders in Millions)

Ridership Level	2031	2032	2033
High Ridership	1.0	12.1	17.9
Medium Ridership	0.7	8.6	12.8
Low Ridership	0.6	7.0	10.3

Table 5.2.1: Silicon Valley to Central Valley High, Medium and Low Farebox Revenue by Year (2019 $ in Millions)

Revenue Level	2031	2032	2033
High Revenue	61	759	1,116
Medium Revenue	42	520	769
Low Revenue	35	437	648

Table 5.2.2 Silicon Valley to Central Valley High, Medium and Low Farebox Revenue by Year (YOE $ in Millions)

Revenue Level	2031	2032	2033
High Revenue	87	1,115	1,688
Medium Revenue	59	763	1,163
Low Revenue	50	642	980

Phase 1 Results

Tables 5.3, 5.3.1 and **5.3.2** provide the ridership and revenue results for Phase 1. Ridership and revenue results assume one month of full Phase 1 operation in 2033. Future YOE$ estimates assume an escalation of 3 percent per year from June 2019.

Table 5.3: Phase 1 High, Medium and Low Ridership by Year (Riders in Millions)

Ridership Level	2033	2034	2035	2040	2045	2050	2055	2060
High Ridership	17.9	36.4	41.9	50.0	52.6	55.2	58.1	61.0
Medium Ridership	12.8	27.8	32.0	38.6	40.5	42.6	44.8	47.1
Low Ridership	10.3	21.3	24.5	29.3	30.8	32.3	34.0	35.7

Table 5.3.1: Phase 1 High, Medium and Low Farebox Revenue by Year (2019 $ in Millions)

Revenue Level	2033	2034	2035	2040	2045	2050	2055	2060
High Revenue	1,116	2,319	2,723	3,381	3,466	3,554	3,644	3,736
Medium Revenue	769	1,644	1,932	2,410	2,471	2,533	2,597	2,663
Low Revenue	648	1,388	1,631	2,036	2,087	2,140	2,194	2,249

Table 5.3.2: Phase 1 High, Medium and Low Farebox Revenue by Year (YOE $ in Millions)

Revenue Level	2033	2034	2035	2040	2045	2050	2055	2060
High Revenue	1,688	3,614	4,369	6,290	7,476	8,885	10,560	12,552
Medium Revenue	1,163	2,562	3,100	4,484	5,329	6,334	7,528	8,947
Low Revenue	980	2,163	2,618	3,787	4,501	5,350	6,359	7,558

Photo: Environmental mitigation activities are ongoing at the Kings River floodplain

Greenhouse Gas (GHG) Analysis

The following tables describe the GHG benefits of implementing high-speed rail as part of a building block approach.

The information in **Tables 5.4, 5.4.1** and **5.4.2** summarizes the benefits achieved annually with each service implementation phase, beginning with Merced to Bakersfield in 2029, followed by the introduction of service on the Silicon Valley to Central Valley line in 2031 and the full Phase 1 system by 2033.

These calculations are based on the results of the ridership modelling for the 2020 Business Plan. The calculations do not reflect any adjustments for the Safer Affordable Fuel-Efficient Vehicles Rule from March 2020.

Table 5.4: Merced to Bakersfield GHG Reductions by Year (in Millions of Metric Tons of Carbon Dioxide Equivalent)

Ridership Level	2029	2030
High Ridership	.075	.075
Medium Ridership	.075	.075

Table 5.4.1: Silicon Valley to Central Valley GHG Reductions by Year (in Millions of Metric Tons of Carbon Dioxide Equivalent)

Ridership Level	2031	2032
High Ridership	.10	.42
Medium Ridership	.093	.32

Table 5.4.2: Phase 1 GHG Reductions by Year (in Millions of Metric Tons of Carbon Dioxide Equivalent)

Ridership Level	2033	2034	2035	2040	2045	2050	2055	2060
High Ridership	.615	1.314	1.504	1.775	1.853	1.943	2.042	2.146
Medium Ridership	.480	1.073	1.229	1.459	1.524	1.598	1.680	1.765

Operations and Maintenance Cost Estimates

Based upon the Early Train Operator's (ETO) review and experience, adjustments were made to the 2020 Business Plan Operations and Maintenance (O&M) model assumptions to incorporate the latest available data. The key enhancements included:

- Full operation of Silicon Valley to Central Valley and Phase 1 services, eliminating the operational ramp-up based on implementation of Merced to Bakersfield service;
- Maintenance and operations cost approach based on a maintenance response time with service levels assumed in the updated service plan;
- Cost assumptions for track access fees in the shared corridors;
- Updated revenue collection costs, including the costs to operate and maintain fare collection infrastructure; and
- New staffing approaches.

A Monte Carlo simulation was conducted for the 2020 Business Plan to understand the risks and uncertainties associated with the forecasts. These were then applied to derive a forecast O&M range of costs. The high- and low-cost forecasts presented reflect the results of these Monte Carlo simulations.

The Silicon Valley to Central Valley Line assumed a new service plan that incorporated the Merced extension of the initial Merced to Bakersfield service. In addition, the ETO's review of previous assumptions and the application of their global experience has also updated some baseline costs. These results have not changed since the 2020 Business Plan.

For more information on these changes, see the Operations and Maintenance Cost Model Documentation Technical Supporting Document at: ***https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Operations_and_Maintenance_Cost_Model.pdf***.

Silicon Valley to Central Valley Results

Tables 5.5 and **5.5.1** summarize the results of the 2020 Business Plan Silicon Valley to Central Valley analysis. Consistent with ridership and revenue, these results assume one month of Silicon Valley to Central Valley operations in 2031 and one month of Phase 1 operations in 2033. Year of expenditure costs assume an escalation of 3 percent per year from June 2019.

Table 5.5: Silicon Valley to Central Valley High, Medium and Low O&M Costs by Year (2019 $ in Millions)

O&M Levels	2031	2032	2033
High Operations and Maintenance Cost	38	457	557
Medium Operations and Maintenance Cost	35	418	509
Low Operations and Maintenance Cost	34	402	491

Table 5.5.1: Silicon Valley to Central Valley High, Medium and Low O&M Costs by Year (YOE $ in Millions)

O&M Levels	2031	2032	2033
High Operations and Maintenance Cost	54	671	842
Medium Operations and Maintenance Cost	50	614	770
Low Operations and Maintenance Cost	48	591	742

Phase 1 Results

Tables 5.6 and **5.6.1** summarize the analysis for Phase 1 O&M costs. These results assume one month of Phase 1 operations in 2033. Year of expenditure costs assume an escalation of 3% per year from June 2019.

Table 5.6: Phase 1 High, Medium and Low O&M Costs by Year (2019 $ in Millions)

O&M Levels	2033	2034	2035	2040	2045	2050	2055	2060
High Operations and Maintenance Cost	557	1,085	1,139	1,197	1,200	1,216	1,215	1,228
Medium Operations and Maintenance Cost	509	992	1,041	1,094	1,097	1,111	1,111	1,122
Low Operations and Maintenance Cost	491	956	1,004	1,055	1,058	1,072	1,071	1,082

Table 5.6.1: Phase 1 High, Medium and Low O&M Costs by Year (YOE $ in Millions)

O&M Levels	2033	2034	2035	2040	2045	2050	2055	2060
High Operations and Maintenance Cost	842	1,690	1,828	2,226	2,588	3,039	3,521	4,125
Medium Operations and Maintenance Cost	770	1,545	1,671	2,035	2,366	2,779	3,219	3,771
Low Operations and Maintenance Cost	742	1,489	1,611	1,962	2,282	2,679	3,104	3,636

Life Cycle Cost Estimates

The life cycle costing methodology used in the 2020 Business Plan compiled all operations, maintenance, rehabilitation and replacement expenditures that the Authority will incur on initial capital investments through 2060 for the Silicon Valley to Central Valley and Phase 1 lines. The costs, summarized in **Tables 5.7, 5.7.1** and **5.7.2**, are specific to rehabilitating and replacing initial capital investments. Operations and Maintenance costs are reported separately above. This model methodology is similar to the model used in past Business Plans, which provides a "cash flow" estimate of the funds required for rehabilitation and replacement. It is important to note that capital rehabilitation and replacement costs are based upon component parts of the system, with different longevity and costs. This creates some variability in the amount of budget necessary in any given year to address these rehabilitation and replacement needs.

The 2020 Business Plan estimate included a consolidated annual expenditures review and reports the capital investments needs in five-year increments starting in 2040 through 2060. These estimates account for the Silicon Valley to Central Valley operations beginning at the end of 2031. In addition, a Monte Carlo analysis was conducted at that time to evaluate a potential range of life cycle cost forecasts as shown in the tables below.

For more detailed information on this analysis, see the 50-Year Life Cycle Capital Cost Model Documentation Technical Supporting Document at ***https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_50-Year_Lifecycle_Capital_Cost_Model.pdf***.

Table 5.7: Silicon Valley to Central Valley High, Medium and Low Life Cycle Costs by Year (2019 $ in Millions)

Level	2040	2045	2050	2055	2060
High Life Cycle Cost	0.10	43	118	130	631
Medium Life Cycle Cost	0.09	39	109	119	579
Low Life Cycle Cost	0.08	35	99	108	525

Table 5.7.1: Silicon Valley to Central Valley High, Medium and Low Life Cycle Costs by Year (YOE $ in Millions)

Level	2040	2045	2050	2055	2060
High Life Cycle Cost	0.17	88	283	360	2,028
Medium Life Cycle Cost	0.16	81	260	331	1,862
Low Life Cycle Cost	0.14	73	236	300	1,689

Table 5.7.2: Silicon Valley to Central Valley High, Medium and Low Life Cycle Costs Cumulative Through 2060 ($ in Millions)

Level	2019$	YOE$
High Life Cycle Cost	5,923	14,535
Medium Life Cycle Cost	5,438	13,345
Low Life Cycle Cost	4,933	12,105

Net Cash Flow From Operations Forecast

The estimates in **Tables 5.8, 5.8.1** and **5.8.2** illustrate the potential net cash flows that could be available from operations that could be applied to future development costs or future financing. Net operating cash flow after capital replacement is determined by calculating the net cash flow from operations (revenue less operations and maintenance (O&M) costs). Revenues include those generated from high-speed rail passenger service (farebox revenue), and feeder and connecting bus service, as well as ancillary revenues.

For the 2020 Business Plan, ancillary revenues were further evaluated to provide financial support for system expansion, capital funding and ongoing operations and maintenance. The ETO performed an analysis on benchmarking and market analysis of potential ancillary revenue sources from the system's real property and rights of way, as well as passenger-generated opportunities. This refined analysis provided a basis of support for ancillary revenues at an average of 2% of farebox revenues for the period through 2060. Ancillary revenue contributions could include sources such as advertising, parking, retail concessions, sponsorships and telecommunications.

For more information on this analysis, see the High, Medium and Low Cash Flow Analysis Technical Supporting Document at ***https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_High_Medium_and_Low_Cash_Flow_Analysis.pdf***.

Table 5.8: Net Operating Cash Flow Silicon Valley to Central Valley Through Phase 1 High Case (YOE $ in Millions)

Year	2031	2032	2033	2034	2035
Total Revenue	91	1,167	1,746	3,708	4,468
Less: O&M	(54)	(671)	(842)	(1,690)	(1,828)
Net Cash Flow from Operations	36	496	904	2,018	2,640

Table 5.8.1: Net Operating Cash Flow Silicon Valley to Central Valley Through Phase 1 Medium Case (YOE $ in Millions)

Year	2031	2032	2033	2034	2035
Total Revenue	62	797	1,200	2,623	3,164
Less: O&M	(50)	(614)	(770)	(1,545)	(1,671)
Net Cash Flow from Operations	12	183	430	1,079	1,493

Table 5.8.2: Net Operating Cash Flow Silicon Valley to Central Valley Through Phase 1 Low Case (YOE $ in Millions)

Year	2031	2032	2033	2034	2035
Total Revenue	51	657	996	2,194	2,650
Less: O&M	(48)	(591)	(742)	(1,489)	(1,611)
Net Cash Flow from Operations	3	66	254	705	1,039

Breakeven Analysis

The Breakeven Analysis measures the likelihood that farebox revenue is equal to or greater than operations and maintenance costs in a given operating year. A Monte Carlo analysis is used to conduct this review.

The Monte Carlo process begins by identifying a range of potential operating and maintenance costs and revenue outcomes. These inputs are used as inputs into a probability model that selects at random one value from cost and one value from revenue and calculates the results. The model conducts this calculation, selecting randomly each time, thousands of times to develop a random distribution of results.

Tables 5.9, 5.9.1 and **5.9.2** and **Exhibits 5.1, 5.1.1** and **5.1.2** on the opposite page summarize the results of this Monte Carlo analysis conducted for the 2020 Business Plan for three points in time:

- Silicon Valley to Central Valley opening year (2031);
- Phase 1 opening year (2033); and
- Phase 1 horizon year (2040).

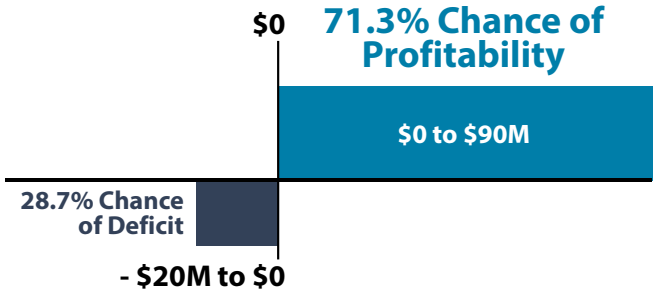
Each table summarizes how often the model predicted that a certain value would occur. Each exhibit shows the range of results over all runs. It is important to note that these results are used for forecasting and estimating purposes only. These figures will continue to change as operating costs are further refined, as ridership estimates change and as the schedule for construction becomes more certain.

Phase 1 Opening 2031

Table 5.9: Silicon Valley to Central Valley Opening Year 2031 (2019 $ in Millions)

Probability Distribution	Net Operating Cash Flow
10%	(8)
25%	(2)
Median	9
75%	21
90%	34

Exhibit 5.9: Breakeven Analysis Silicon Valley to Central Valley Opening Year (2031)

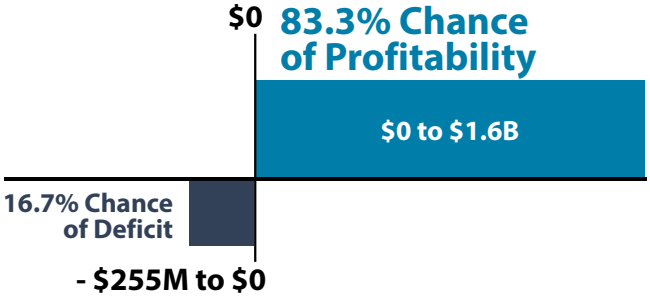


Phase 1 Opening 2033

Table 5.9.1: Phase 1 Opening Year 2033 (2019 $ in Millions)

Probability Distribution	Net Operating Cash Flow
10%	(58)
25%	59
Median	233
75%	453
90%	678

Exhibit 5.9.1: Breakeven Analysis Phase 1 Opening Year (2033)



Phase 1 Opening 2040

Table 5.9.2: Phase 1 Horizon Year 2040 (2019 $ in Millions)

Probability Distribution	10%
10%	465
25%	861
Median	1,427
75%	2,108
90%	2,802

Exhibit 5.1.2: Breakeven Analysis Phase 1 Horizon Year (2040)

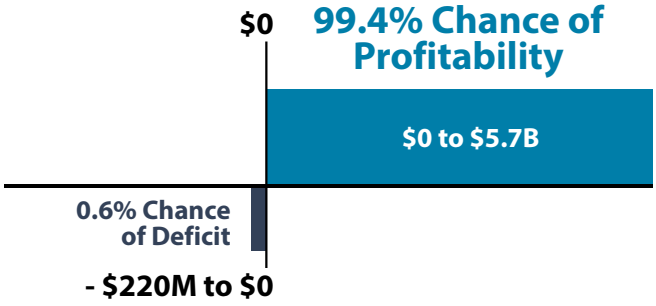


Photo: Construction of an overpass at American Avenue in Construction Package 2

APPENDICES

Appendix A. Statutory Requirements For A Business Plan

This Draft 2022 Business Plan summarizes the progress we have made over the last 10 months, updates information and forecasts that were presented in our 2020 Business Plan and identifies key milestones and decisions we anticipate making over the next few years.

The Authority's governing statutes are established in the California Public Utilities Code sections 185000-185038; Section 185033 lays out the requirements for the Business Plan, which are as follows:

185033. (a) The authority shall prepare, publish, adopt, and submit to the Legislature, not later than May 1, 2014, and every two years thereafter, a business plan. At least 60 days prior to the publication of the plan, the authority shall publish a draft business plan for public review and comment. The draft plan shall also be submitted to the Senate Committee on Transportation and Housing, the Assembly Committee on Transportation, the Senate Committee on Budget and Fiscal Review, and the Assembly Committee on Budget.

(b) (1) The business plan shall include, but need not be limited to, all of the following elements:

(A) A description of the type of service the authority is developing and the proposed chronology for the construction of the statewide high-speed rail system, and the estimated capital costs for each segment or combination of segments.

(B) A forecast of the expected patronage, service levels, and operating and maintenance costs for the Phase 1 corridor as identified in paragraph (2) of subdivision (b) of Section 2704.04 of the Streets and Highways Code and by each segment or combination of segments for which a project level environmental analysis is being prepared for Phase 1. The forecast shall assume a high, medium, and low level of patronage and a realistic operating planning scenario for each level of service.

(C) Alternative financial scenarios for different levels of service, based on the patronage forecast in subparagraph (B), and the operating break-even points for each alternative. Each scenario shall assume the terms of subparagraph (J) of paragraph (2) of subdivision (c) of Section 2704.08 of the Streets and Highways Code.

(D) The expected schedule for completing environmental review, and initiating and completing construction for each segment or combination of segments of Phase 1.

(E) An estimate and description of the total anticipated federal, state, local, and other funds the authority intends to access to fund the construction and operation of the system, and the level of confidence for obtaining each type of funding.

(F) Any written agreements with public or private entities to fund components of the high-speed rail system, including stations and terminals, and any impediments to the completion of the system.

(G) Alternative public-private development strategies for the implementation of Phase 1.

(H) A discussion of all reasonably foreseeable risks the project may encounter, including, but not limited to, risks associated with the project's finances, patronage, right-of-way acquisition, environmental clearances, construction, equipment, and technology, and other risks associated with the project's development. The plan shall describe the authority's strategies, processes, or other actions it intends to utilize to manage those risks.

(2) To the extent feasible, the business plan should draw upon information and material developed according to other requirements, including, but not limited to, the preappropriation review process and the preexpenditure review process in the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century pursuant to Section 2704.08 of the Streets and Highways Code. The authority shall hold at least one public hearing on the business plan and shall adopt the plan at a regularly scheduled meeting. When adopting the plan, the authority shall take into consideration comments from the public hearing and written comments that it receives in that regard, and any hearings that the Legislature may hold prior to adoption of the plan.

All of these requirements are addressed in this Draft 2022 Business Plan. The Appendices include a listing of the plan sections and/or supporting technical memos that correspond to each of these requirements. These documents can be found at the following URL:

https://hsr.ca.gov/about/high-speed-rail-business-plans/2022-business-plan

Appendix B. Meeting Business Plan Statutory Requirements

Public Utilities Code Section 185033 Requirements	Response to Requirements and Location	Requirement Met
The Authority shall prepare, publish, adopt, and submit to the Legislature, not later than May 1, 2018, and every two years thereafter, a business plan.	This is the 2022 Business Plan. It was adopted on April 20/21, 2022, and was submitted to the Legislature by May 1, 2022.	
At least 60 days prior to the publication of the plan, the Authority shall publish a draft business plan for public review and comment.	The Draft 2022 Business Plan was released on February 8, 2022.	
The draft plan shall also be submitted to the Senate Committee on Transportation and Housing, the Assembly Committee on Transportation, the Senate Committee on Budget and Fiscal Review, and the Assembly Committee on Budget.	The Draft 2022 Business Plan was submitted on February 8, 2022.	
A description of the type of service the Authority is developing.	Chapter 1 Chapter 2	
The proposed chronology for the construction of the statewide high-speed rail system.	Chapter 1, Chapter 2, Chapter 5	
The estimated capital costs for each segment or combination of segments.	Chapter 5	
A forecast of the expected patronage, service levels, and operating and maintenance costs for the Phase 1 corridor as identified in paragraph (2) of subdivision (b) of Section 2704.04 of the Streets and Highways Code and by each segment or combination of segments for which a project level environmental analysis is being prepared for Phase 1. The forecast shall assume a high, medium, and low level of patronage and a realistic operating planning scenario for each level of service.	Chapter 5	
Alternative financial scenarios for different levels of service, based on the patronage forecast in subparagraph (above), and the operating breakeven points for each alternative. Each scenario shall assume the terms of subparagraph (J) of paragraph (2) of subdivision (c) of Section 2704.08 of the Streets and Highways Code.	Chapter 5	
The expected schedule for completing environmental review, and initiating and completing construction for each segment or combination of segments of Phase 1.	Chapter 1, Chapter 2, Chapter 5	
An estimate and description of the total anticipated federal, state, local, and other funds the authority intends to access to fund the construction and operation of the system, and the level of confidence for obtaining each type of funding.	Chapter 3	

Any written agreements with public or private entities to fund components of the high-speed rail system, including stations and terminals, and any impediments to the completion of the system.	Chapter 2, Chapter 3, Chapter 4	
Alternative public-private development strategies for the implementation of Phase 1.	Chapter 3	
A discussion of all reasonably foreseeable risks the project may encounter, including, but not limited to, risks associated with the project's finances, patronage, right-of-way acquisition, environmental clearances, construction, equipment, and technology, and other risks associated with the project's development. The plan shall describe the authority's strategies, processes, or other actions it intends to utilize to manage those risks.	Chapter 4	
To the extent feasible, the business plan should draw upon information and material developed according to other requirements, including, but not limited to, the pre-appropriation review process and the pre-expenditure review process in the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century pursuant to Section 2704.08 of the Streets and Highways Code	Full Document	
The Authority shall hold at least one public hearing on the business plan and shall adopt the plan at a regularly scheduled meeting.	Public comment will be taken at the regularly scheduled Board of Directors meetings on February 17, 2022, and March 17, 2022. The Final 2022 Business Plan will be adopted at the April 20/21, 2022, meeting.	
When adopting the plan, the authority shall take into consideration comments from the public hearing and written comments that it receives in that regard, and any hearings that the Legislature may hold prior to adoption of the plan.	To be considered by the Authority in preparing final plan.	

Appendix C. Acronyms and Abbreviations

Acronym	Definition
ARRA	American Recovery and Reinvestment Act
ARTIC	Anaheim Regional Transportation Intermodal Center
BART	Bay Area Rapid Transit
BNSF	BNSF Railway
BPM-V3	Business Plan Model - Version 3
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CBA	Community Benefits Agreement
CEQA	California Environmental Quality Act
CP 1	Construction Package 1
CP 2-3	Construction Packages 2-3
CP 4	Construction Package 4
DBE	Disadvantaged Business Enterprise
DVBE	Disabled Veteran Business Enterprise
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ETO	Early Train Operator
FRA	Federal Railroad Administration
GGRF	Greenhouse Gas Reduction Fund (a.k.a. Cap-and-Trade proceeds)
GHG	Greenhouse Gas
LAO	Legislative Analyst's Office
Link US	Link Union Station Project
LOSSAN Corridor	Los Angeles–San Diego–San Luis Obispo Rail Corridor
Metro	Los Angeles County Metropolitan Transportation Authority
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
PFAL	Project Finance Advisory, Ltd.
PRG	Peer Review Group
PTC	Positive Train Control
SCC	Standard Cost Category
TIRCP	Transit and Intercity Rail Capital Program
UIC	International Union of Railways
UPRR	Union Pacific Railroad
VMT	Vehicle Miles Traveled
YOE	Year of Expenditure

Appendix D. Endnotes

1. (pg.42) Brown, Ross. Cap-And-Trade Auction Update and GGRF Projections, 6 Dec. 2021, ***https://lao.ca.gov/Publications/Report/4480***

2. (pg.44) Brown, Ross. Cap-And-Trade Auction Update and GGRF Projections, 6 Dec. 2021, ***https://lao.ca.gov/Publications/Report/4480***

Appendix E. Factsheets

More information about the California high-speed rail program can be found in the Authority's suite of factsheets. Key facts about the program are highlighted in the factsheets identified below. These factsheets, and more, can be found on the Authority's website at ***https://hsr.ca.gov/communications-outreach/info-center/factsheets/***.

High-Speed Rail by Region

- ***Northern California at a Glance***
- ***Central Valley at a Glance***
- ***Southern California at a Glance***

About the High-Speed Rail Program

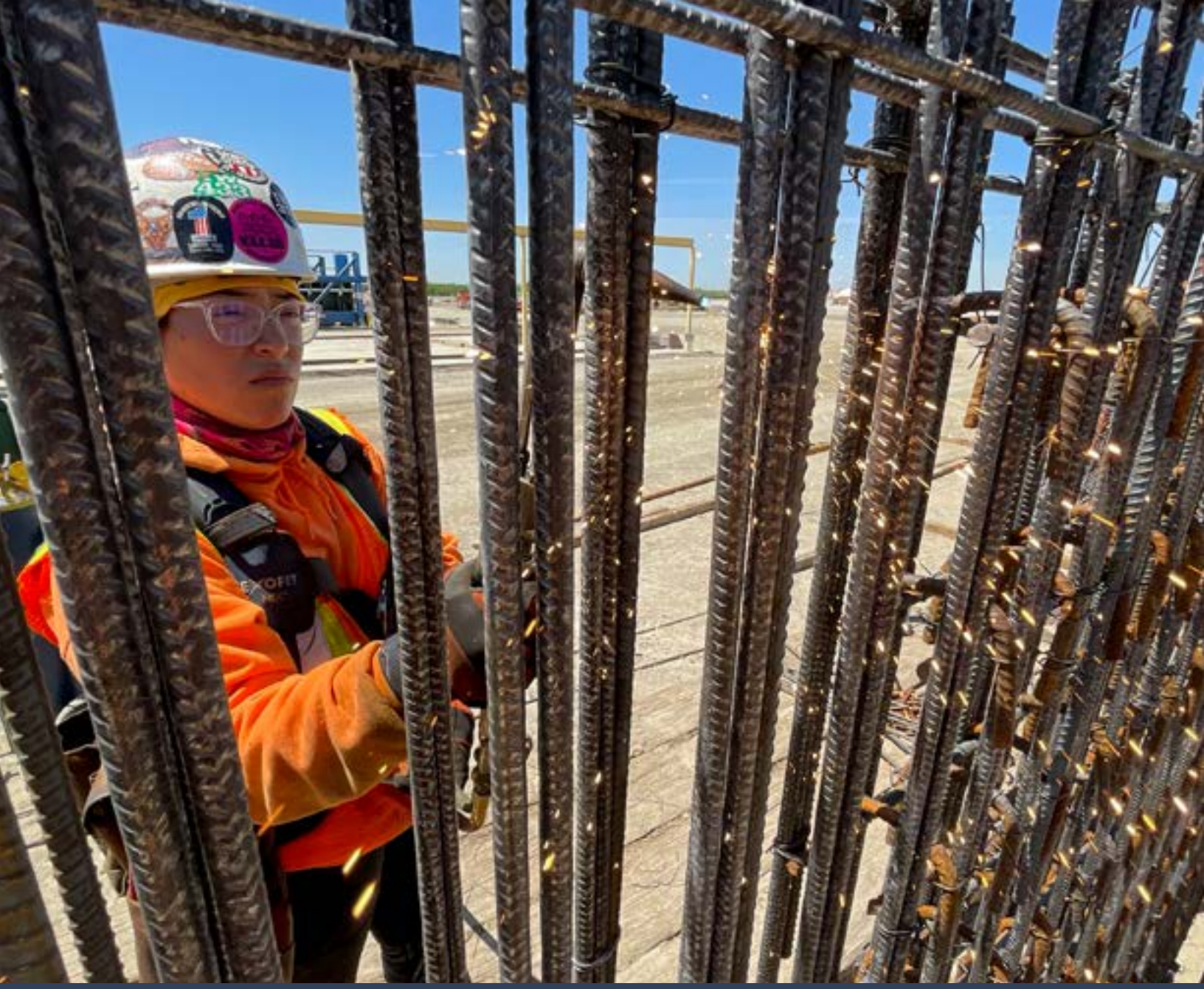
- ***Keeping High-Speed Rail Moving*** High-speed rail operations will require five different facility types, all of which mean more jobs for the future.
- ***High-Speed, High-Capacity Transportation*** To keep pace with demand, California must expand its transportation capacity to improve mobility.
- ***High-Speed Rail: An International Success Story*** Countries around the world have been successfully building thousands of miles of high-speed rail for years.
- ***Our Commitment to Diversity, Equity and Inclusion*** We're committed to delivering high-speed rail all Californians in a way that reflects the Authority's values.

Benefits of High-Speed Rail

- ***Economic Impact*** Investment in the nation's first high-speed rail system has created jobs and generated economic activity in numerous ways.
- ***Creating Jobs*** California's high-speed rail program is putting people to work, with employment opportunities increasing as the program expands.
- ***Helping Small Businesses Grow*** More about the Authority's Small Business Program goals and how to get involved.
- ***Building a Sustainable Future*** California's policies set a national tone while delivering the greenest infrastructure project in the nation.

Funding and Investments

- ***Proposition 1A: High-Level Facts***



Draft 2022 Business Plan

CALIFORNIA
High-Speed Rail Authority

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