CALIFORNIA
High-Speed Rail Authority

DRAFT Revised 2016
Business Plan

Connecting and Transforming California

2016 BUSINESS PLAN

MAY 1, 2016

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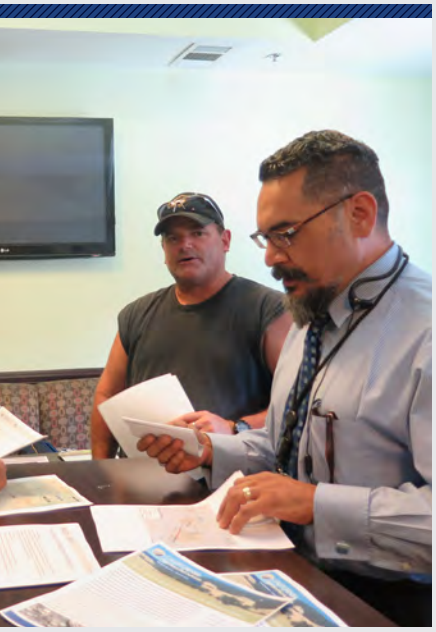

CALIFORNIA High-Speed Rail Authority

The California High-Speed Rail Authority (Authority) is responsible for planning, designing, building and operating the first high-speed rail in the nation. California high-speed rail will connect the mega-regions of the state, contribute to economic development and a cleaner environment, create jobs and preserve agricultural and protected lands. When it is completed, it will run from San Francisco to the Los Angeles basin in under three hours at speeds capable of exceeding 200 miles per hour. The system will eventually extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations. In addition, we are working with regional partners to implement a statewide rail modernization plan that will invest billions of dollars in local and regional rail lines to meet the state's 21st century transportation needs.

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History of High-Speed Rail in California

California has evaluated the potential for high-speed rail for several decades. It first pursued the idea of a Southern California high-speed rail corridor working with Japanese partners in 1981 under Governor Edmund Gerald "Jerry" Brown. In the mid-1990s, planning began in earnest as it became clear that California's growing population was putting an increasing strain on its highways, airports and conventional passenger rail lines. At the federal level, as part of the High-Speed Rail Development Act of 1994, authored by then-Representative Lynn Schenk, California was identified as one of the five corridors nationally for high-speed rail planning. In that same timeframe, the California Legislature created the Intercity High-Speed Rail Commission and charged it with determining the feasibility of a system in California. In 1996, the Commission issued a report that concluded that such a project was indeed feasible.

That same year, the California High-Speed Rail Authority (Authority) was created by the Legislature and was tasked with preparing a plan and design for the construction of a system to connect the state's major metropolitan areas. In 2002, following the release of the Authority's first business plan in 2000, Senate Bill (SB) 1856 (Costa) was passed and signed by Governor Gray Davis that authorized a $9.95 billion bond measure to finance the system. Submission of that measure to the state's voters was delayed several years. In the interim, the Authority, together with its federal partner, the Federal Railroad Administration (FRA), issued a Draft Program-Level Environmental Impact Report/Environmental Impact Statement (EIR/EIS) that described the system and its potential impacts on a statewide scale. Through that process, the Authority received and reviewed more than 2,000 public and government agency comments on the draft document, which was then used to determine the preferred corridors and stations for the system.

In November 2008, the bond measure (Proposition 1A) was approved by the state's voters, making it the nation's first ever voter-approved financing mechanism for high-speed rail. In 2009, $8 billion in federal funds was made available nationwide as part of the American Recovery and Reinvestment Act (ARRA), which was passed to help stimulate the economy, create new jobs, and foster development of new rail manufacturing enterprises. This funding demonstrated a new commitment to the development of high-speed rail in the United States as embodied in a plan issued by the U.S. Department of Transportation: "A Vision of High-Speed Rail in America."

California sought and successfully secured $3.3 billion in ARRA funds and other funds made available through federal appropriations and grants for planning and environmental work, as well as construction of the first construction section in the Central Valley, which is underway.

In 2012, the Authority adopted its 2012 Business Plan that laid out a new framework for implementing the California high-speed rail system in concert with other state, regional and local rail investments, as part of a broader statewide rail modernization program. In that same year, the Legislature approved – and Governor Brown signed into law – Senate Bill 1029 (Budget Act of 2012) approving almost $8 billion in federal and state funds for the construction of the first high-speed rail investment in the Central Valley and 15 bookend and connectivity projects throughout the state.

In 2014, the Authority adopted its 2014 Business Plan which built on and updated the 2012 Business Plan, implementing the requirements of Senate Bill 1029. Also in 2014, the Legislature and Governor reaffirmed their commitment to the program by providing an ongoing funding stream through the state's Greenhouse Gas Reduction Fund.

In 2015, the Governor and supporters celebrated the historic groundbreaking of the high-speed rail program at the site of the future high-speed rail station in downtown Fresno. Thus began the commencement of what will become America's first true high-speed rail system.

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Comparison of 2014 Business Plan to 2016 Business Plan

Meeting Business Plan Statutory Requirements

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Statutory Requirements for a Business Plan

This 2016 Business Plan summarizes the progress we have made over the last two years, updates information and forecasts that were presented in our 2014 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, as amended by Assembly Bill (AB) 528 (Lowenthal, Chapter 237, Statutes of 2013), lays out the requirements for the Business Plan and they are as follows:

185033.[1] (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.

[1] *Source:* Public Utilities Code Section 185033

http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PUC&division=19.5.&title=&part=&chapter=3.&article

All of these requirements are addressed in this 2016 Business Plan. The Appendix includes 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: ***new URL TBD***

High-Speed Rail: Connecting and Transforming California

Executive Summary

Much has happened since we issued our 2014 Business Plan. There are now more than 119 miles of construction underway in the Central Valley. We have made a fundamental transition from being a planning organization to a program-delivery organization. And the Legislature and the Governor reaffirmed their commitment to the program by providing an ongoing revenue stream through the state's Cap and Trade proceeds (also referred to as Greenhouse Gas Reduction Funds). We are now positioned to deliver the program in a logical and practical way.

As we move forward, we remain focused on three fundamental objectives:

- **First, initiate high-speed rail passenger service as soon as possible.** By doing so we both demonstrate its benefits and begin generating revenues which will then attract private sector participation and help fund extending the system beyond an initial line.
- **Second, make strategic, concurrent investments throughout the system that will be linked together over time.** By making discrete investments that connect state, regional and local rail systems, we can provide immediate mobility, environmental, economic and community benefits. Together these prepare a solid foundation for high-speed rail. We will enter into partnering agreements with other transportation providers, aggregate federal, state and local funding sources and advance regional planning and coordination. This approach will yield the best and fastest results.
- **Third, position ourselves to construct additional segments as funding becomes available.** This requires completing the required environmental analyses for every mile of the program and securing environmental approvals as soon as possible. These three objectives will continue to provide a framework for decision-making as we move forward.

What Is Different from our 2014 Business Plan

- **Funding** - The funding authorized by the Governor and Legislature, by the federal government and the people of California is sufficient to deliver a high-speed rail line connecting the Silicon Valley to the Central Valley
- **Schedule** – We now project starting passenger service on that line in 2025 instead of on a line between Merced and the San Fernando Valley in 2022
- **Cost Estimates** - Our capital cost estimates for building the Phase 1 system between San Francisco/Merced and Los Angles/Anaheim are lower than prior estimates

THIS IS THE AUTHORITY'S 2016 BUSINESS PLAN

This 2016 Business Plan provides an update on the progress made, the changes that have occurred and the lessons we have learned over the past two years. It focuses on achieving the above objectives and specifically it:

- Lays out an approach to sequencing the Phase 1 system that will ultimately connect the San Francisco Bay Area to the Los Angeles Basin via the Central Valley with high-speed passenger rail service.
  - This sequencing approach is designed to maximize current federal and state dollars – and use them to deliver the earliest operating high-speed rail line within anticipated funding levels and to comply with Proposition 1A, which the voters approved in 2008.

- It also positions the program to begin generating revenues that will allow access to private sector investment that in turn will be used to continue building out the Phase 1 system.

- Describes our plan to deliver high-speed rail service connecting the Silicon Valley to the Central Valley, and offer high-speed rail passenger service between these two important economic regions within the next ten years
- Provides a clear path for making concurrent investments in concert with regional partners and delivering early, tangible mobility and safety benefits in Southern California, while building a solid foundation for the critically important passenger rail corridor that links Burbank, Los Angeles and Anaheim
- Commits to completing environmental clearance, and selecting alignments and station locations for the remaining sections in order to position the entire system to be ready for immediate construction as funds become available.
- Provides updated capital cost estimates, showing that the projected cost of the entire system has been revised downward by $5.5 billion. This lower cost estimate comes about mainly through value engineering efforts, better operational and technical approaches to design, and the favorable bidding environment.

California's investment in high-speed rail will provide both near- and long-term transportation benefits—in addition to increasing safety, protecting the environment, creating jobs, supporting disadvantaged communities, businesses and workers, and helping California continue to prosper in an increasingly competitive global economy.

WE ARE MOVING FORWARD

Building on lessons learned. Over the past few years, we have received bids for three design-build construction contracts in the Central Valley from 13 world-class teams with significant experience delivering large, complex transportation projects including developing high-speed rail projects internationally. The proposals for the first three construction packages not only offered valuable design innovations, they contained bids that were hundreds of millions of dollars under our estimates. The international marketplace for construction has been very responsive and competitive in its bidding.

However, advancing construction on the first design-build construction package (Construction Package 1) has been challenging. Specifically, as construction got underway, acquiring the necessary right of way lagged. Further, the time associated with completing third party agreements, such as utility relocations, took longer and is now projected to cost more than originally predicted. We acted quickly to analyze and address these challenges. Based on this experience, we reorganized and enhanced our land acquisition processes, increased our estimates for the cost of third party agreements, and instituted aggressive management and mitigation strategies. Despite these challenges, we have been able to maintain project momentum as we advance through the Central Valley.

This 2016 Business Plan focuses on three positive developments that impact how we are advancing the delivery of the program:

- **Progress on Environmental Clearance –** Over the last two years, significant progress has been made in advancing environmental clearance of the Phase 1 system. In June 2014, we achieved a Record of Decision on the Fresno to Bakersfield section. Completing the rest of the environmental clearance for the entire Phase 1 system is a high priority yielding maximum flexibility to take advantage of opportunities to develop any segment of the system as circumstances allow.
- **New funding –** As previously noted, with the passage of Senate Bill 862, the Legislature and Governor approved

an annual appropriation of 25% of the annual Cap and Trade proceeds on a continuous basis to fund high-speed rail. In making that continuous appropriation, the Legislature determined that these funds can be used to pay for planning and construction costs for the system and/or to repay loans made to the Authority.

→ **Updated cost estimates -** We have conducted a comprehensive update to our capital cost estimates, factoring in the lessons derived from our first design-build construction bids, design refinements suggested in those proposals and through other reviews, advancing more detailed engineering and design work, conducting value engineering, incorporating contractors' viewpoints and other changes. Through this process our overall Phase 1 cost estimate has been significantly reduced. For the same scope of work, these updated estimates reflect an 8% reduction in costs, down to $62.1 billion in year of expenditure dollars (YOE$), when compared to the $67.6 billion (YOE$) estimate presented in our 2014 Business Plan.[1]

As a result, we now propose to reinvest some of these savings to enhance service levels in the vital Los Angeles to Anaheim segment. A $2.1 billion investment in that corridor will provide not just blended service, but allow for one additional track and, in some segments, two additional tracks in the existing corridor. This would not only fulfill the commitment made in the 2012 and 2014 Business Plans to provide one-seat ride service all the way to Anaheim, it would significantly enhance the capacity, speed and reliability of this high demand rail service. Moreover, it will greatly benefit public safety by removing some of the most dangerous at-grade crossings in the state. After incorporating this additional investment, which represents a change in scope since our 2014 Business Plan, our cost estimate has still been reduced from $67.6 to $64.2 billion (YOE$) which is our revised Phase 1 system capital cost estimate presented in this 2016 Business Plan.

Moving forward to deliver: Based on the above developments as well as updated ridership and revenue and other forecasts, we evaluated how to most efficiently achieve our three objectives and fulfill our mission of delivering the system.

With the goal of getting a high-speed passenger rail line into operations as quickly as possible, we evaluated how best to sequence the program. We analyzed how and where we could deliver a line that would meet all of the Proposition 1A requirements (e.g., designed and built to a standard that achieves travel speed and travel time criteria and generates sufficient revenues to cover operating costs) with the federal and state funds that have been committed and are allocated for the program to date.

Analysis, shows that the line that can be funded and built within projected sources, and initiate revenue producing operations on quickly, connects the Silicon Valley (San Jose) to the Central Valley near the existing Construction Package 4 southern construction terminus north of Bakersfield). The Silicon Valley to Central Valley line, from Diridon Station in San Jose to a station north of Bakersfield, which includes an interim facility that functions as a temporary station, meets Proposition 1A requirements including non-subsidized operations. It can be built with available funding from Proposition 1A bonds, federal funds and the continued anticipated Cap and Trade proceeds. The reason for identifying an interim station is to avoid a potential situation where a fully Prop 1A compliant line remains idle because of insufficient funding to reach the next station. The Authority's goal is to avoid the need for an interim station. If, however, an interim station is needed due to funding constraints, consideration will be given to alternative locations, such as adjacent to the existing Amtrak station in the City of Wasco, with the goals of reducing the level of interim investment, minimizing impacts, and maximizing connectivity with the permanent station in Bakersfield.

This 2016 Business Plan describes how we plan to build the Silicon Valley to Central Valley line by 2024 and begin

Connecting Merced to the Silicon Valley as Part of Initial Operations

The Authority is also adopting a goal of completing a connection between the City of Merced and San Jose as part of the initial Silicon Valley to Central Valley line. Connecting the cities of the Central Valley to those of the Silicon Valley and the broader Bay Area will tie together the regions as never before and create unprecedented economic opportunities for residents of the Central Valley. In large part due to the jobs-housing imbalance in the Bay Area, travel between the northern San Joaquin Valley and the Bay Area is growing significantly, putting increased pressure on roads and existing passenger rail systems. At the same time, air quality issues continue to be a challenge for the Central Valley. Long trip times of 2 to 3 hours reduce productivity and impose hardships on travelers. For those reasons, the State and regional leaders are working together to ensure that Merced is part of the first operations of the high-speed rail system.

Working with City of Merced and County of Merced officials, the Authority is developing plans to provide a single-track option for connecting to Merced, as well as initially constructing only the leg of the Central Valley Wye that will tie Merced to the Bay Area. These and other options will be further developed based on engineering, operations and financial factors. Ultimately, as part of the completion of the Phase 1 system, a two-track connection to Merced and full buildout of the Central Valley Wye will be completed but the immediate goal is to connect the Merced and Silicon Valley/Bay area regions together.

offering passenger service on it by 2025. We also determined that this is the best way to begin sequencing of the larger Phase 1 system. By building a line connecting northern California to the Central Valley—commencing service and starting to generate revenue—we will be in a position to attract private investment and unlock additional capital to help move the rest of the system forward.

The Authority's objective is that the initial line would extend to Bakersfield and San Francisco, tying into the electrified Caltrain corridor. This extended line would significantly enhance ridership and revenues and therefore attract higher value private sector concession bids based on future discounted cash flows. It will require approximately $2.9 billion of additional funding to extend the line to Bakersfield and for initial improvements in the San Jose to San Francisco corridor to allow reasonable operation of high-speed rail trains in the Caltrain corridor between San Jose and the 4th and King Station in San Francisco and ultimately Transbay Transit Center. It its also the Authority's goal to complete a connection to Merced. Given the opportunity to leverage more ridership, revenue and private sector participation, our priority will be to secure additional funds, including federal, to complete the full San Francisco to Bakersfield line. The state is working with the City and County of San Francisco and others to develop options for funding the extension from San Jose to San Francisco. On a cost-benefit basis, this extension would provide significant benefits for the system as a whole, enhance regional mobility and connectivity and expand private participation. If those additional funds are not forthcoming, we can and will still construct the Silicon Valley to Central Valley line described above.

The implications of the Silicon Valley to Central Valley connection are tremendous. Today it takes about three hours to drive from Fresno to the Bay Area; flights are available but often at exorbitant prices. With this new connection, a trip from Fresno to San Jose will take about an hour on high-speed rail which is a game changer both for the people and the economy of the Central Valley and for Silicon Valley as well. New job markets will be opened up for people living in the Central Valley and creating a high-speed connection to the Central Valley would help address the affordable housing crisis in the Bay Area. New linkages will be created between higher education institutions in the Central Valley and high-tech and other cutting edge industries in the Silicon Valley. And some high-tech companies might choose to locate certain corporate functions in the Central Valley where commercial real estate is less expensive, generating new job opportunities in this region.

We will also advance the program in Southern California with specific focus on early Phase 1 investments in the Burbank-Los Angeles-Anaheim corridor. These investments represent our continued commitment to advance regionally significant connectivity projects with Proposition 1A and other funds as embodied in the 2012 Southern California Mem-

orandum of Understanding that we entered into with our transportation partners. By making strategic investments with our partners, and leveraging our mutual resources, we will provide early benefits to transit riders and local communities and lay a solid foundation for high-speed rail (see Section 4 for details).

This corridor is of regional and statewide significance and is critical to supporting the economy of Southern California. It is a shared corridor – in addition to moving people, it is a vital freight and goods movement corridor. We propose to invest, together with our partners, up to $4 billion on a range of improvements in the corridor and we are poised to move forward this year. Our early investments will focus on one of the highest priority grade separations in the state, at Rosecrans Avenue/Marquardt Avenue, the Southern California Regional Interconnection Project (SCRIP), and improvements at Los Angeles Union Station. These and other investments identified in this 2016 Business Plan will increase capacity and improve safety in this highly-congested travel corridor. They are also critical to improving air quality and reducing greenhouse gas emissions in the region and will be an investment in disadvantaged communities. Immediate benefits will accrue to freight and passenger rail operations. Every project will be used for high-speed rail once service starts on the Burbank to Anaheim corridor.

A REALISTIC, REASONABLE AND ACHIEVABLE APPROACH TO FUNDING AND DELIVERING THE SYSTEM

In previous business plans, we have noted the importance of being able to adapt to changing circumstances as we move forward to complete the system. There is now a clear path forward for funding the initial operating line from the Silicon Valley to the Central Valley with public funds that have been committed by the Legislature and the federal government. With these funds, we expect to be able to begin serving passengers in 2025. As work proceeds to complete this line, equal attention will be focused on advancing and extending the system through concurrent investments that provide early benefits – and with the goal of starting service on the full Phase 1 system by 2029.

Since the inception of planning for high-speed rail in California, it has been assumed that the program would be funded with federal funds, state funds and private sector investment, each at approximately one third. This was the underlying assumption when the Legislature and the voters approved Proposition 1A in 2008. However, there were no other established funding sources for the program in place at the time. But the Legislature and voters determined that it was appropriate to move forward, stating that, "It is the intent of the Legislature by enacting this chapter and of the people of California by approving the bond measure pursuant to this chapter to initiate the construction of a high-speed train system…." In addition to providing $9 billion in state bond funds, Proposition 1A directed that the Authority "...pursue and obtain other private and public funds, including but not limited to, federal funds, funds from revenue bonds, and local funds..." to augment the high-speed rail bond funds. In addition, Proposition 1A requires a 50 percent match for construction funds from other sources, none of which were identified by the Legislature, voters, or Authority at the time.

Subsequent to the passage of Proposition 1A by the voters in 2008, the federal government made funding for intercity and high-speed passenger rail systems available as part of the American Recovery and Reinvestment Act of 2009 (ARRA) and The Passenger Rail Investment and Improvement Act of 2008 (PRIIA). The Authority competed for and successfully secured $3.5 billion in federal funds. More recently, the Legislature provided an ongoing commitment of Cap and Trade proceeds to help fund the system. That commitment is expected to provide over $10 billion of funding for construction for the Silicon Valley to Central Valley line. Clearly, between Proposition 1A and Cap and Trade, the State is stepping up to fund a significant portion of the system costs.

Traditionally, transportation infrastructure projects of this magnitude can rely on the federal government as a funding partner with grants of up to 50 percent or higher. Key transportation corridors, such as the Interstate Highway System, were built with 90% federal funding. A very recent example of this is the Gateway Tunnel Project to improve intercity and commuter rail services in the Northeast. In 2015, officials from the federal government as well as the governments of New York and New Jersey announced an agreement to fund the approximately $20 billion Gateway Tunnel Project which will add two new rail tunnels under the Hudson River to connect New York and New Jersey for both intercity and commuter railroads. The agreement calls for at least 50% of the cost of the project to be borne by the federal government with the states providing matching funds. This is consistent with historical precedent where the federal government plays an important role in funding large infrastructure projects, and it reaffirms the reasonableness of the assumptions in Proposition 1A.

A fundamental goal of the Authority is to create a commercially successful high-speed rail transportation system to connect the State. As segments of the program are delivered, they are projected to generate significant revenues and positive cash flow which will support private sector investment. As the high-speed rail system expands and connects with other passenger rail networks, network connectivity will increase and the passenger experience will be enhanced – generating more ridership and revenue. Over time, the value of the system as a commercial enterprise will be significant for the State of California, creating the opportunity for private investment to further support system expansion.

Of equal importance to securing additional funding is delivering the project cost effectively. Alternative delivery models, such as public-private partnerships, will be utilized when appropriate to help reduce both capital and operating costs. After initial start-up costs, it is expected that cost efficiencies will increase as the high-speed rail industry grows in strength and maturity and as competitive pressures continue to drive industry costs down. Using these types of delivery models can also help accelerate the construction schedule which will help reduce costs and risk to the State.

We are funding and implementing California's high-speed rail program in the same way that high-speed rail systems have been – and are continuing to be – developed throughout the world. Specifically, we have a clear long-term vision and a long-term plan for implementing it, 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. And just like other systems around the world, we will fund and build it in a series of overlapping, not sequential, phases. So just as we fund and proceed with constructing the Silicon Valley to Central Valley line, we are also moving forward with initial funding for system extensions and laying the building blocks for future phases.

This 2016 Business Plan lays out the business model for how the Silicon Valley to Central Valley line will be delivered and operated. It presents a snapshot of the cost estimates and the funding available in addition to the strategies we plan to implement to fully fund that line. It also provides an estimate of the ridership and revenue forecasts associated with passenger operations. The funding and financing section describes how the revenues generated by this first line will be captured (monetized) which will position us to engage the private sector in a meaningful way to deliver additional elements of the system. It also lays out a range of near and long-term sources of funding and revenue, as well as efficiencies and cost savings, that could potentially be used to help complete the Phase 1 system.

This 2016 Business Plan further describes our business model for delivery and operation of the entire Phase 1 system including updated Phase 1 forecasts and cost estimates. It also includes a summary of the risks that the program faces along with our strategies for managing and mitigating these risks. This plan also summarizes the status of planning for advancing the Phase 2 extensions, from Merced to Sacramento and from Los Angeles to San Diego via the Inland Empire, which will ultimately be constructed to serve all of California's major population and employment centers.

Introduction

The California High-Speed Rail Authority is connecting and transforming California by delivering an integrated statewide rail modernization program with high-speed rail at its core combined with a set of concurrent strategic investments in urban, commuter and intercity rail systems that together will significantly improve mobility and connectivity throughout the state.

A TRANSFORMATIVE INVESTMENT IN CALIFORNIA'S FUTURE

- Connecting – for the first time- all of California's major economic and population centers
- Enhancing California's competitiveness in the global economy
- Shaping and revitalizing our cities and communities
- Creating new jobs and training opportunities and encouraging workforce development
- Assisting disadvantaged workers and supporting small businesses
- Protecting our environment, reducing greenhouse gas emissions and creating a more sustainable future even as the state grows to 50 million people
- Meeting the state's 21st century mobility needs
- Setting the stage for the rest of the country in high-speed rail development and operations

A high level of convenience, comfort and amenities

Passengers traveling on California high-speed rail will experience a whole new way to travel between the State's vibrant city centers – not unlike how Europeans travel across Europe. For example, Spain's AVE trains carry travelers between Barcelona and Madrid with a one-seat ride in less than 3 hours and Eurostar carries passengers between London and Paris in 2 hours. A one-seat ride offers travelers direct service to their destination without the need to change trains along the way. On these and other high-speed rail systems around the world, passengers typically enjoy a high level of onboard comfort. Ample legroom, comfortable seating, the opportunity to enjoy a snack when you want, space to work or relax and a smooth, quiet ride sets high-speed rail travel apart. Passengers will be able to use their smart phones and other mobile devices to plan, book and manage their trips, to pay fares and obtain real-time travel information en route in order to make more productive use of their time.

DRAMATICALLY CHANGING HOW PEOPLE TRAVEL THROUGHOUT THE STATE

- More relaxing and more productive trips between San Francisco and Los Angeles in less than three hours
- Train stations that are conveniently located in or near city centers for easy connections — arrive in town, hop on a bus or a local light rail line, hail a taxi or a ridesharing service, rent a bike or walk to your final destination
- Better access to more destinations without having to drive –fast, easy connections between high-speed and regional/urban transit systems at existing hubs like Transbay Transit Center or the 4th and King Station in San Francisco and Union Station in Los Angeles and the ARTIC Station in Anaheim as well as new high-speed rail stations in cities like Fresno and Palmdale

"Today a single rail passenger trip from Los Angeles to the Bay Area is nearly a 12-hour journey, an option that's not acceptable for a vibrant, modern economy. High-speed rail brings new choices for California travelers—clean, convenient, and fast choices for everyone—including those who do not drive due to age, income, ability or choice. Together we are choosing to invest in California's future by modernizing and integrating our transportation systems to build our economy and support millions of new travelers."

- Brian Kelly
Secretary of the California State Transportation Agency (CalSTA)

- Safe, predictable trips – arrive on time with no delays or canceled trips due to congestion, fog or bad weather – make reliable connections and keep your appointments
- Less stress from driving long distances in heavy traffic — arrive refreshed and ready to work or have fun
- Work on your laptop, catch up on your reading or relax and enjoy the scenery
- All powered by 100% renewable energy — a trip that is better for you and for the environment

CREATING NEW OPPORTUNITIES FOR SUSTAINABLE TRANSIT-ORIENTED DEVELOPMENT

- Vibrant station areas where new residential, retail and commercial development clusters around high-speed rail stations, helping to reduce urban sprawl and slowing conversion of farm land to development
- Compact pedestrian-oriented design that promotes walking, bicycling and transit access with streetscapes that incorporate small parks and other amenities
- Stations that integrate best practices for sustainable construction materials and district scale water, energy and other investments that accelerate urban regeneration

THIS IS OUR 2016 BUSINESS PLAN – IT BUILDS ON THE:

2012 Business Plan

- Presented cost estimates, ridership/revenue forecasts and financial analyses
- Included credible, reliable data for decision-making
- Provided an initial framework for a business model and funding approach
- Created the foundation for a blended implementation strategy

2014 Business Plan

- Updated forecasts and estimates informed by rigorous external scrutiny
- Introduced a risk-based breakeven analysis that continued to show financial viability
- Confirmed that the system will be an attractive private sector investment opportunity

IN THIS 2016 BUSINESS PLAN:

We report on the progress that has been made since 2014, such as:

- Breaking ground and advancing construction on the backbone of the system in the Central Valley
- Applying lessons learned from initial challenges with our first construction contract to improve our right of way acquisition process and maintain progress in the Central Valley
- Developing reporting tools and mitigation strategies and applying them to manage risks
- Building upon our experience to improve how we manage other construction contracts in the Central Valley and across the state
- Collaborating with our partners to advance high value strategic investments statewide such as the Peninsula Corridor electrification, the Los Angeles Regional Rail Connector and the San Diego Trolley Blue Line improvements
- Employing over 260 small businesses and putting Californians to work

We include developments on four very important fronts:

- The Legislature and Governor reaffirming their commitment to the program by providing an ongoing funding stream through the state's Cap and Trade program
- Driving capital cost estimates down from $67.6 billion to $62.1 billion (YOE$) compared to the cost estimates and associated scope presented in the 2014 Business Plan by:
  - Factoring in lessons derived from our first design-build construction contract
  - Advancing more detailed design and engineering work
  - Conducting value engineering
  - Incorporating contractors' viewpoints
  - While also enhancing one-seat ride service between Los Angeles and Anaheim through an additional investment of $2.1 billion (a scope change)
  - Resulting in an updated capital cost estimate of $64.2 billion (YOE$)
- Updating and further developing our analytical tools to produce the most accurate forecasts to support the implementation of the program; recently the independent Peer Review Group described our ridership forecasts as "state of the art."
- Continuing engagement with the private sector, including more than 50 world-class firms, soliciting their advice and expertise on project delivery.

Conducting Value Engineering

Value engineering provides an independent assessment to identify increased efficiencies and reduction in total cost without sacrificing functionality. It is a systematic process to capture additional benefits to the Owner through innovation and value judgments and is done early in project development and in later phases of implementation. It provides for program and design adjustments to fit better with budget realities. For example, replacing viaduct sections with less costly "fill embankments" does not change functionality but does significantly reduce costs.

Peer Review Group

California Law AB 3034 established a Peer Review Group whose duty is to evaluate the California High-Speed Rail Authority's funding plans and prepare its independent judgment as to the feasibility and the reasonableness of the Authority's plans, appropriateness of assumptions, analyses and estimates, and any observations or evaluations the Group deems necessary. The Peer Review Group is part of the reviews process for this 2016 Business Plan and its comments will be incorporated when the business plan is finalized.

We lay out a plan to deliver a first high-speed rail passenger line as part of a new approach to sequencing the system — connecting the Silicon Valley to the Central Valley — that can be opened for service in 2025

- Allows operations to start as quickly as possible
- Will meet Proposition 1A requirements including being designed and built to a standard that achieves travel speed/travel time criteria and generates sufficient revenue to cover operating costs
- Can be funded with the federal and state funds that have been committed to the program to date
- Our business model has been refined to show how this line will be delivered and operated

→ In delivering it, we will continue to collaborate with the private sector to implement efficiencies and innovation including bringing an operator on board at the right moment to help inform our decisions on system implementation

→ Once passenger service is underway, revenues will be generated which could then unlock private dollars to continue sequencing the rest of the system

We outline a path for making concurrent investments and delivering early benefits to Southern California in the Burbank-Los Angeles-Anaheim corridor

→ We are committed to advancing the high-speed rail program in Southern California with specific investments in this high demand travel corridor

→ These early, high priority investments will be made in collaboration with our local and regional partners to provide near term safety, mobility and community benefits

→ They will also provide a solid foundation for future high-speed rail service on this corridor

→ We have identified viable funding sources that we will work to secure in collaboration with our partners to pay for these improvements

We will continue to work with our partners and local communities to obtain environmental clearance of the entire system

→ A high priority is to complete environmental review and the selection of alignments and station locations of the entire Phase 1 system – from San Francisco and Merced to Los Angeles and Anaheim

→ This will allow the program to be construction-ready which will maximize flexibility to capture new funding opportunities

→ It will also provide greater certainty about route and station locations to help local communities and transport partners with their planning decisions

We will continue to work with our partners to advance planning for Phase 2 extensions

→ While Phase 1 is the current priority per Proposition 1A, it is important to advance planning in Phase 2 corridors so connectivity can be improved in anticipation of future high-speed rail service

→ We will continue to work closely with local partners in the corridors between Los Angeles and San Diego, Merced and Sacramento and over the Altamont Corridor

→ We will continue collaborating with the California State Transportation Agency and Caltrans on the 2018 State Rail Plan, which will advance additional efforts to develop a seamless statewide rail network

The Authority will work with regional, state and federal partners and decision makers to identify new ways to fund and finance the full Phase 1 system

- It is a high priority to complete extensions north to Merced, south to Burbank and to put in place the final building blocks in the San Jose-San Francisco and Burbank-Anaheim corridors as soon as possible.
- To fulfill that, we intend to work closely with our regional partners, the Legislature, California State Transportation Agency and Caltrans to find ways to accelerate and fund the statewide rail modernization program through new and existing funding resources.
- We also intend to work with Congress and the Executive Branch to meet and match the investment that the State is making to this investment that is critical not just to California's future prosperity, but also to the nation's as well.

Section 1: *Progress*

Moving Forward on Multiple Fronts

Over the last two years significant progress has been made in implementing the statewide high-speed rail system that will connect and transform California.

- Starting with our official groundbreaking in January 2015, there are now more than 119 miles of construction-related activities underway with almost $3 billion in contracts that came in lower than our estimates.
- Work has advanced to obtain environmental approvals between San Francisco and the Central Valley and between Bakersfield and Los Angeles/Anaheim.
- We continue to collaborate with partners and cities to deliver community benefits across the state.
- In 2014, the Legislature and Governor reaffirmed their commitment to investing in the high-speed rail program with the continuous appropriation of funds generated by state's Cap and Trade program. This commitment leverages other funds that have been have secured and provides the opportunity to advance the program beyond the Central Valley.
- We continued to coordinate with local jurisdictions and planning agencies in the Phase 2 corridors – from Los Angeles to San Diego via the Inland Empire and between Merced and Sacramento.

CENTRAL VALLEY CONSTRUCTION: BUILDING THE BACKBONE OF HIGH-SPEED RAIL

- On January 6, 2015, Governor Edmund G. Brown Jr., surrounded by hundreds of supporters, hosted the official groundbreaking ceremony on the nation's first high-speed rail system in downtown Fresno.

- In the months that followed, we advanced the design, secured right of way, attained permits and continued geotechnical investigations which are essential to completing structural design, demolished mostly-dilapidated existing structures and relocated utilities along the right of way in preparation for the construction of dedicated high-speed rail trackways and bridges.
- By June 2015 the first vertical structure started to take shape at the Fresno River Viaduct in Madera. Seven small businesses and more than 100 workers have been involved in the construction of the viaduct.
- In January 2016, we began the process of demolishing and rebuilding the Tuolumne Street Bridge in downtown Fresno to allow for clearance over the high-speed rail line and for two-way traffic to support the revitalization of downtown Fresno's city core.
- In February 2016, drilling and concrete operations began at the Fresno trench, the almost 1.5 mile long and 40-foot deep trench that will carry high-speed rail trains under State Route 180 in Fresno.
- In February 2016, preparation began for the construction of the Cedar Viaduct which will mark the Southern end of the high-speed rail line through Fresno. The viaduct will have four, tall concrete arches and extend over State Route 99, as well as North and Cedar Avenues.
- Site preparation is underway at the San Joaquin River Viaduct which will feature two concrete arches and a "pergola" structure that will allow high-speed tracks to travel above the already established Union Pacific tracks.
- In partnership with Caltrans, work has begun to realign portions of State Route 99 north of Fresno to accommodate high-speed rail and at the same time improve traffic operations, reducing congestion and improving safety in this busy corridor.
- We continue to work closely with homeowners, property owners and businesses being relocated as part of the development of the high-speed rail system. This process can be a challenge for those affected by the relocation. However some property owners have chosen to use the relocation as an opportunity to expand and grow their businesses or move to better locations.
- In the first few months of building structures, we used 300 tons of 100% recycled steel; this was about 70% of the steel used up to that point.
- In 2015, to offset 3 tons of air pollutants created during construction, we helped replace 30 tractors and truck engines for Central Valley farmers and one school bus with new, cleaner versions.
- As of April 22, 2016 the Authority has acquired 745 parcels of the approximately 1,450 parcels needed. With this, we have reached critical mass and have advanced construction in Construction Packages 1 and Construction Package 2-3.
- We have been able to advance property acquisition and deliver right of way through better understanding of individual property owner concerns, improved communications and processes and increased staff and resources.
- We have partnered with Caltrans to use its Quick Map traffic system to inform public safety officials and the public about any construction activities that may impact them.
- With work underway, a comprehensive set of project management, finance, and risk reports were developed and are updated monthly, reviewed by our Finance and Audit Committee, and made available to the public on our website.

- We have selected an alignment and station locations between Fresno and Bakersfield, certified the environmental document and received approval to begin construction.
- In March 2016, the Board approved the extension of Construction Package 1 approximately 2.72 miles to the North on an environmentally cleared section and provide the capability for a more logical connection and transfer point at the existing Amtrak station in Madera.
- As of December 2015, 248 construction craft laborers have been dispatched to work on Construction Package 1 and 17 on Construction Package 2-3.
- 174 people have graduated from a Pre-Apprenticeship Training Program established by the Fresno Workforce Investment Board.
- As of March 2016, 266 Small Businesses are working on the program statewide

CENTRAL VALLEY LESSONS LEARNED AND MANAGEMENT STEPS IMPLEMENTED

As with many projects of this magnitude, the initial implementation stages often reveal unknowns that require adjustments and mitigation strategies. Some of these factors have worked in favor of the project and some have exposed challenges. Our experience with construction bids and project delivery to date has taught us the following:

- Since 2013, we have received competitive design-build bids for the first three construction contracts in the Central Valley, demonstrating strong competition within the industry to be part of building the first high-speed rail system in the country.
- On average, Construction Package 1 and Construction Package 2-3 bids came in approximately 30% below engineer's estimates. As announced in January 2016, bids for the Construction Package 4 contract continued this trend and came in about 25% below engineer's estimate.

EXHIBIT 1.1 COMPARISON OF ENGINEER'S ESTIMATE AND BID PRICES*

SECTION	ENGINEER'S ESTIMATE	BID AVERAGE	BEST VALUE BID	PERCENT DIFFERENCE (BEST VALUE VS. ESTIMATE)
Construction Package 1	$1.2 - $1.8 billion	$1.25 billion	$985 million	-18/45%
Construction Package 2-3	$1.5 – $2 billion	$1.68 billion	$1.23 billion	-18/38%
Construction Package 4	$400 – $500 million	$442 million	$348 million	-13/30%

**Does not include contingencies or provisional sums.*

- During a bid process a number of factors play a significant role in lowering the average bid price, such as competitive pressure, current market conditions, risk position and specific bidding strategies adopted by bidding consortia. Recognizing that, we did not directly apply a simple 30% reduction to our prior capital cost estimates when updating them for this 2016 Business Plan.
- Although the first construction packages came in under engineers' estimates, they also faced a number of problems in execution and delivery.
- Execution delays associated with Construction Package 1 may impact the expected cost and schedule for completing that package. However, we are making adjustments and managing the project to stay within budget contingencies:

- The right of way acquisition process was slow to start due to litigation-related delays and required some streamlining and heightened management. The program requires the acquisition of an unprecedented number of parcels of land. A more efficient process was implemented over time that has allowed us to significantly increase the rate of parcels acquired per month. We are on schedule with respect to the Construction Package 2-3 and Construction Package 4 contracts.
- Negotiations for third party agreements (railroads, utilities and others) were more difficult than anticipated. Mitigation strategies were implemented successfully so that key agreements with the railroads and the utility companies (power, water and communications) were finally signed leaving free access for the contractors to start construction.
- The contractors took more time to complete the design and mobilize the construction workforce than anticipated. Final design has now been completed for Construction Package 1 and a prioritized list of construction sites developed (in conjunction with the right of way acquisition plan) to catch up with the construction schedules.

→ Construction Package 1 is trending negatively in terms of cost and reflects a delay due to three of the cost risks originally identified in its contract contingency analysis. The most recent analysis indicates that there is the potential of exceeding the current approved contract contingency for the Construction Package 1 contract if risk mitigation actions are not successful although not by a significant percentage amount. These risks and mitigation measures to manage them are described more fully in Section 9.

→ However, Construction Package 1 is not on the critical path for completing the construction of the entire Central Valley line. In other words, the potential delay forecasted in completing Construction Package 1 will not impact the broader schedule to complete construction in the Central Valley. Furthermore, additional contingencies for right of way acquisition and third party agreements have been allocated to the capital cost estimate.

→ Thanks to lessons learned from Construction Package 1, the right of way acquisition and utility agreements have gone much more smoothly with Construction Package 2-3. For example, the rate of parcels acquired per month for Construction Package 2-3 is already higher than that for Construction Package 1.

→ We have built upon this experience to improve both the management and implementation of the other construction contracts in the Central Valley.

ENVIRONMENTAL CLEARANCE: BECOMING SHOVEL READY

→ We continue to work with partner agencies, corridor cities, stakeholders and community members as well as local and state leaders to advance environmental clearance of the remaining project sections of the Phase 1 system.

→ This is part of a comprehensive, ongoing outreach program that incorporates public input and feedback as the program is being developed.

→ Moving forward to obtain environmental approvals for the full Phase 1 system will maximize our ability to advance any segment of the system as resources become available.

→ Conceptual designs and various planning and technical studies are underway to achieve the goal of finishing environmental clearance in the remaining areas:

- The **San Francisco to San Jose Project Section** will connect the cities of San Francisco, Millbrae (San Francis-

co Airport) and San Jose on an electrified corridor utilizing a blended system which will support modernized Caltrain commuter rail service and high-speed rail service on shared track. This approach minimizes impacts on surrounding communities, reduces project cost, improves safety and expedites implementation.

- The **San Jose to Merced Project Section** will provide a critical rail link between the Silicon Valley and the Central Valley, traveling between stations in San Jose and Gilroy and (after passing through the Central Valley Wye) north to Merced or south to Fresno.
- The **Central Valley Wye** will serve as the junction for the system to head west to the Bay Area, north to Merced and Sacramento and south to Fresno.
- The proposed **Bakersfield F Street Station Alignment** is a locally generated alternative developed in cooperation with the City of Bakersfield that is under study in a supplemental environmental analysis for the Fresno to Bakersfield section.
- The **Bakersfield to Palmdale Project Section** will connect the Central Valley to the Antelope Valley, closing the existing passenger rail gap over the Tehachapi Mountains with proposed stations in Bakersfield and at the Palmdale Transportation Center.
- The **Palmdale to Burbank Project Section** will connect the Antelope Valley to the San Fernando Valley bringing high-speed rail service to the urban Los Angeles area with proposed stations at the Palmdale Transportation Center and near the Burbank Airport.
- The **Burbank to Los Angeles Project Section** will connect two key multi-modal transportation hubs, Burbank (airport area) and Los Angeles Union Station, providing an additional link between Downtown Los Angeles, the San Fernando Valley and the rest of the state.

EXHIBIT 1.2 PROJECTED ENVIRONMENTAL SCHEDULE

SECTION	ANTICIPATED RECORD OF DECISION
San Francisco to San Jose	2017
San Jose to Merced	2017
Merced to Fresno	Completed
Central Valley Wye	2017
Fresno to Bakersfield	Completed
Bakersfield F Street Alignment	2017
Bakersfield to Palmdale	2017
Palmdale to Burbank	2017
Burbank to Los Angeles	2017
Los Angeles to Anaheim	2017
Los Angeles to San Diego (Phase 2)	TBD
Merced to Sacramento (Phase 2)	TBD

- The **Los Angeles to Anaheim Project Section** will connect Los Angeles and Orange Counties by traveling from Los Angeles Union Station to the Anaheim Regional Transportation Intermodal Center (ARTIC) in a shared corridor with dedicated track using the existing Los Angeles-San Diego-San Luis Obispo (LOSSAN) rail corridor.

→ In 2013, we adopted our Unsolicited Proposals Policy to both welcome and encourage the private sector to review our entire program and consider developing unsolicited proposals for our consideration. Completing environmental approvals will best position each section to potentially attract such proposals.

MAKING PROGRESS WITH OUR PARTNERS ON THE STATEWIDE RAIL MODERNIZATION PROGRAM

→ In 2012, Senate Bill (SB) 1029 appropriated $2 billion in Proposition 1A funds – that will leverage approximately $5 billion in additional funding – for bookend and connectivity projects.

→ These projects will generate significant near-term benefits from increased safety, capacity and frequency for regional and interregional rail services, which will also lead to air quality improvements in some of the most deserving communities in the state.

→ We have worked to achieve early approval and release of Proposition 1A dollars for construction of a number of regionally significant connectivity projects most notably in the heavily congested urban rail corridors in Southern and Northern California.

→ The following pages includes an update on five of these projects.

EXHIBIT 1.2 STATEWIDE RAIL MODERNIZATION

Statewide Rail Modernization: Progress on Connectivity and Bookend Projects

Central Subway

Construction is underway on the 1.7-mile light-rail line extension from 4th and King Streets to Chinatown in downtown San Francisco. This modern, efficient light-rail line will improve public transportation in San Francisco and provide direct connections to major retail, sporting and cultural venues while efficiently transporting people to jobs, educational opportunities and other amenities throughout the city. With stops in South of Market (SoMa), Yerba Buena, Union Square and Chinatown, the Central Subway will vastly improve transit options for the residents of one of the most densely populated neighborhoods in the country, provide a rapid transit link to a burgeoning technology and digital-media hub, and improve access to a premier commercial district and tourist attraction.

California's investment of $61 million will help leverage a total investment of $1.6 billion into this project.

Caltrain Corridor

The Caltrain Modernization Program, scheduled to be implemented by 2020, will electrify and upgrade the performance, operating efficiency, capacity, safety and reliability of Caltrain's commuter rail service. The Peninsula Corridor Electrification Project is a key component of the Caltrain Modernization Program and consists of converting Caltrain from diesel-hauled trains to Electric Multiple Unit (EMU) trains for services between the Fourth and King Street Station in San Francisco and the Tamien Station in San Jose. The project will entail the installation of new electrical infrastructure and the purchase of electrified vehicles. Environmental clearance was achieved in early 2015 and construction of the electrical infrastructure could start as early as 2016.

California's investment of $600 million will help fund a total investment of $1.759 billion for this project.

Regional Connector Transit Corridor

Construction continues along the Regional Connector Transit Corridor, one of the pivotal connectivity projects in Southern California. This new Metro Rail extension will allow passengers to travel from Azusa to Long Beach and from East Los Angeles to Santa Monica without transferring. The additional alignment will serve Little Tokyo, the Arts District, Civic Center, the Historic Core, Broadway, Grand Avenue, Bunker Hill, Flower Street and the Financial District communities. Underground light-rail will create direct connections as well as three new stations. The Regional Connector Transit Corridor will improve access to local and regional destinations with continuous service, and offer an appealing alternative to congested roadways. This investment in Southern California will also produce significant environmental benefits, spark economic development, and encourage employment oppor-

tunities throughout Los Angeles County. Construction highlights include First Street utilities and storm drain work which began in December 2015 and station excavation which started in early February 2016 for the First & Central Station.

California's investment of $114 million for construction will contribute to a total investment of $1.366 billion for this Southern California rail improvement.

Metrolink Positive Train Control

The Southern California Regional Rail Authority's Metrolink Positive Train Control project reached major milestones in 2015. Positive Train Control is state-of-the art collision avoidance technology that allows trains, tracks and dispatch centers to actively communicate using a fiber optic network. Through Positive Train Control, train engineers receive continuous information about speed restrictions, work zones and other safety impacts. In June of 2015, Southern California Regional Rail Authority reached the milestone of a positive train control System-wide Revenue Service Demonstration, signifying that all lines have positive train control service installed with approval from the Federal Railroad Administration. In conjunction, the Southern California Regional Rail Authority has installed and tested positive train control on all of its locomotives and cab cars and is the first railroad in the nation to have its entire system (territory, equipment, and crew) in service with Positive Train Control.

California's investment of $35 million helps fund a total investment of $210.9 million for this enhancement.

Blue Line Light Rail Improvements

This recently completed project consisted of improvements to existing infrastructure on the Blue Line Trolley. The Blue Line is the most heavily-used transit service in the San Diego region, with an average weekday ridership of more than 45,000. This investment in Southern California transit included replacing worn out rails and tracks; replacing/rehabilitating switches, improvements to signaling and reconstruction of existing platforms to accommodate low-floor vehicles. All 12 light rail stations were renovated and approximately 100 percent of the rail track was replaced. The final phase of the project was completed in late 2015. Trolleys are now fully operational on the Blue Line making commuting faster, more comfortable, and more ADA-accessible for San Diego's commuters.

California's investment of $57.855 million helps fund a total investment of $660 million for this enhancement.

Enhanced connections between Los Angeles and Anaheim

Since the 2014 Business Plan, we assessed ways to provide a higher-quality one-seat ride to the ARTIC Station in Anaheim. Where the 2014 Business Plan included relatively limited investment in this section, this 2016 Business Plan proposes a higher level of investment to deliver more service, faster speeds, and enhanced reliability in this already heavily-traveled corridor. This has resulted from the commitments we made to work with our partners in this corridor to find a cost-effective path forward. Our revised capital cost estimate provides for a higher level of investment in the Los Angeles to Anaheim corridor and a better connection between these two vital economic centers.

COMMUNITY BENEFITS: TRANSFORMING CITIES

Statewide Rail Modernization

We are working with the California State Transportation Agency (CalSTA) and regional and local partners throughout the state to advance planning and investments in network integration and rail modernization. Modernizing, integrating and expanding California's regional and intercity passenger rail systems are essential to California's future mobility needs. While existing regional and intercity investments have provided a good foundation, it is often far too difficult to reach one' destination in a manner that is competitive with driving one's car because of gaps in the network. CalSTA and Caltrans are addressing these issues through an effort to develop the 2018 California State Rail Plan that fully incorporates the high-speed rail system as the backbone for an improved state network. The goal is to develop a vision and framework for a state of the art, integrated transit and rail network that allows Californians and our visitors to move quickly, cleanly and conveniently throughout the state, providing an attractive alternative for future travel needs on California's transportation system.

Station Communities and Hubs

- High-speed rail stations will serve as more than just a train stop; they will transform cities, create community hubs and anchor intermodal transportation networks.
- To that end, we have entered into station area planning agreements with the following cities to advance strategies that promote economic development, encourage station area development and enhance multi-modal connections between the cities and stations.
  - San Jose
  - Gilroy
  - Merced
  - Fresno
  - Bakersfield
  - Palmdale
  - Burbank
- Construction is continuing at the Transbay Transit Center in downtown San Francisco, the northern terminus of the high-speed rail one-seat ride between the Bay Area and Southern California. The Transbay Transit Center will serve as a hub for 11 different transit systems.
- The City of Anaheim held the grand opening of its Anaheim Regional Transportation Intermodal Center (ARTIC), the state-of-the-art transportation hub in Orange County, bringing nine transportation options under one roof and serving as the Southern terminus of the high-speed rail one-seat ride between the Bay Area and Southern California.

ENVIRONMENTAL BENEFITS AND SUSTAINABILITY

- We remain focused on an overall reduction in greenhouse gas emissions through a combination of mitigation measures.
- We have approved an agreement with San Joaquin Valley Air Pollution Control District to offset criteria air pollutant emissions during construction by replacing aging farm and other equipment, including replacing school bus engines and irrigation pumps. As of April 2016, the Air District has offset 39 tons of pollution through the replacement of 30 pieces of farm equipment and trucks in addition to a school bus in the Central Valley.
- We have deployed Tier IV construction equipment, including cranes, crawlers and excavators, which meet the nation's most stringent environmental standards, to help protect air quality and reduce greenhouse gas pollution.
- We have required that all steel and concrete from demolition and construction is recycled and, as of April 2016, all metals and concrete have been recycled, or stockpiled by the contractor for reuse later in the construction of the project. In addition, we have required recycling of at least 75% of the remaining non-hazardous demolition and construction material. As of November 2015, we have achieved a 91% recycle rate of this material.
- In close coordination with the Strategic Growth Council, we have focused on establishing a statewide conservation program that will identify priority natural resources throughout the state that are important to protect and retain in order to promote sustainable habitats for the health of humans and native species.
- We have approved an agreement with the Department of Conservation for implementing agricultural preservation which identifies suitable agricultural land for mitigation of project impacts and funds the purchase of agricultural conservation easements.
- We are working with Central Valley irrigation districts to coordinate potential development of recharge basins to enhance Central Valley groundwater percolation and groundwater capture.
- Since we committed to the goal to run service using 100% renewable energy in 2008, we have worked with public and private sector partners to develop a path to achieve that goal. We are engaged in finalizing our renewable energy policy and implementation plan. We will continue to collaborate with the renewable energy industry to contract for 400 to 600 megawatts of renewable energy to help power the Phase 1 system.

FUNDING & INVESTMENTS

- In July 2014, the California 3rd District Court of Appeal ruled in the Authority's favor in two lawsuits relating to our ability to access Proposition 1A bond funds. Subsequently, in October of 2014, the California Supreme Court denied a petition to review the lawsuits, making the Court of Appeal decision final.
- In 2014, the Legislature also established a continuous funding source for the program from the state's Cap and Trade program – which provides the basis for funding the first high-speed passenger rail line in California.
- Following the appropriation of Cap and Trade proceeds, we extended our interaction with the private sector that we began in 2011. Through this process valuable information was gathered from companies experienced

in a range of program delivery activities including construction conglomerates, international developers, train manufacturers, rail operators and financial and investment firms. Their insights are being used to inform how we will implement the program as described in Section 4.

- In the last two years, we have reduced the capital cost estimate for the Phase 1 system from $67.6 billion to $64.2 billion (YOE$). We have done so by factoring in lessons learned from our first construction bids, design refinements suggested in those proposals and other reviews, advancing more detailed engineering and design work and incorporating contractors' viewpoints. We now propose to reinvest some of these savings to expand the scope of Phase 1 with a higher level of investment in the Los Angeles to Anaheim segment, a scope change which is budgeted to cost an additional $2.1 billion.[2]

Progress on Network Integration

Developing high-speed rail as part of an integrated transportation network is a philosophy that drives California's intercity rail network approach to produce benefits to all users and is more than a smart business approach. We are focused on the door-to-door journey of passengers, not just high-speed rail users. Staff has been working on linking together strategic, concurrent investments throughout the state's passenger rail network, along with high-speed rail investments. Linking these investments together ensures early benefits to users initially, followed by more efficient implementation of high-speed rail expansion and ultimately greater connectivity throughout the state.

Network integration is the basis of California's rail modernization, blended service planning, and connectivity investments. We have been working with our partners to identify priority investments that, when combined with high-speed rail dedicated federal and state funds, produce greater financial and ridership results and increase overall system capacity. With construction of the high-speed rail backbone underway in the Central Valley, we continue to assess other locally planned improvements that increase connectivity and enhance the network.

In the Central Valley and Northern California, we're working with our rail partners to develop faster and more reliable connections in the near term between Sacramento and Merced and to the Bay Area and Bakersfield. Likewise, between Los Angeles and San Diego via the Inland Empire, corridor planning is helping to prioritize the timing and type of investments necessary to extend the Phase 1 system. In the Bay Area and Southern California, we have developed working relationships and funding agreements with our rail partners to realize priority investments such as Caltrain Modernization and SCRIP, essential elements of the high-speed rail blended system.

Throughout the state, our stations serve as hubs connecting all modes of transportation. We are working with the Santa Clara Valley Transportation Authority, Caltrain, the City of San Jose and others to optimize connectivity at San Jose Diridon Station. In Fresno, we are working with the City of Fresno, Fresno Area Express and others to optimize walk, bike and transit access; coordinate parking investments; and effectively plan for pick-up and drop-off activity. In Los Angeles, we are teaming with the Los Angeles County Metropolitan Transportation Authority, the City of Los Angeles, Amtrak and others to integrate high-speed rail at the Los Angeles Union Station while strengthening first/last-mile connections to and from downtown and surrounding communities.

Similar efforts are underway in station communities up and down the system with the intent of integrating high-speed rail with local and regional priorities for mobility and community development.

Section 2: *Guiding Principles and Core Values*

There are a number of guiding principles and commitments that we have established and that we will adhere to as we advance the California high-speed rail system

GUIDING PRINCIPLES

We will continue to advance the statewide program on multiple fronts over the coming years within a flexible framework and guided by the following principles:

- Fulfill all commitments made to the citizens of California when they approved Proposition 1A to provide a true high-speed rail system
- Evaluate new opportunities—and adapt to changing circumstances—so that a cost-effective, high-quality system can be delivered as quickly and efficiently as possible
- Reduce costs and construction time by using a blended implementation strategy in urban areas where appropriate and consistent with mandated performance goals to:
  - Enhance access and mobility
  - Minimize impacts
  - Reduce costs
  - Improve safety
  - Expedite implementation
- Match projects with available funding and deliver them through appropriate business models:
  - Seek the earliest and best value private-sector participation with appropriate risk management and cost containment
  - Select an initial line for development (as described below), establish a funding plan for it, commit all resources necessary to build it and begin offering high-speed passenger service as quickly as possible
- Advance other strategic early investments in collaboration with our partners in order to:
  - Improve the speed, safety and efficiency of existing passenger rail services and prepare the way for high-speed rail
  - Grow the market for passenger rail travel throughout California
  - Deliver early economic, environmental, mobility, safety and community benefits
  - Promote regional rail and bus connectivity projects
  - Leverage funding by collaborating with local partners to advance high priority mutually beneficial projects

Developing the Silicon Valley to Central Valley Line

Our mission is to connect California for the first time ever with a modern rail network with high-speed rail as its backbone. The first step toward that fulfilling that mission is to build an initial line using available public dollars, begin providing service to customers and start generating revenue. Achieving this as soon as possible will allow us to unlock private dollars which can then be used to expand the system.

In 2011, the Board of Directors evaluated potential lines upon which to start service. Among the criteria it considered were ridership, operating and maintenance costs, breakeven analysis to assure Proposition 1A compliance and the potential for private sector participation. At that time, the Board selected two potential "initial operating segments" (IOS) that could extend beyond the Central Valley – a northern line connecting San Jose to Bakersfield (IOS-North) and a southern line between Merced to a station in the San Fernando Valley (IOS-South). Our 2012 and 2014 Business Plans identified the Merced to San Fernando Valley as our initial operating segment, but made it clear that the funds were not yet in place to construct and operate it.

In the last two years, circumstances have changed. Most significantly, for the first time, there is a combination of existing funding sources that allow us to deliver high-speed service, and do so within the next 10 years. It is our statutory and fiduciary responsibility to utilize available funding in the most efficient and productive manner, and focus those resources on a segment that can be built within the limits of available funding. To do otherwise would mean that the State would be left with a segment that would not be complete, could not meet the statutory requirements, and/or that would not generate private sector participation.

In making this evaluation, we took into consideration all of the requirements of Proposition 1A – particularly building to a standard that can meet travel speed, travel time, and other design criteria and generating sufficient fare revenues to cover operating costs. We matched the projected funding level against updated capital cost figures, and determined that a connection between the Silicon Valley (San Jose) and the Central Valley (near the existing Construction Package 4 southern construction terminus north of Bakersfield) meets all essential and relevant requirements and it can be built with available funding.

The Authority's intent is to avoid the need for an interim station. If one is needed, due to funding constraints, we will work with Central Valley stakeholders to consider alternative locations, such as adjacent to the existing Amtrak station in the City of Wasco, with the goals of reducing the level of interim investment, minimizing impacts and maximizing connectivity with the permanent station in Bakersfield.

In addition, we are committed to completing the work underway on Construction Package 4, the supplemental environmental analysis of the Bakersfield F Street Station alignment, and the acquisition of right-of-way along the balance of the route up to and into Bakersfield. This will allow the connection to Bakersfield to be built as quickly as possible as funds become available.

However, extending the initial line to downtown Bakersfield and into San Francisco (by tying into the electrified Caltrain corridor and making relatively small initial investments between San Jose and the 4th and King Station in San Francisco that would allow high-speed rail trains to operate on existing tracks) would generate significantly higher ridership and revenue, as will completing the system to Transbay Transit Center. It would also command higher prices for a concession agreement with a private operator and position the Authority to use those additional funds to continue extending the system. The Authority is working closely with City and County of San Francisco to advance this key segment.

We will commit to building the initial Silicon Valley to Central Valley line with our existing and allocated resources, but we will also seek additional funds to extend the line to Bakersfield, San Francisco and Merced. This approach reflects and is consistent with our principles and our overarching objectives. As we move forward, as we have done to date, we will continue to evaluate new opportunities and circumstances in order to fund, build and bring the remaining segments into service as soon as possible.

CORE VALUES

There are a number of core values that we adhere to and that guide how we do business as we develop the program. Our core values are focused on maximizing the benefits that are generated through the implementation of the system and include:

Safety and Security

We will implement the highest levels of safety and security measures to ensure the protection of passengers, employees, emergency responders and the public including:

- A comprehensive safety and security program
- Positive train control – a state of the art system that monitors speeds and regulates the distances between trains and can automatically slow down or even stop trains to prevent collisions.
- Grade separations – the dedicated high-speed rail right of way will have no at-grade crossings and early efforts are being made to construct:
  - 55 freight rail grade separations in the Central Valley where our corridor parallels freight lines
  - Key grade separations in Southern California including State College, Doran Street and Rosecrans Avenue/Marquardt Avenue
- Quad gates and intrusion detection along blended corridors and the entire system, which will substantially reduce the risk of people driving onto the tracks.
- An early earthquake warning system to detect earthquakes before they happen and to stop the trains and enable safety measures to be taken.
- A holistic, layered, risk-based approach for securing the rail system
  - Early engagement with federal, state and local intelligence and policing agencies during design and construction
  - Ongoing engagement with the same agencies to review current and evolving criminal and terrorist threats and applying mitigations to minimize vulnerabilities
  - Applying technology, fencing, intrusion protection, surveillance capabilities and other system hardening techniques
  - Development of security plans and procedures and protocols and a professional security force to monitor, patrol and respond
  - Ensuring that the these safety and security measures enhance the passenger experience

Partnership with the Private Sector

The high-speed rail system will not be entirely a public works project nor will it be a fully privatized system. It will be a partnership between the public sector and private sector partners who have the skill and experience in a range of technical, commercial and financial areas to deliver the program. Following successful models in nations that have developed high speed rail, making an investment in an initial line with public funds and private involvement in its delivery

Safety and Security – Japanese 2011 Earthquake Response

"[East Japan Railway Company] had 27 trains operating on the Tohoku Shinkansen Line when the earthquake occurred. The [Early Earthquake Detection System] performed as designed… When the P-wave hit the first coastal sensor, the sensor transmitted a signal to the substation and the electricity to the rail line in the disaster area was cut off. Within three seconds, the power supply was cut, and within three more seconds, the brakes for the trains in the area were automatically applied. The trains slowed from 275 kilometers per hour (171 mph) to just over 70 kilometers per hour (43.5 mph) by the time the S-wave and the surface waves hit the line. As a result, no high-speed trains derailed."

– Mineta Transportation Institute

(http://transweb.sjsu.edu/PDFs/research/1225-great-east-japan-earthquake-lessons-for-California-HSR.pdf)

Sustainable Infrastructure

- In the first year of operation, the Silicon Valley to Central Valley system is projected to divert .119 million metric tons of carbon dioxide equivalent (MMT CO2e). Cumulatively by 2030, this system results in 2.06 MMT CO2e, by 2040 13.2 MMT CO2e, by 2050, 25.7 MMT CO2e, and after 50 years of operation, 2075, 62.9 MMT CO2e.
- The average annual savings of the Phase 1 system through 2040 is projected to be 1.04 MMT CO2e annually, and through 2075 is projected to be 1.35 MMT CO2e annually.
- In the first year of operation, the Silicon Valley to Central Valley Extended system (extension to San Francisco and Bakersfield) is projected to divert .182 MMT CO2e. Cumulatively by 2030, this system results in 2.6 MMT CO2e, by 2040 13.8 MMT CO2e, by 2050 26.3 MMT CO2e, and after 50 years of operation, 2075, 63.5 MMT CO2e.
- The average annual savings of the Phase 1 system through 2040 is projected to be 1.06 MMT CO2e annually, and through 2075 is 1.36 MMT CO2e annually.

"High-speed rail will take cars off the road, boosting California's economic productivity as more people take a fast, efficient train. By 2040, the system will reduce vehicles miles in the state by almost 10 million miles every day, a game-changer."

- Mayor of the City of Palmdale
Jim Ledford

will demonstrate the viability of the system; this then generates revenues used to attract private investment in additional lines and extensions. Specifically, this approach works as follows:

- As always contemplated, we are and will remain a lean organization so we will not construct or operate the system ourselves. Instead, we will manage contracts with the private sector to construct the infrastructure and operate the system.
- Currently, the private sector assists with planning and environmental analysis and is undertaking the first three construction contracts in the Central Valley, which are being performed under a design-build delivery model.
- As we advance from construction contracts in the Central Valley to systems, rolling stock, and operator contracts across the Phase 1 system, we will expand the complexity and length of contracts and the degree of responsibility and risks that are borne by the private sector.
- Finally, we strongly encourage private sector innovation throughout the process including through our Unsolicited Proposals Policy which encourages the private sector to bring new ideas to us for consideration.

Sustainable Infrastructure

We will be a leader in delivering sustainable infrastructure in the state of California through our commitments to:

- Operate our system on 100% renewable energy for which we will contract for 400 to 600 megawatts of renewable power.
- Develop net zero energy buildings and water conservation strategies
- Achieve net zero greenhouse gas emissions in construction and recycle 100 percent of the steel scrap and concrete refuse generated in project construction.
- Utilize the most environmentally-friendly construction equipment available to reduce emissions.
- Implement mitigation strategies to create long-term benefits including:
  - Working with partner agencies to modernize systems that use renewable energy
  - Enhancing sustainable practices utilized by planning, engineering and construction teams

- Reducing vehicle miles traveled – and subsequently reducing statewide emission levels
- Building a sustainable travel alternative to support California's growing population

Workforce Development

We will create training and employment opportunities for Californians, including disadvantaged workers by:

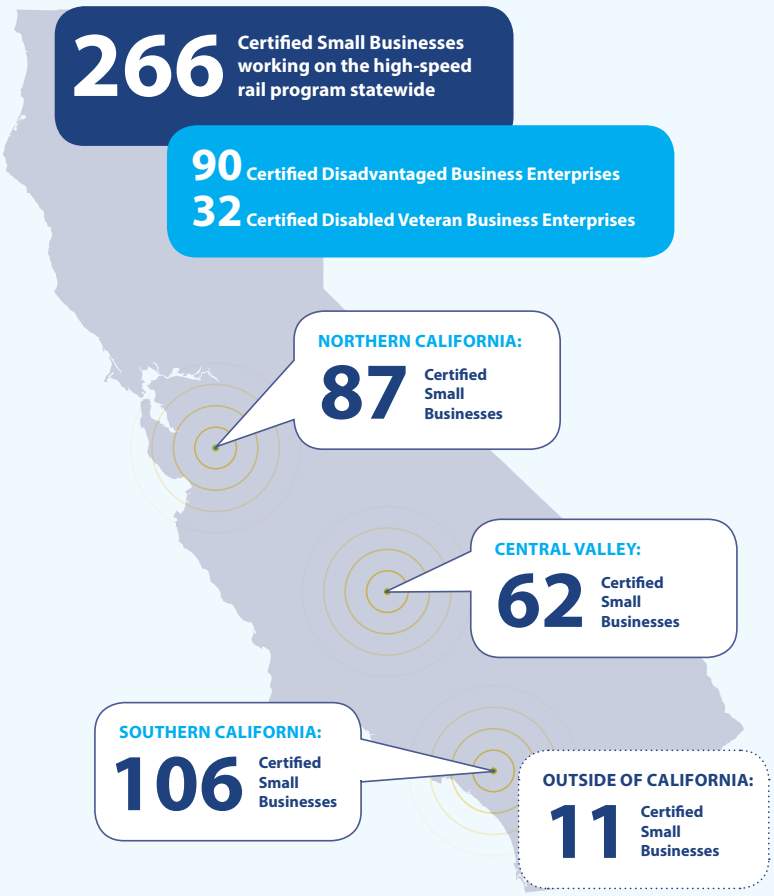
- Building the system and directly employing thousands of Californians while indirectly providing job opportunities throughout the surrounding communities and in the larger economy.
- Generating more than 3,500 permanent jobs around the state as high-speed rail opens and expands service from the Bay Area to the Los Angeles Basin. These workers will be responsible for operating and maintaining the high-speed rail system.
- Assisting job seekers in finding jobs by promoting and advancing training opportunities for all individuals, including those often left behind by economic opportunities.
- Implementing our Disadvantaged Worker Program, which ensures that 30 percent of project work hours are performed by National Targeted Workers and 10 percent of all hours are performed by Disadvantaged Workers.

Small Business Participation

Maintain our commitment to small businesses making major contributions to building the statewide project by:

- Meeting our aggressive 30 percent goal for small business participation.
- Meeting specific goals for Disadvantaged Business Enterprises (DBEs) and Disabled Veteran Business Enterprises (DVBEs) of 10 percent and 3 percent, respectively.

EXHIBIT 2.1 SMALL BUSINESS PARTICIPATION
As of March 2016



"This forward-looking initiative will employ thousands of construction workers and eventually create generations of well-paying rail operations, maintenance, and manufacturing jobs here in the U.S."

- Ed Wytkind
President of the Transportation Trades Department
AFL-CIO

- Conducting extensive outreach, including workshops and events to encourage businesses to get certified, meet prime contractors, and learn about upcoming opportunities.
- Collaborating with the Business Advisory Council, which works with us to refine our approach to meeting our small business goals.

Sustainable Land Use

Support sustainable land use and economic development around high-speed rail stations by:

- Connecting the state's mega-regions to spur economic development, promote infill development near the stations to help reduce sprawl, create a cleaner environment and preserve agricultural and protected lands.
- Minimizing impacts to the natural and built environments, developing policies that encourage efficient land development and affordable housing around stations and helping California manage pressing issues with climate change, high and airport congestion and energy use.
- Use green materials – our concrete replaces 25% of regular cement with fly ash, a waste product from coal-fired power plants that improves durability and reduces greenhouse gas emissions

Our commitment to these values is reflected in the work we do every day and the progress we have made to date in delivering the system.

Section 3: *Business Model*

As identified earlier, the Project will be government owned but maintained and operated by the private sector. The business model will transition over time from government funding and government decisions to a commercially run enterprise managed by a private sector operator and infrastructure provider responsible for service, safety and commercial risks and success, all under the policy direction of the State. This section describes the functional delivery model that the Authority will follow to implement this development strategy.

In the 2014, Business Plan we described our plan for a phased delivery model for 2014 and beyond. It consisted of:

- **Private sector partnership –** we planned to leverage private sector innovation and expertise in the delivery of an initial operating segment and the remainder of the system. We recognized the need to create significant partnership with the private sector that features balanced risk transfer, early planning input for innovation and cost reduction, and private sector investment. Through our unsolicited proposal process, we will be able to consider innovative approaches from potential private sector partners.

- **Engage an operator early –** we knew that the role of the train operator would span several phases of operations – (1) operations and integration planning and design support during construction, (2) early operations during ramp-up and (3) mature operations after ridership has been proven. We planned to procure a high-speed rail operator early in the construction phase to help design, launch and then operate the high-speed rail service.

- **Long-term infrastructure provider as partner –** to reduce the costs and manage the risks of delivering the most complex elements of the program, we envisioned relying on the private sector for the combined delivery and maintenance of the rail infrastructure (i.e., track, systems, and power). We knew engaging the private sector early would aid in developing innovative ideas and proposals on how best to deliver these critical elements of the project and manage costs and safety over the long term. We planned to seek input from major infrastructure developers on strategies for the design, construction, maintenance and financing of the rail infrastructure for an initial segment.

- **Continue with civil works packages through design-build contracts.** We envisioned that the civil works activities on an initial segment would be primarily delivered through a series of design-build contracts, consistent with the approach to the civil works contracts in the Central Valley.

Since the 2014 Business Plan, we have further developed our business model. While the core framework remains the same, we have further refined the delivery model and procurement plan over the last two years. The business model described in this 2016 Business Plan is based on our assessment of what we have seen in the market up to this point and the feedback we have received from the private sector. At the same time, we will continue to engage with the private sector to further refine our approach and evolve our business model as circumstances change.

"We have seen first-hand the benefits of having the person responsible for maintaining and upgrading the system in future years sitting at the same table as the designer and builder from an early stage in the project."

- FCC Construccion

Examples – integrated delivery cost savings:

"On a recent pursuit our team was able to identify solutions that would reduce construction, maintenance and life cycle costs 10 – 20% on the Traction Power and Overhead Contact Systems."

–Kiewit

"Overall, integration of design and construction with operations and maintenance can achieve lifecycle cost savings in excess of 20%."

-Cintra and Ferrovial Agroman

Private Sector Feedback

Since 2011, we have had extensive interaction with private sector developers, contractors, operators, and equipment providers, both formally and informally. These firms have global experience in designing, building, operating, maintaining, and financing elements of high-speed rail systems and other major infrastructure projects. During our discussions, we received extensive feedback on the best ways to structure the business enterprise to incorporate private sector innovation and efficiencies that can enhance operations, reduce costs, accelerate schedules, and manage risk. We continue to encourage additional feedback as we move forward, including through our Unsolicited Proposals Policy. The input we have used to shape our approach to delivering and operating the system is described below.

- Early involvement of the eventual operator is key to establishing a commercially viable system over the long-term. Integration of the operating model, equipment, infrastructure and commercial approach is critical to creating a safe, efficient and highly reliable service. Engaging the operator in early decisions on safety, operations, equipment and systems, fare structures and schedules and other commercial and operating elements helps ensure that the system is designed to operate as a safe and successful enterprise once construction is complete. Industry confirmed the benefits of bringing on an operator early during the design and development of the system to ensure it is built with an eye towards end-state operations.
- Managing integration is key to cost savings. Industry feedback from around the world has confirmed a significant opportunity to reduce the costs of constructing and maintaining the system through procurement approaches that encompass large, integrated, highly competitive contracts combining construction and long term maintenance and the transfer of asset performance responsibilities and risks to the private sector. Combining complex elements into system-wide procurements reduces duplication and the number of integration points. These procurements should have direct involvement from the operator as described above.
- Procurement packages should be structured to stimulate competition. Balancing a desire to reduce integration risk through large procurements, it is important to avoid mega-procurements that would limit the number of potential bidders. Based on past projects, industry consensus is that $3 billion to $5 billion is the current maximum contract size to maintain competition.

- Long-term performance driven contracts lead to lower construction and maintenance (lifecycle) costs. Industry has stated that including maintenance with construction under long-term performance based contracts, such as ones that include the design, build, finance, and maintain responsibilities, provides the flexibility and incentives needed to innovate and drive down costs for the long-term, especially for more complex system elements. Firms with extensive experience in delivering high-speed rail around the world have found the value of this innovation and perspective in similar projects they have been involved in.
- Risks should be allocated in a balanced and cost-effective manner. Industry was consistent in stating that risks should be allocated to the parties best able to manage them such that appropriate risks are transferred in a cost effective manner.

California High-Speed Rail Delivery Model

The functional delivery model that we have developed uses lessons from around the world and from requested industry feedback to structure upcoming procurements and define how the system will be delivered and operated once it is completed.

- Our objective is to provide California citizens a highly safe, reliable and commercially successful system while reducing the cost of constructing and maintaining the system and transferring operations and asset performance responsibilities and related risks to the private sector.
- Developing high-speed rail involves designing, constructing and integrating complex component parts into a seamless, safe and commercially successful system. We will work with two key private sector partners, a train operator and an infrastructure provider, to carefully manage technical and operational integration and connections between components and geographic segments to ensure efficiency and compatibility.
- Through every stage of the process, the State will provide policy oversight and appropriately manage the program to ensure that the public's interests are served.

"The benefits of a [Design Build Finance Maintain] (DBFM) approach can be substantial. The system can be available for public use sooner than with a conventional delivery approach – in this instance the time savings can be measured in years."

– Fluor/Balfour Beatty

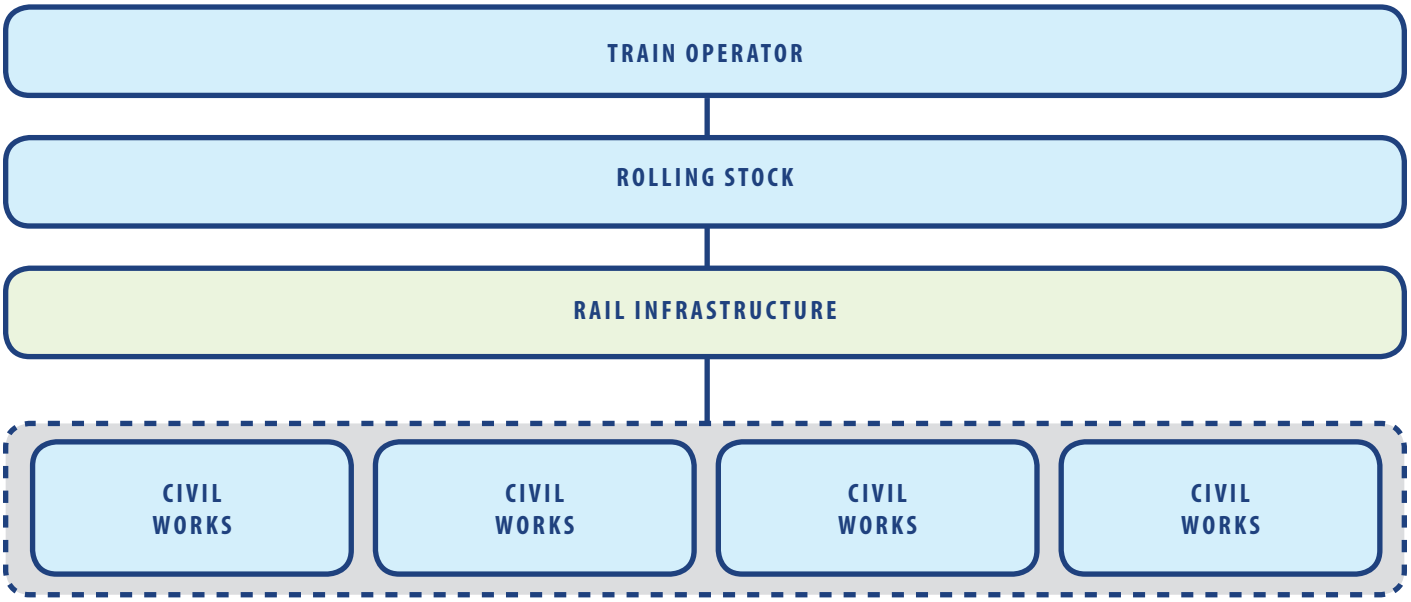
Key high-speed rail components include:

- Civil works (e.g. earth moving, tunneling, viaducts, trenches, etc.)
- Systems (e.g. signaling, communications, positive train control, etc.)
- Track
- Traction power and overhead catenary (electrification)
- Rolling stock
- Stations
- Facilities (e.g. heavy and light maintenance facilities)

DELIVERY MODEL

Our delivery model consists of different strategies for functionally delivering each of the major elements of a high-speed rail system – commercial and train operations, rolling stock, rail infrastructure (track, systems, and traction power), and construction of the civil works. Each element is unique and requires a delivery approach that is tailored to its characteristics and that, when combined, fit together into a commercially successful model. This section describes how our delivery model addresses each of these elements.

EXHIBIT 3.1 DELIVERY MODEL



Commercial and Train Operations

The operator will be brought on early and be involved in planning, commercial and operating decisions. Our operating model will mature over time and will always keep an eye fixed on long-term, safe and commercially viable operations.

The California high-speed rail program is not envisioned as just a series of construction projects but rather as a transportation network carrying riders between Northern, Central, and Southern California. Our operating model consists of three distinct phases:

EXHIBIT 3.2 PHASES OF OPERATIONS

PHASE	DESCRIPTION
Pre-Operations	Operational aspects of the system must be incorporated into the planning, design and construction of the system to ensure commercial viability.
Ramp-up	California high-speed rail brand is built and users begin adopting a new mode of transportation. This phase is critical to the success of the system.
Mature Operations	"Steady state" operations is the core operations phase and generates the most revenue after travelers adapt to the system and view it as one of the State's transportation options.

We will procure an operator early in the construction (Pre-Operations) phase under a flexible contract designed to support the maturing phases of the project. We believe this will add invaluable input during the planning and development stages of the system that can increase asset performance and revenues while reducing costs. We intend to transfer key operating and cost risks during the ramp-up phase and full revenue risk once revenues are proven.

Pre-Operations Phase

- We will develop the infrastructure based on operational goals and requirements. This is key to creating a sustainable, safe and financially successful service. The train operator must be at the forefront of the business model development and the technical decisions that support it. This initial work is anticipated to be structured as a management contract.

Ramp-up Phase

- Once in operations, we will strive to enhance ridership and revenue during the initial ramp-up period. The general public will become more aware of and more familiar with the system and the mobility and accessibility benefits it offers.
- Risks to be transferred early in the ramp-up phase will be finalized as part of the procurement planning process. This will be based in part on analysis of the level of competitive interest by the private sector and the costs of transferring risks early.

Mature Operations

- Towards the end of the ramp-up phase, we intend to complete the transfer of operating and revenue risks to the operator and the operator will become responsible for revenues, operations and maintenance costs. We will also monetize the future net cash flows (potential private investment that could be raised based on projected net cash flows) as part of an operating concession. The proceeds from the monetization will be used to fund the continued build out of the Phase 1 system (see Funding and Financing section).
- We will have a common operator across the entire system. While there are expected to be other users of joint system assets (for example in the Peninsula corridor), we plan to have a single end-to-end operator running the high-speed trains in California. As stated above, once revenues are proven, we will monetize future revenues through a concession procurement (See Section 6).
- To increase the attractiveness of the operating concession, the private sector needs to have the ability to make key decisions on issues including schedules and fares in order to meet its market goals. At the same time, we will develop guidelines for the concessionaire to operate within to protect the public interest.

ROLLING STOCK

Rolling stock performance is the key element of the passenger experience and must be safe, comfortable and consistent across the system. There are many rolling stock manufacturers around the world that are interested in providing the rolling stock for the system. Purchasing world class rolling stock with a proven safety record is vitally important to our delivery model.

- We will start by only purchasing the rolling stock that we need to begin running our service on the initial segment. This will help reduce capital costs in the short-term and allow us to adjust future rolling stock purchases to the system's evolving service plans and demand.

> ***"Appropriate risks to be borne by the private sector for the delivery of the civil works, track, traction power and infrastructure are design and construction execution risk, long term maintenance and rehabilitation of these elements (as it relates to delays, cost overruns and price escalation, for example). Risks that are best managed by the Authority are those typical in a P3 arrangement, and include risks relates to force majeure events, unforeseen geological conditions, governmental approvals, and appropriation of funding for payments during construction and availability payments, to identify a few."***
>
> *– ACS/Dragados*

- Over time, we will have the option to purchase additional trains as we continue to build out the full Phase 1 system. The purchase price formula for future trains will be locked in based on the initial procurement of trains.
- We will use a design-build-maintain or similar delivery model to contract for the purchase and long-term maintenance of rolling stock. This will link the design and manufacturing activities with the maintenance activities under one, long-term contract (30+ years) consistent with other systems in the world.
- The contract will be performance-based such that the rolling stock provider must meet certain performance criteria or else it will be subject to payment adjustments. This links performance to payment.
- Linking the maintenance with the design and manufacturing of the rolling stock under a performance-based contract will help ensure that the rolling stock is designed and manufactured in a quality manner and will allocate the risk and responsibility for long-term asset performance to the rolling stock manufacturer.
- As we near the end of the equipment life, we will have the flexibility to re-procure the rolling stock.
- The rolling stock procurement will be one of the early procurements and must encompass a process for early operator input. A long lead time is necessary to manufacture rolling stock.

RAIL INFRASTRUCTURE (TRACK, SYSTEMS, POWER)

Complex rail infrastructure elements, such as systems, track, traction power and overhead catenary should be compatible across the entire system and could be combined into a single procurement to enhance cost efficiency and reduce duplication and the number of integration points. Industry feedback was clear that the most integration and interface risk resides in the rail infrastructure components of a high-speed rail system. Through this contract, a major private sector company or consortia will be responsible for long-term rail infrastructure performance, integration with other elements, and cost.

- Industry feedback confirmed that there is significant opportunity to reduce the costs of constructing and maintaining the rail infrastructure and enhancing asset performance through a contracting model that encompasses large, integrated contracts that combine construction and long-term maintenance for several elements and allocates significant responsibility to the private sector under a performance based contract.

- We will procure a single rail infrastructure provider under a long-term (30+ years) contract that could include financing.
- There should be one signaling and communications system across the entire high-speed rail network to ensure performance and reduce interface risk across the geographical segments.
- The initial procurement will be for the rail infrastructure on the first operating segment and may be combined with additional option pricing to extend the rail infrastructure to the full Phase 1 build out. If the option pricing is not included or the option is not executed, we will procure additional contracts that will be compatible with the initial procurement.
- The rail infrastructure provider will be a key long-term partner along with the operator and will be responsible for integrating the other elements of the high-speed rail system (rolling stock, civil works, facilities) such that the system works seamlessly both horizontally (across geographical segments) and vertically (between different elements).
- We will contract with the rail infrastructure provider under a long-term performance based contract with performance tied to payment. If the infrastructure provider fails to perform, then payment deductions will be incurred.
- The infrastructure provider will be responsible for maintaining the underlying civil works across the system.

CIVIL WORKS CONSTRUCTION

We will continue to leverage our strategy that has led to bids for three design-build construction contracts in the Central Valley priced hundreds of millions of dollars under our estimates and offering valuable design innovations.

- We have been successful in using a design-build delivery model for developing the civil works thus far. This model is consistent with many transportation projects around the country.
- The design-build model incorporates innovative procurement and contracting concepts, such as Alternative Technical Concepts, to drive innovation by the private sector.
- The design-build model combines design and construction into one contract performed, usually, by a joint venture. This helps ensure that the design takes into account construction techniques and more of a contractor's view. Design-build contracts can reduce change orders that drive cost overruns and can deliver projects more quickly.
- Design-build contracts are evaluated on a best-value basis by looking at both the technical solution and the cost (i.e., it is not just a low bid). The three design-build contracts in the Central Valley were weighted 30% technical/70% cost.
- Maintenance of the civil works packages is less complex technically and requires less maintenance than some of the other, more complex high-speed rail components. Because of that, we believe maintenance responsibilities can be transferred to a third party, such as the infrastructure contractor, after construction is complete and an extended warranty period by the construction contractor. This third-party will manage the interfaces between the design-build contracts
- While we anticipate using design-build for the next set of civil works contracts, we will continue to consider other innovative procurement models, such as design-build-finance-maintain contracts, for selected complex contracts such as tunneling.

PROCUREMENT PLAN

As highlighted above, the delivery and operation of a high-speed rail system involves procuring numerous elements and integrating them into one, contiguous operating asset. Our procurement plan involves phasing numerous procurements over time based on availability of funding, the goal of driving competition, and meeting schedule targets.

- **We will structure procurement packages to stimulate competition.** The number of firms bidding for a contract drives competition. Competition has already contributed to hundreds of millions of dollars of savings on the three design-build contracts in the Central Valley. Based on industry feedback and past projects, the current recommended maximum contract size could be $3 billion to $5 billion.
- **We will procure contracts based on availability of funding and financing.** Following the principles described in Section 2, when laying out the procurement roadmap for an operating segment, we will match procurement structures and schedules with the availability of funding and financing to ensure that sufficient funds are available to deliver an operating segment.
- **We will advance procurement on contracts based on progress in achieving environmental approvals (i.e., RODs) to provide the private sector with greater certainty.** We will advance procurements only once there is sufficient certainty in the environmental process (e.g., alignments are selected) for the private sector to expend significant resources in developing their bids. Industry feedback was consistent in stating that approvals (e.g., environmental, third party) must be in place before expending significant bid cost. We will not advance to the final stages of a procurement or sign a contract until we have environmental approvals.
- **We will incentivize innovation by the private sector.** Incorporating opportunity and incentives for innovation in procurements, such as Alternative Technical Concepts, brings out technical solutions that can benefit the public. Creating an environment that encourages innovation is critical to constructing the highest quality system. We will continue to do that throughout our procurements and also through our Unsolicited Proposals Policy, which allows the private sector to bring new ideas for us to consider in a formal and structured way.
- **Over the next twelve months, we plan to begin the procurements for rolling stock and an early operator.** As highlighted above, rolling stock requires a significant lead time due to the design and manufacturing processes and an operator should be engaged as soon as possible to ensure that the perspective of a train operator is considered in the planning and design of the civil works, infrastructure, rolling stock, and facilities. Therefore, we plan to initiate procurement activity for the rolling stock and early operator within the next twelve months.
- **We will continue to procure civil works on a segmented basis subject to available funding and requisite approvals.** The design-build contracts for civil works outside of the Central Valley will continue to be procured on a segmental basis subject to availability of funding and securing approvals. Releasing these contracts on a segmental basis will help ensure that there is sufficient contractor capacity to perform the work.
- **Where feasible and advantageous, we will utilize a public-private partnership model to deliver elements of the program.** Industry feedback suggest that long-term performance driven contracts can reduce costs and increase efficiency.

- **Tunneling contracts will need to be procured before other civil works contracts.** Similar to the rolling stock contract, the tunneling works are long lead time activities due to the complex nature of tunneling. Contractors must procure the necessary tunneling equipment which can take longer than normal construction equipment. Therefore, tunneling contracts must be procured earlier than other civil works contracts. We will seek to procure tunneling contract as soon as the environmental approvals and funding are secured.
- **We will incorporate flexibility into procurements to allow for individual contractors to deliver the rolling stock, train operations, and infrastructure across the entire system.** As highlighted above, certain high-speed rail elements must be consistent across the entire system. These include rolling stock, systems, and train operations. We will incorporate flexibility into procurement by, for example, including option pricing, so that we can partner with one contractor for each of these elements over a phased implementation approach. This provides us with the flexibility to continue partnering with the same entities if we desire.

EXHIBIT 4.1 HIGH-SPEED RAIL SYSTEM

Section 4: *Implementation Strategy*

As prescribed in statute, the Authority's mission is to complete the high-speed rail system between San Francisco and Anaheim while also continuing planning for Phase 2 sections. As we develop the system, we are focusing on delivering short-term improvements to local corridors, mid-term regional corridor benefits and full-term integration of high-speed rail into key high capacity urban corridors to complete the integrated statewide passenger rail network. To achieve this, the state and the Authority propose to broaden the scope and accelerate the implementation of the statewide rail modernization program, aligning it more closely with high-speed rail implementation in order to deliver both programs through a single, integrated strategy. Through this strategy, the heavily congested urban rail corridors in northern and southern California will realize significant near-term benefits from increased safety, system capacity and service frequency and reliability and the Central Valley will become more connected to the state's other economic centers.

A focus on statewide rail modernization will deliver:

- Focused, strategic early investment projects that improve the speed, safety and efficiency of existing services
- Expanded and improved regional and interregional passenger rail services
- New infrastructure that will streamline the ultimate delivery of high-speed rail
- Mobility and environmental benefits across multiple stakeholders and communities, including significant benefits within disadvantaged communities, at each stage of development
- More benefits through integration than can be accomplished independently by leveraging existing funds and attracting new funding sources

This integrated, phased approach brings more benefits sooner and is made possible through stronger partnerships, new funding sources and the state's programmatic, holistic approach being developed for the 2018 State Rail Plan and network integration activities.

The Legislature's and Governor's long-term commitment of Cap and Trade proceeds to the program has re-positioned the Authority for delivering the high-speed rail system. While construction has begun in the Central Valley, for the rest of the system we have been primarily a planning organization. With this new funding, we are now positioned to deliver the first operating high-speed rail line in the country by expanding beyond the Central Valley.

The challenge of constructing a system of this length and complexity, daunting in its own right, is made greater by the legal and market constraints imposed on the program by Proposition 1A. Access to the bond funding necessary for construction depends on showing that a segment can be built that is self-sustaining in terms of fare revenues and revenues from other sources. That means that a segment must span a sufficient number of travel markets in order to generate the requisite ridership and associated revenues. Private sector interest, which is very high, cannot be converted to investment in the early stages of program development because Proposition 1A forbids the payment of any subsidy to mitigate market risk. Accordingly, the private sector funds will come after ridership and revenue is demonstrated. These

constraints lead to a logical system development sequence where public dollars are spent first to thereby unlock private sector dollars.

With our new revenue stream, and within this context, we are focused on three objectives:

- **Initiate high-speed rail into passenger service as soon as possible**
- **Make strategic concurrent investments throughout the high-speed rail corridor that can be linked together over time, and**
- **Position ourselves to advance additional segments as funding becomes available.**

These objectives were used to evaluate how best to sequence the program. We identified a line between San Jose Diridon Station and an interim station north of Bakersfield as the first line for high-speed passenger rail service.

CONNECTING SILICON VALLEY TO THE CENTRAL VALLEY

This Silicon Valley to Central Valley line is the most rational approach for how and where to start sequencing the system based on current circumstances. While previous plans included a phasing plan that started with an initial line between Merced and the San Fernando Valley, the Silicon Valley to Central Valley line can be delivered with available and allocated funds, is compliant with Proposition 1A, can generate operating revenue sooner and, with the sale of an operating concession, will accelerate our access to private capital to fund additional construction. We are also setting a high priority on extending this initial line to the north into San Francisco, to provide a one-seat ride, and to the south into Bakersfield as quickly as possible.

Connecting the Silicon Valley to the Central Valley

The Silicon Valley to Central Valley line will enable people to connect and work at high-tech jobs in the Silicon Valley and San Francisco while having greater access to more affordable housing options in cities like Gilroy, Merced and Fresno who are already working on plans to create vibrant, livable districts around high-speed rail stations. These new connections will foster economic revitalization, affordable housing and workforce development goals.

SILICON VALLEY TO CENTRAL VALLEY LINE –WHAT IT MEANS

Connecting the Silicon Valley to the Central Valley will usher in a new era of transportation and have a transformative effect as it creates new connections and access. The impact of this line will be inestimable in terms of the economic impacts within each region. Silicon Valley is the indisputable engine of economic growth in California – home to many leading edge global companies including Apple, Google, Intel and Facebook among others. Its industries have led the world in innovation and no region of America or the world has seen more start-up technology companies grow so quickly into global enterprises

"The Bay Area economy is threatened by a shortage of housing and high housing costs that make it difficult for many workers and their families to live in the region where they work. This is both an economic competitiveness and family challenge. High speed transportation connections between the Bay Area and adjacent areas including Central Valley communities can provide affordable housing and fast car free commuting while at the same time providing support for vibrant downtown areas in these communities."

- Stephen Levy
Director and Senior Economist
Center for Continuing Study of the California Economy

of enormous market influence. Yet the Silicon Valley/Bay Area region faces persistent challenges in terms of providing adequate affordable housing for its workforce causing dislocations in transportation and land use.

The socio-economic realities of the Central Valley offer the contradictions of great wealth from an agricultural sector that supplies much of the nation's special fruits, nuts and vegetables atop a stratum of poverty and persistently high unemployment. There is a significant lack of economic diversity in this region, employment opportunities are more limited and there are manifold challenges in terms of employment and a sustainable environment. Downtown areas in key cities are in need of revitalization and leaders in those communities are endeavoring to find catalysts to support their redevelopment goals.

By building the Silicon Valley to Central Valley Line, we can reduce the trip time from Fresno to the Bay Area from about 3 hours driving today to about an hour on high-speed rail. The opportunity to connect these two regions and their unique economies—to help bring about jobs and housing balance through effective land use and transit oriented development—and to provide for fast, efficient connections to Silicon Valley employment centers could spark significant economic growth in the Central Valley and sustain economic prosperity in Silicon Valley.

While the focus for the past few years has been on the first area of major construction in the Central Valley, we have also been moving forward to lay the foundation for high-speed rail in the Northern California region. We are proceeding with environmental review and working with regional partners and stakeholders to determine the best, most efficient ways to integrate the high-speed rail system into local communities.

"High-speed rail trains are a necessary addition to the airport's current flights that serve passengers flying from the Bay Area to Southern California. In fact, due to runway configuration and geographic location on the water there is no space to accommodate increasing flight demand through expanded capacity without engaging in extensive Bay fill. And that was unsuccessfully tried several years ago."

– Julian Potter
Chief Administrative and Policy Officer
San Francisco International Airport

Connecting Northern California to the Central Valley will include significant station improvements creating new multimodal connections in northern California – San Francisco, Millbrae, San Jose and Gilroy – and new linkages to stations being planned in Merced, Madera, Fresno and Kings/Tulare in the Central Valley. These investments and linkages will enhance the commercial and retail opportunities at each station, increasing the economic activity in and around them.

- In 2014, the City of Gilroy and the Authority entered into a station planning agreement to work together to develop a station area plan that will serve Gilroy, south Santa Clara County and surrounding areas. Gilroy will become a new gateway to the Bay area bringing new opportunities for redevelopment and economic growth.
- Connecting high-speed rail into the Diridon Station in San Jose (the tenth largest city in the nation) will provide connections to Bay Area Rapid Transit (BART), Altamont Corridor Express, Caltrain, Santa Clara Valley Transportation Authority light rail and buses, Amtrak's Coast Starlight service and the Capitol Corridor (Amtrak). In April 2016, we entered into a station area planning agreement with the City of San Jose and our transportation partners to develop new intermodal transportation opportunities in the region and encourage transit-oriented development and smart growth policies around it.

- In addition to transit, rail and ground connections, the Millbrae Multi-Modal Station will facilitate a connection to San Francisco International Airport (SFO) allowing Central Valley residents to connect quickly and efficiently to SFO for national and international travel.
- We have entered into a Memorandum of Understanding (MOU) with the Peninsula Corridor Joint Powers Board to enhance the existing rail corridor between San Francisco and San Jose by fully electrifying the Peninsula Rail Corridor. These improvements will allow the high-speed rail system to eventually blend with the Caltrain commuter rail system. Caltrain is also installing an advanced signal system that will significantly improve performance and enhance safety on the corridor.

CONNECTING MERCED TO SAN JOSE AS PART OF INITIAL OPERATIONS

Connecting the cities of the Central Valley to those of the Silicon Valley and the broader Bay Area will tie together the regions as never before, and create unprecedented economic opportunities for residents of the Central Valley. In large part due to the jobs-housing imbalance in the Bay Area, travel between the northern San Joaquin Valley and the Bay Area is growing significantly, putting increased pressure on roads and existing passenger rail systems. At the same time, air quality issues continue to be a challenge for the Central Valley. Long trip times of 2 to 3 hours reduce productivity and impose hardships on travelers. For those reasons, the State and regional leaders are working together to ensure that Merced is part of the first operations of the high-speed rail system.

Travel times will be reduced to approximately 45 minutes, and travel will be on non-polluting electric trains that will provide service well matched to demand, helping support the jobs-housing balance in the Northern California mega region. Passengers will be able to make connections at San Jose Diridon Station to Caltrain, planned BART service, the Capitol Corridor and Altamont Corridor Express trains and Santa Clara Valley VTA light rail trains, dramatically shortening trips to a variety of Silicon Valley and Bay Area destinations. These connections will not only help address environmental and jobs-housing imbalance issues, but also allow greater interaction between and access to institutions of higher learning, including UC Merced.

To Authority is adopting a goal of opening-day Merced service and to achieve that is committing to a number of steps, including:

- Working with City of Merced and County of Merced officials, the Authority is developing plans to provide a single-track option for connecting to Merced, as well as initially constructing only the leg of the "wye" that will tie Merced to the Bay Area. These and other options will be further developed based on engineering, operations and financial factors. Ultimately, as part of the completion of the Phase 1 system, a two-track connection to Merced and full buildout of the "wye" will be completed but the immediate goal is to connect the Merced and Silicon Valley/Bay area regions together.
- Completion of the environmental reviews necessary to prepare for the Merced to San Jose connection; that work is funded and underway
- Continuing work with the City of Merced to plan for the sustainable development of the station and surrounding areas
- Extending current high-speed rail construction north to enhance connectivity with San Joaquin intercity service. In March 2016, the Authority extended the northern terminus of its first construction section in the Central

Valley, adding a 2.7 mile northward extension. This northern extension expands the work on an environmentally cleared section and will create an important connection to San Joaquin intercity passenger rail service at the Madera Amtrak station.

- Working to identify cost savings on the Silicon Valley to Central Valley system that can be applied in part to accelerate investment in the connection to Merced.
- Analyzing ridership and revenue to ensure that operations will continue to meet statutory requirements
- Working with partners to identify and secure potential funding sources.

The Authority is working with the City of Merced and the County of Merced to implement this strategy and will develop a formal agreement to proceed.

Completing a high-speed rail connection between Northern and Central California will change how people travel, work, live and play. Reducing travel times, providing access to jobs and transportation options will improve mobility, quality of life, economic opportunity and air quality.

BURBANK TO ANAHEIM CORRIDOR IMPROVEMENTS

Even as we advance the Silicon Valley to Central Valley line, we are reiterating and reinvigorating our commitment to work with our state and regional partners to fulfill our commitment, as embodied in a 2012 Memorandum of Understanding, to collaborate on and accelerate regionally significant concurrent investments in Southern California. These connectivity projects can be completed incrementally and provide significant near-term improvements which will benefit passenger, freight and auto traffic. They will also serve as building blocks for high-speed rail service in California. Through this Memorandum, we are working with our partners to leverage resources, work together to secure new funding, identify and fund projects ready to move into construction (or advance others through environmental clearance) and advance improvements as quickly as possible.

The approximately 45-mile rail corridor connecting Burbank-Los Angeles-Anaheim is of regional and statewide significance and is critical to supporting the economy of Southern California. In addition to moving people, it is a vital freight and goods movement corridor. It is part of the nation's second busiest Amtrak line, is serviced by Metrolink commuter rail service and it will be an essential link in the statewide high-speed rail system. It connects some of California's most significant tourist, entertainment, cultural and business destinations.

The corridor contains key stations that will provide significant connectivity benefits, both intra-regionally and inter-regionally. Burbank, Los Angeles Union Station, Anaheim (and a potential station at Norwalk/Santa Fe Springs or Fullerton as well as a potential connection to Los Angeles International Airport) will be model intermodal facilities, tying together rail, aviation, local roads and freeway connections.

Consistent with the agreement for the development of the master plan for Los Angeles Union Station, the Authority will work with the Los Angeles County Metropolitan Transportation Authority, Metrolink and other partners to make sure that the design of the facility cost effectively meets the service needs

Vital to the economy and the environment

BNSF uses this corridor to connect the Ports of Los Angeles and Long Beach, busiest port complex in the nation and the eighth largest in the world, with the busiest intermodal yard in the country. In 2010, 1.5 trillion tons of goods worth $2 trillion moved through Southern California.

The Amtrak and Metrolink passenger service in Southern California accounts for over 14 million passengers per year, providing a regional alternative to travel on the I-5 freeway and local roadways, thus reducing regional greenhouse gas emissions.

A Critical Investment With Major Benefits

The Rosecrans/Marquardt Avenue Grade Separation Project is one of the priority projects identified in the 2012 Memorandum of Understanding. The California Public Utilities Commission has identified it as the most hazardous grade crossing in California. When complete, it will yield significant traffic, safety and air quality benefits. Passenger rail services throughout the region will dramatically improve – allowing service to the Inland Empire to more than double from Los Angeles. Orange County could also see a greater than 50% increase in rail service as well.

High Capacity Urban Corridor Investment

By bringing together several individual projects along corridors, that benefits include:

- Immediate travel time savings and improved reliability for existing freight and passenger trains
- Unlocking new capacity which will position existing operators to attract more riders and generate more revenue
- Greater reliability and fluidity of freight and goods movement
- High-speed rail corridor readiness
- Significantly improved corridor safety
- Significantly reduced GHG emissions in the corridor

of all operators. The Authority will also identify improvements necessary for its operations that need to be cleared through its ongoing environmental reviews for the corridor.

Since the adoption of a the 2012 Southern California Memorandum of Understanding, the Legislature's appropriation of Proposition 1A funds for bookend investments in the region and in commitments in our 2012 and 2014 Business Plans to develop a way to provide cost-effective one-seat ride service to Anaheim, we have worked with regional partners and the California State Transportation Agency to advance planning and project development in the corridor. We worked to achieve early approval and release of those funds for construction of regionally significant connectivity projects totaling $367.6 million which has included funding for the Regional Connector Transit Corridor project in Los Angeles, positive train control investments to improve safety throughout the region and improvements to the existing Blue Line Trolley in San Diego.

Work will continue with those operating in the corridor to address future issues involving shared service, including railroad signaling, maintenance and agreements. Coordination with freight railroads will continue to ensure agreement on design, construction and operational issues.

This is a shared corridor, which means when it is improved, the enhancements will benefit not only high-speed rail but immediately improve freight and commuter rail operations as well.

By collaborating with our partners who already use the corridor, together we can deliver:

- Focused, strategic early investment projects—like grade separations– that increase capacity and improve the speed, safety and efficiency of existing passenger and freight services
- Expanded and improved regional and interregional rail services
- New infrastructure that will lay the foundation for the high-speed rail system such as new tracks between Los Angeles and Anaheim
- Mobility and environmental benefits, including greenhouse gas reductions including significant benefits to disadvantaged communities

This will be made possible by leveraging existing funds and attracting new funding sources, forging stronger partnerships and working through the State's programmatic, holistic approach being developed for the 2018 State Rail Plan. Potential funding sources that can be tapped are described in Chapter 6 of this plan.

By working together we can bring greater benefits to more people sooner – we will seek to:

- Advance significant rail projects more rapidly through the environmental clearance, design, construction and operation phases.
- Broaden and widen benefits by bringing different owners, users and operators together so each investment accrues across more services and brings more benefits.
- Increase corridor capacity in the near term, laying the foundation for significant regional service growth to the Inland Empire, Orange County and San Diego County.
- Complete key safety improvements by eliminating some of the most dangerous grade crossings in the State and providing relief to one of the most congested railway corridors in the country.
- Reduce greenhouse gas emissions and criteria pollutants providing relief to the many disadvantaged communities immediately adjacent to the corridor that currently experience some of the worst air quality in the State.
- Create jobs during construction and improve access to jobs once improvements are complete through improved mobility.
- Achieve the full benefits of corridor investments made by local, regional, state and federal government as well as freight operators over many years by completing the Rosecrans/Marquardt grade separation and by investing in reliability improvements between Los Angeles and Fullerton allowing Amtrak and Metrolink to substantially increase service.
- Allow for growth in both future passenger and freight in this key commuter and trade corridor by preparing for further investments which will improve the reliability of freight and passenger operations.
- Tie-in to a potential future high-speed rail line to Las Vegas by advancing this corridor and preparing the way for the Burbank to Palmdale section.

IMPROVING THE CORRIDOR THROUGH PACKAGES OF PROJECTS

Exhibit 4.2 shows an initial package of projects that can be advanced quickly, provide immediate benefits and is integral to sequencing in high-speed rail service in the Burbank-Los Angeles-Anaheim corridor. Every project will be used for high-speed rail once service starts in the corridor. This represents an initial package of improvements that can be advanced immediately.

This initial package of improvements builds on efforts taken by regional agencies to advance key projects of benefit to multiple stakeholders. We will work alongside these regional partners and Caltrans, under the leadership of the State Transportation Agency. This package includes several technical studies and the advancement of environmental clearance for the corridor in order to also set the stage for future packages that are shovel ready. We will seek to increase the number of projects that can be completed by leveraging additional funding sources, including the Transit and Intercity Rail Capital grant program, funded by Cap and Trade proceeds, as well as new federal programs targeting rail-highway safety projects and freight corridors.

As technical studies are completed and projects go through the environmental process, we will identify additional packages of projects to move forward. This will culminate in a final package of investments for running high-speed trains in the corridor. On the way, each package or project will have independent utility and be able to improve both passenger and freight rail in Southern California in this key corridor.

EXHIBIT 4.2 BURBANK TO ANAHEIM CORRIDOR IMPROVEMENTS

IMPROVEMENT	FACTS & BENEFITS
Doran Street Grade Separation **- Glendale**	• Being advanced by Los Angeles County Metropolitan Transportation Authority in partnership with Metrolink, the City of Glendale, and the California High-Speed Rail Authority • Safety improvement that eliminates two existing at-grade crossings: Doran and Broadway-Brazil
Full Funding through Design of the Southern California Regional Interconnection Project (SCRIP) **- Los Angeles**	• Being advanced by Los Angeles County Metropolitan Transportation Authority in partnership with Metrolink and the California High-Speed Rail Authority • Run-through tracks at Los Angeles Union Station and concourse expansion identified in the Union Station Master Plan • Increases capacity, increases operational flexibility, improves reliability and reduces green-house gas emissions while helping coordinate service between different users
Rosecrans Avenue/ Marquardt Avenue Grade Separation **- Santa Fe Springs**	• Being advanced by Los Angeles County Metropolitan Transportation Authority in partnership with the City of Santa Fe Springs, BNSF, Metrolink, LOSSAN, Riverside County Transportation Commission, and the California High-Speed Rail Authority • Regional safety improvement that grade separates the #1 project on the California Public Utilities Commission list • Completes the triple track on the BNSF San Bernardino subdivision between Redondo Junction and Fullerton adding over 30 additional passenger slots on the segment, which allows for increases in the level of service for both Amtrak and Metrolink • Fully integrates service planning for express, regional, and commuter services as well as long distance trains to provide dramatic benefits in trip time, schedule reliability, and capacity
State College **- Anaheim**	• Grade separation project that is the 27th highest priority grade crossing on the CPUC grade separation list. • Significant reduction in roadway emissions. • Improved emergency vehicle movements.
Fullerton Junction and Station Improvements **- Fullerton**	• Track and platform modifications through western Fullerton, Fullerton Station, and Fullerton Junction • Increases capacity and provides greater separation between passenger and freight trains, allowing more reliable passenger and freight operations between Riverside and Orange County, and improved freight capacity • Likely leads to several minutes of travel time reduction for Metrolink and Surfliner trains
Technical Analysis to Guide Future Investments	• Can be advanced by the California High-Speed Rail Authority in partnership with LOSSAN, Caltrans, and Metrolink • Study of cross-operator maintenance facility optimization on how existing sites could be best utilized across operators in order to leverage the limited space available, reduce operating costs and avoid congestion on mainline tracks due to deadhead moves • High-capacity signaling analysis to fully utilize infrastructure and optimize time tables

Full Utilization of New Locomotives & Full Implementation of Positive Train Control	• Replacement of Tier 0 locomotives with Tier 4 locomotives by Caltrans and Metrolink • Full implementation of positive train control in the corridor being led by Metrolink (in conjunction with BNSF) • Delivers greenhouse gas reduction, better passenger train performance, and improved safety
Full Funding through Environmental Clearance of High-Capacity Urban Corridor between Burbank and Anaheim for Future High-Speed Rail Service and Existing Users	• Advance all remaining Southern California MOU projects in this corridor through preliminary engineering and environmental clearance preparing the corridor to advance to construction of high-speed rail and related projects while positioning future programs of projects to be competitive for funding opportunities • Includes opportunities for additional tracks, full grade separation, controlled access and other infrastructure enhancements that provide safety, reliability, capacity, travel time and other benefits • Specific projects that would be environmentally cleared and could be part of this or a further package of projects include: Ball, Orangethorpe Grade Separations, BNSF Storage Track and Norwalk Boulevard/Los Nietos Road Grade Separation.

EXPANDING OPERATIONS IN SOUTHERN CALIFORNIA AND COMPLETING PHASE 1

Completing the Phase 1 high-speed rail system to Southern California to close the passenger rail gap and link the most populous region of the state to the Central Valley and Northern California will tie the State together as never before, and create unprecedented economic opportunities. In large part due to regional jobs-housing imbalances around the state, goods movement pressures, and tourism, travel to and from Southern California has grown significantly, putting increased pressure on roads, airports and existing passenger rail systems. At the same time, air quality issues continue to be a challenge in the South Coast Air Basin. Long trip times from outlying areas to job centers in Los Angeles, Orange County, San Diego and other key areas of two or more hours reduce productivity and impose hardships on travelers. For those reasons, the State and regional leaders are working together to ensure the entire high-speed rail system is completed. On a high-speed train rail trips not currently available between Kern County and the Los Angeles Basin would take less than one hour, and travel times between key areas like the Antelope Valley and San Fernando Valley will be cut from just under 2 hours to about 20 minutes. All these trips will be on non-polluting electric trains that will provide service well matched to demand, helping support the jobs-housing balance in the Southern California mega-region. Seamless connections extend these benefits throughout the region as follows:

- ***From Palmdale:*** Connections to the Antelope Valley and the Airport, and future connections to the Inland Empire at Victorville, and Las Vegas
- ***From Burbank:*** Connections on Amtrak and Metrolink to Ventura, Santa Barbara, San Luis Obispo, and Santa Clarita
- ***From Downtown Los Angeles (LAUS):*** Connections to the Inland Empire via Metrolink and to Metro services serving Hollywood, the San Gabriel Valley, East Los Angeles, Long Beach, and future connections to Los Angeles International Airport and Santa Monica
- ***From Santa Fe Springs/Norwalk, Fullerton, and Anaheim:*** Connections on Amtrak and Metrolink south to San Diego, and east to Riverside and Perris Valley, thus shortening trips to a variety of commuter and tourist destinations.

To advance the goal of completing the southern portion of Phase 1 and realizing these benefits the Authority is committing to a number of steps, including:

- Completion of the environmental reviews necessary to prepare for the approximately 170 mile Bakersfield to Anaheim connection. That work is funded and underway.
- Application of Cal Enviroscreen during the environmental analysis to identify and consider impacts to disadvantaged communities during the preparation of the environmental documents.
- Implementation of thorough stakeholder and community outreach including structured activities to understand regional and community priorities that can be reflected in the environmental documents in order to multiply the benefits of the HSR investment
- Completion of MOU projects to fully meet the $1 billion commitment in the 2012 Memorandum of Understanding (MOU) and provide immediate relief at key "pinch points" like Los Angeles Union Station, the Rosecrans Marquardt Grade Separation, areas of single track and other grade separations along some of the most frequently traveled rail lines that radiate out from the urban Burbank to Anaheim mobility corridor to San Diego, San Bernardino, Riverside, San Luis Obispo, and Santa Clarita. Projects funded will be consistent with regional priorities, project readiness, and the magnitude of operational benefits. The Authority, in conjunction with the State and local metropolitan planning organizations (MPOs) will maintain the prioritized list and work with local agencies to keep it up to date, monitor progress, and develop implementation schedules and funding plans.
- Developing specific plans to advance MOU projects which are ready for additional project development and/or construction funding, utilizing high-speed rail Phase 1 and Phase 2 funding where eligible, and identifying other available funding sources for the balance of project scope. The projects that have been regionally identified beyond those in Exhibit 4.2 include:
    - Brighton to Roxford Double Track in Los Angeles County
    - Orangethorpe Avenue Grade Separation in Orange County
    - Ball Road Grade Separation in Orange County
    - McKinley Street Grade Separation in Riverside County
    - Jurupa Road Grade Separation in Riverside County
    - Lilac to Rancho Double Track in San Bernardino County
    - San Onofre to Pulgas Double Track in San Diego County
    - Eastbrook to Shell Double Track in San Diego County
- Advancing concurrent investments in the urban mobility corridor between Burbank and Anaheim to improve freight and passenger service by identifying additional "building blocks" of future high-speed rail service that have early, independent utility. By addressing operational conflicts at junctions, goods movement facilities, and in other key locations, immediate benefits can be realized that set the stage for service increases, robust timetable implementation, and future high-speed rail service. Further operational analysis and project definition is needed to determine the phasing of the projects and operations and financial factors. This effort will include full dialogue with infrastructure owners and operators to ensure compatibility of blended service with other passen-

ger and freight rail services, as well as detailed dialogue around operational requirements of multiple operators at Union Station

- Continuing work with the Cities of Palmdale, Burbank, Los Angeles, Santa Fe Springs/Norwalk, Fullerton, and Anaheim to plan for the sustainable development of the stations and surrounding areas.
- Analyzing ridership and revenue to ensure that operations will meet statutory requirements and continually assess the P3 potential so private investment can be brought at the right time to support the schedule and maximize the amount of the investment.
- Working with partners, above and beyond the MOU commitment mentioned above, to grow available funding by bringing the widest possible variety of funding sources together to complete programs of projects that deliver operational benefits for passenger and freight services.

The Authority is working with the partners across the region to implement this strategy in accordance with the Southern California Memorandum of Understanding, and will develop additional formal agreements, as necessary, to proceed.

TYING THE NORTH AND SOUTH TOGETHER

The Authority has identified the high priority it is placing on pursuing additional funding for both the Silicon Valley to Central Valley extensions to San Francisco, Merced and Bakersfield as well as the Burbank to Anaheim Urban Mobility Corridor. These investments are tied together to deliver critical statewide benefits in two important ways:

First, investing in the Urban Mobility Corridor between Burbank and Anaheim, including the SCRIP project at Los Angeles Union Station, delivers critical near term service benefits for Southern California that will make major contributions to increasing the use of public transportation in Southern California while laying the groundwork for high-speed rail's arrival from the north.

Second, adding the three extensions to the Central Valley to Silicon Valley line dramatically increases the value of the system to a future concessionaire. It grows ridership and revenue dramatically. Bakersfield and San Francisco extensions alone increase revenue and ridership by over 50% as discussed in more detail in Section 7 of the Business Plan; positive growth by adding Merced would increase the value even more. The greater concession value in turn increases the private investment which, in turn, accelerates the construction of investments tying Burbank to Palmdale and Palmdale to Bakersfield.

The success of the Silicon Valley to Central Valley concession is thus of critical importance to accelerating the delivery of the entire Phase 1 high-speed rail system, tying the interests of Northern and Southern California together.

NEXT STEPS FOR DELIVERING HIGH-SPEED RAIL SERVICE TO CALIFORNIA

- Over the next few years, we will complete the environmental clearance for the entire Phase 1 system – focusing first on clearing the remaining sections for the Silicon Valley to Central Valley line
  - Through this process final alignments and station locations for the entire Phase 1 corridor will be identified
  - This will provide certainty to communities along the line, allowing them to plan and make land use decisions

- It will also enable us to work collaboratively with our transportation partners in planning for multimodal connections and the development of a statewide passenger rail system

→ Concurrently, we will finalize and initiate the procurement strategy described in Section 3 to advance construction of the Silicon Valley to Central Valley line; at the same time we will seek federal funds to extend this line to San Francisco, Merced and Bakersfield.

→ Even as we construct this line, we will work with our partners on the Burbank to Anaheim Corridor Investments in Southern California.

→ We will continue to pursue additional funds and opportunities to complete the Phase 1 system with the goal of expanding service to the entire route from San Francisco/Merced to Los Angeles/Anaheim by 2029.

This is a prudent and realistic strategy for delivering the Phase 1 high-speed rail program in California. It is consistent with our three overarching objectives and our principles and the intent of Proposition 1A. With ongoing Cap and Trade proceeds, we are in a position to deliver California's first operating high-speed rail line. As we move forward, we will continue to evaluate new circumstances, options and strategies that may allow us to deliver the system better, faster, or cheaper and may evolve our approach over time.

PLANNING FOR PHASE 2

Proposition 1A prioritizes the delivery of the Phase 1 system and restricts our ability to spend construction funds on Phase 2 until it is complete. At the same time, Proposition 1A recognizes the value of advancing Phase 2 planning as do we, the Legislature and the California State Transportation Agency. Doing so will enable the Authority and local and regional stakeholders to identify corridor improvements that might be made in anticipation of future high-speed rail service. Similarly, it will enable local and regional land use planning decisions to be made with future high-speed rail in mind. To that end, we are working closely with local partners to continue planning activities in between Los Angeles and San Diego, Merced and Sacramento, and over the Altamont Corridor, as described below. At the same time, we are collaborating with the California State Transportation Agency and Caltrans on the development of the 2018 State Rail Plan, which will advance additional efforts to develop a seamless statewide transportation network. As the high-speed Rail system grows to include the entire Phase 1 service, similar opportunities will exist in the Bay Area, the Central Valley and Southern California to begin to extend the benefits of Phase 1 service into Phase 2 corridors.

Northern California

In the Central Valley and Northern California, these efforts will clearly identify the local and express service needs between Madera, Merced and the rest of the Northern Valley and Sacramento, as well as between the Central Valley and the Bay Area over Altamont. The outcome of these planning efforts will ensure that the most effective investment is pursued that supports the service needs of local communities as well as statewide mobility. Near term service improvements that leverage local, state and federal funding sources will be pursued through continued expansion of integrated Amtrak San Joaquin and Altamont Corridor Express services, while also defining how such service improvements lay the groundwork for full Phase 2 high-speed rail service in the future. The Authority is committed to pursuing Phase 2 and Altamont Corridor planning efforts, as addressed through spending appropriations for these corridor segments as identified in SB 1029. The Authority's partners in these corridor planning efforts will include the City of Merced, the County of Merced, the Central Valley Rail Working Group, the California State Transportation Agency, the Capitol Corridor Joint Powers Authority, the San Joaquin Regional Rail Commission and the San Joaquin Joint Powers Authority.

Southern California

In Southern California, similar efforts will focus on the Los Angeles-Inland Empire-San Diego Phase 2 corridor. Near term service improvements to Metrolink, Amtrak Pacific Surfliner and Coaster services will be identified, while also laying the groundwork for full Phase 2 high-speed rail service in the future. In conjunction with Statewide Rail Modernization, Planning, and Integration efforts the Authority and the Inland Corridor Group (ICG) have been working to define the southern Phase 2 corridor. The Authority has undertaken a technical planning study in close coordination with local agencies that is focused on developing strategies for how high-speed rail will be implemented in the project section, including prioritizing locations for advancing enhanced connections to the Phase 1 system, early blended service, phasing, opportunities for right-of-way preservation and approaches for environmental clearance, partnerships and funding, and next steps to move the project forward. To advance the goals for network connectivity and integration and completion of Phase 2, the Authority is committing to a number of steps, including:

- Advancing planning for the Los Angeles – Inland Empire – San Diego Corridor using funds allocated in SB 1029 to provide increased level of project definition in order to preserve right-of-way and support local, regional, and state led planning efforts
- Targeted support for regional agency planning and analysis to identify, define, and align projects and programs for investments by the Authority and by others consistent with principles in the Southern California Memorandum of Understanding and to achieve mutually agreed upon outcomes
- Evaluating elements of the blended corridor concept to support the ultimate completion of the high-speed rail program and identify investments that can provide near term independent utility
- Station area planning to enhance multi-modal connectivity (including airports) and promote economic development
- Development of high-speed rail and other integrated rail network elements that complements key findings of the 2018 State Rail Plan and principles and projects identified in the Southern California Memorandum of Understanding
- Supporting the next update of Southern California Association of Governments and San Diego Association of Governments Regional Transportation Plans by working closely with these agencies to provide more defined Phase 2 service, including ridership information once the project section is sufficiently defined
- Assessment of the public-private partnership potential so private investment can be brought in as soon as possible
- Complementary planning to support interstate service expansion concepts identified in the Federal Railroad Authority's Multi-State Planning Study for High-Performance Rail in the Southwest

The outcome of these planning efforts will ensure that the most effective investment is pursued that supports the service needs of local communities as well as statewide mobility. Near term service improvements that leverage local, state and federal funding sources will be pursued through continued expansion of integrated services, while also defining how such service improvements lay the groundwork for full Phase 2 high-speed rail service in the future. The Authority's partners in this corridor planning effort will include the agencies that are part of the Southern California Memorandum of Understanding, the Inland Corridor Group, the California State Transportation Agency, the Southern California Regional Rail Authority, the LOSSAN Rail Agency, and the North County Transit District.

THE IMPORTANCE OF PARTNERSHIPS FOR CONNECTIVITY AND NETWORK INTEGRATION

The high-speed rail system provides much greater benefit to Northern and Southern California when planned and implemented in a manner that complements connecting transit and rail services. Several examples include:

- Silicon Valley to Central Valley connections to (1) Amtrak San Joaquin services at the Madera Station, allowing Amtrak trains to connect to HSR trains at the Madera Amtrak station, and (2) Caltrain, BART, the Capitol Corridor and Altamont Corridor Express services at San Jose providing high-speed rail connections at Madera to Sacramento, the Northern Central Valley, and the East Bay on more frequent trains.
- Transformation of travel opportunities at San Jose Diridon Station, with frequent service to many communities throughout the Bay Area, across many transit and rail services.
- Connections to multimodal options (including airports) at key hubs in Palmdale, Burbank, and Los Angeles that support service throughout the Southern California region from San Luis Obispo to the Inland Empire and San Diego, as well as future connections to Nevada and Arizona.

When the connecting services are integrated with HSR services through timed connections and integrated ticketing concepts being developed as part of the 2018 State Rail Plan, ridership and revenue for all services will be enhanced, and customers will be able to access many more destinations with frequent and easy transit and rail services.

To advance the goals for network connectivity and integration on opening day, the Authority is committing to a number of steps, including:

- Broadening the scope and accelerating the implementation of the Statewide Rail Modernization Program by aligning it more closely with high-speed rail project implementation to deliver both programs through a single, integrated strategy. Most notably, the heavily congested urban rail corridors in Southern and Northern California will realize significant near-term benefits from increased capacity and frequency, which will also lead to air quality improvements in some of the most deserving communities in the State.
- Extending current construction north to enhance connectivity with San Joaquin service. In March 2016, the Authority extended the northern terminus of its first construction section in the Central Valley, adding a 2.7 mile northward extension. This northern extension expands the work on an environmentally cleared section and provides the capability of a more logical connection to San Joaquin intercity passenger rail service at the Madera Amtrak station. The connecting station at Madera within the Valley to Valley segment will be pursued in collaboration with the City of Madera, SJJPA and CalSTA.
- Extending concurrent construction south to the Burbank to Anaheim urban mobility corridor where investments in network elements like junctions, storage and maintenance, signaling and integrated services and ticketing realize immediate benefits for freight and passenger service.
- Entering into detailed service planning efforts with service providers at the San Jose Diridon Station and Los Angeles Union Station, as examples, to maximize the value of the multiple investments in the stations, and to ensure regional network integration benefits (also being addressed in the 2018 State Rail Plan) are achieved
- High level of engagement with agencies across the state to understand and articulate the benefits of investments and better describe how regional priorities contribute to improved air quality, service, safety, capacity, frequency, and reliability and help increase ridership

This integrated, phased approach brings greater benefits sooner than previous plans and is made possible through new funding sources, stronger partnerships, and the State's statewide integrated network approach being developed for the 2018 State Rail Plan.

The following sections of this 2016 Business Plan cover:

- The cost estimates to deliver both the Silicon Valley to Central Valley line and the full Phase 1 system
- The public funding that is currently available and committed to achieve these goals and how these funds will be prioritized
- The ridership and revenue forecasts, operations and maintenance (O&M) cost estimates and projected lifecycle costs of running the system (including sensitivity analyses associated with potential extensions to San Francisco and Bakersfield)
- Breakeven analyses for both the Silicon Valley to Central Valley line and the full Phase 1 system
- A look-ahead to what Californians can anticipate as the system is implemented in the coming years
- The risks that the program faces, our strategies to manage and mitigate these risks and how we have applied our strategies to date

Section 5: *Capital Cost Estimates*

This section presents the program's updated capital cost estimates factoring in the lessons learned from the bids we've received and the progress we have made in design and construction to date. These updated estimates reflect and incorporate design refinements, contractors' viewpoints and other reviews, more advanced and detailed engineering and design work and other changes. The new estimates show an eight percent cost reduction for the equivalent scope shown in the 2014 Business Plan (from $67.6 billion to $62.1 billion in YOE$). The updated cost estimates also include a scope change, specifically a higher level of investment in the Los Angeles to Anaheim segment (this scope change adds $2.1 billion). This higher level of investment is designed to enhance capacity, speed and reliability in this already high demand passenger rail corridor. Even when accounting for this additional investment, our cost estimate has been reduced from $67.6 billion to $64.2 billion (YOE$).

- Since 2013, we have received competitive design-build bids for the three construction contracts in the Central Valley, demonstrating the high level of interest within the industry to be part of building the first high-speed rail system in the country.
- The best value bids for Construction Package 1, Construction Package 2-3 and Construction Package 4 have come in between 13 and 45 percent below engineer's estimates.

EXHIBIT 5.1 COMPARISON OF ENGINEER'S ESTIMATE AND BID PRICES*

SECTION	ENGINEER'S ESTIMATE	BID AVERAGE	BEST VALUE BID	PERCENT DIFFERENCE (BEST VALUE VS. ESTIMATE)
Construction Package 1	$1.2 - $1.8 billion	$1.25 billion	$985 million	-18/45%
Construction Package 2-3	$1.5 – $2 billion	$1.68 billion	$1.23 billion	-18/38%
Construction Package 4	$400 – $500 million	$442 million	$348 million	-13/30%

**Does not include contingencies or provisional sums.*

Value Engineering

Further system optimization via greater utilization of existing rail infrastructure along the Caltrain corridor and in the LOSSAN corridor between Burbank and Los Angeles eliminated 6 miles of viaduct structures and numerous retaining walls.

Value engineering analysis of tunnel design criteria reduced required tunnel diameter and ventilation requirements, resulting in $1.6 billion cost savings.

Advancement of final design provided an opportunity to refine assumptions on foundation configurations, column and superstructure dimensions of bridges and viaduct structures allowing measured reductions in allocated contingencies.

- Several reasons can explain the differences between estimates and final contractor bids, including:
  - We adopted a conservative estimating approach to develop the construction cost estimates: The bidders were able to propose Alternative Technical Concepts (ATCs) that were not included in the engineer's estimates and were able to reduce the high levels of contingency that was assumed in the engineer's estimates by advancing the design beyond the early stages of the engineer's estimates.
  - Favorable economic conditions in the state: After a significant slow-down of the economy during the recession, the construction market is gaining momentum and is better positioned to support such large undertakings.
  - Healthy, competitive environment in the industry: We successfully attracted three or more bidding consortia for each procurement, which contributed to driving the price down.
  - Strong interest in the industry to be part of the construction of the first high-speed rail system in the country: The prestige attached to the high-speed rail program contributes to industry interest and increases competition for the contracts.
  - The contracts in the Central Valley do not incorporate a high level of risk: The first three construction contracts are civil packages and there is little integration and technological risk.
- Significant updates and revisions to the system construction cost estimates have been made based on new technical concepts and a better understanding of the private sector's approach to pricing the project.
  - Learning from the three procurements conducted to date, new technical concepts were introduced in the design of the system, which has driven overall estimated construction costs down. Our procurement process provides that we own the intellectual property of all bidders, whether they win or not, and we have applied some of their innovations to our analysis of construction costs.
  - Overall system costs have also been refined based on a wide range of information from the industry including risk integrated pricing techniques. For example, from Construction Package 1 and Construction Package 2-3, we gained a better understanding of the level of competitive pricing. Also, we refined the schedules and the ways that construction can be operationalized. These ongoing project experiences provided very valuable sources of information to refine and drive down costs for the rest of the system.
- As a result, capital cost estimates have decreased from the $67.6 billion ($YOE) in the 2014 Business Plan to $62.1 billion ($YOE), representing an eight percent (8%) decrease when comparing equivalent investments. Exhibit 5.2 shows how the cost decrease was achieved by type of reduction.

- The cost reduction identified in the new estimates allowed us develop a design to run trains between Los Angeles and Anaheim that includes additional scope relative to what was previously planned and reflected in our 2012 and 2014 Business Plans. The costs of this additional scope has now been incorporated into the estimates. This additional $2.1 billion in scope, which will improve reliability, increase operating speeds and add capacity in this section, is factored into the estimates presented below.
- As stated in the Implementation Strategy section, we will work with our partners to make concurrent investments in the Burbank to Anaheim corridor through 2024 and provide early benefits to existing rail systems in advance of high-speed rail operations[3]
- A total of $5.5 billion in cost reductions have been identified, largely driven by a better technical and operational approach to design and construct the system, leading to significant decreases in tunnel and viaduct costs plus the incorporation of industry bid characteristics (pricing and contingencies) based upon recent contracts. Detailed information on the changes from the 2014 Business Plan is presented in the 2016 Business Plan Capital Cost Basis of Estimate Report.

EXHIBIT 5.2 PHASE 1 (IN BILLIONS OF YOE$) CONSTRUCTION COST COMPARISON

Includes funding for early improvement projects in Los Angeles - Anaheim section

- We have not carried this 30% reduction directly into the updated cost estimates. That is because during a bid process other factors such as competitive pressure, current market conditions, risk position and particular bidding strategies adopted by bidding consortia play a more significant role in lowering the average bid price.
- Exhibit 5.3 shows the updated capital cost estimates for the Phase 1 system in current 2015 dollars and shows the updated estimates for the Phase 1 system in year of expenditure dollars.

EXHIBIT 5.3 CAPITAL COST ESTIMATES: PHASE 1 SYSTEM (IN MILLIONS)

FRA STANDARD COST CATEGORIES	2015$	YOE$
10 – Track structures and track	$22,782	$26,848
Civil (10.04–10.06, 10.08, 10.18)	*$5,439*	*$6,426*
Structures (10.01–10.03, 10.07)	*$15,628*	*$18,419*
Track (10.09, 10.10, 10.14)	*$1,637*	*$1,919*
20 – Stations, terminals, intermodal	$2,345	$2,630
30 – Support facilities: yards, shops, administrative buildings	$993	$1,212
40 – Sitework, right-of-way, land, existing improvements	$11,286	$12,581
Purchase or lease of real estate (40.07)	*$4,430*	*$4,827*
50 – Communications and signaling	$1,158	$1,370
60 – Electric traction	$3,021	$3,574
70 – Vehicles	$3,400	$4,192
80 – Professional services (applies to categories 10–60)	$6,375	$7,250
90 – Unallocated contingency	$2,133	$2,509
100 – Finance charges	-	-
Sub-Total (San Francisco – Los Angeles Union Station)	**$53,491**	**$62,167**
Enhanced Design Los Angeles – Anaheim Corridor	$1,804	$2,072
TOTAL	**$55,295**	**$64,238**

Subtotals for information only, figures may not sum due to rounding.

Although the estimates presented in this 2016 Business Plan represent the best information we have available, the schedules and estimates are subject to further changes based on both internal and external factors, including the availability and timing of funding. Estimates will continue to evolve over time as we receive additional information and the program advances.

- Exhibit 5.4 shows the capital cost estimate for the Silicon Valley to Central Valley line in current 2015 dollars and shows the estimate for that line in year of expenditure dollars.
- The capital cost estimates for the Silicon Valley to Central Valley line include everything required to construct the line and start revenue services. It includes rolling stock, maintenance facilities, stations and all necessary rail systems. These detailed costs were used to determine the financing requirements.

EXHIBIT 5.4 CAPITAL COST ESTIMATES: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) (IN MILLIONS)

FRA STANDARD COST CATEGORIES	2015$	YOE$
10 – Track structures and track	$7,038	$7,851
Civil (10.04–10.06, 10.08, 10.18)	*$1,061*	*$1,153*
Structures (10.01–10.03, 10.07)	*$5,147*	*$5,769*
Track (10.09, 10.10, 10.14)	*$830*	*$929*
20 – Stations, terminals, intermodal	$279	$308
30 – Support facilities: yards, shops, administrative buildings	$193	$219
40 – Sitework, right-of-way, land, existing improvements	$4,910	$5,309
Purchase or lease of real estate (40.07)	*$1,302*	*$1,345*
50 – Communications and signaling	$468	$528
60 – Electric traction	$1,108	$1,258
70 – Vehicles	$774	$865
80 – Professional services (applies to categories 10–60)	$2,994	$3,249
90 – Unallocated contingency	$985	$1,091
100 – Finance charges	-	-
TOTAL	**$18,749**	**$20,679**

Subtotals for information only, figures may not sum due to rounding.

Although the estimates presented in this 2016 Business Plan represent the best information we have available, the schedules and estimates are subject to further changes based on both internal and external factors, including the availability and timing of funding. Estimates will continue to evolve over time as we receive additional information and the program advances.

For in-depth information on the capital cost estimates, see the 2016 Business Plan Capital Cost Basis of Estimate Report.

Section 6: *Funding and Financing*

This section presents the financial analysis and funding strategy for the program. There are a range of funding sources that can be used to deliver the system. The challenges of funding a transportation system or network are not new to this program or most other large-scale programs. It was known by the Legislature, the voters and the Authority at the time of passage of Proposition 1A, that the state was initiating the program with the anticipation of other sources of funding becoming available over time – and that has happened. Since the passage of Proposition 1A, unprecedented federal funding has been secured, a new source of state funding has been committed, and, as presented in the analysis in this Plan, there is a clear path to securing private sector participation as envisioned.

With the passage of Proposition 1A, the Legislature and voters provided less than one-quarter of the funding estimated to be needed to deliver the system, and there was no pathway to get anything into operation. As detailed in this section, because of the progress made over the last few years, it is now possible to get a world-class 250 mile high-speed rail line into revenue service, make concurrent investments that will enhance existing services and build for the future, to complete environmental approvals for the entire Phase 1 system, and to contribute to further expansion through private sector participation – all within projected levels of existing funding sources.

Identifying and securing additional funds necessary to complete construction of the entire system will be an ongoing process and will require the engagement of the Legislature, Congress, the federal government, the private sector and others. The potential for private sector engagement in the delivery of the initial operating line through public-private partnerships will be explored. Importantly, the delivery of initial operations on the Silicon Valley to Central Valley line, concurrent investments and full environmental clearance can all happen while that process takes place.

The appropriation of 25% of the annual Cap and Trade proceeds on a continuous basis provides a new, long-term revenue stream to support the early completion of the Silicon Valley to Central Valley line. At the same time, we plan to pursue additional funding, including federal funding, to extend that line to San Francisco, Merced and Bakersfield. As the first line is opened and operations mature, positive cash flow from ticket sales and other ancillary revenue sources and value capture will be generated that can be monetized to help build other sections of the system. This section describes the funding available for planning and constructing the Silicon Valley to Central Valley line, as well as each funding source, and the financing requirements. It also presents a menu of potential funding options, opportunities to achieve savings or efficiencies through program delivery, as well as private sector investment opportunities that may be available in the future.

CURRENT FUNDING

Below we describe the funding that is currently available to pay for the capital costs of the system and long-term funding that could be available to support financing for capital costs. Federal grant funds, Proposition 1A funds and Cap and Trade proceeds are available to pay for program planning and construction costs.

Federal Grants

$3.48 billion in appropriated federal grants, including funds available through the American Recovery and Reinvestment Act and Fiscal Year 2010 funds are available for the program:

- $315 million is dedicated for Phase 1 planning activities
- $3.165 billion is dedicated for construction in the Central Valley

Proposition 1A Bond Proceeds

→ $9.95 billion in bond funds are available to pay for the planning and construction of the system, including regional services which will connect to the system:

- $2.609 billion has been appropriated for and committed to matching the federal grant funds in the Central Valley
- $1.1 billion has been appropriated for and committed to bookend improvements in Caltrain electrification and improvements in Southern California[4]
- $950 million was appropriated for regional connectivity projects, as laid out in Proposition 1A
- Up to $1.125 billion can be set aside for pre-construction activities and administration costs, as spelled out in Proposition 1A

→ This leaves approximately $4.166 billion of bond funds available to help fund capital costs for the first high-speed rail line

Cap and Trade Proceeds

→ In 2014, the Legislature approved appropriation of funding including 25% of the annual Cap and Trade proceeds on a continuous basis beginning in FY15/16 along with two one-time appropriations:

- $250 million, one-time appropriation in FY14/15
- $600 million in the Governor's budget for FY15/16 based on the continuous appropriation
- $500 million in the Governor's budget for FY16/17 based on the continuous appropriation plus $100 million of a $400 million one-time appropriation, for a total of $600 million in FY16/17

→ In making the continuous appropriation, the Legislature determined that we could use these funds to pay for planning and construction costs for the system and/or to repay loans made to the Authority.

EXHIBIT 6.1 FUNDING AVAILABLE TO COMPLETE PHASE 1 ENVIRONMENTAL CLEARANCE*

FUNDING SOURCE	AMOUNT (IN MILLIONS)
State Bonds (Proposition 1A)	$675
Federal Grants (ARRA)	$315
Greenhouse Gas Reduction Fund Proceeds (FY14/15)	$59
Total Environmental/Planning Funding Available	**$1,049**
Less: Amount Spent-to-Date on Environmental/Planning	($643)
Remaining Funds for Environmental/Planning	**$406**
Costs to Complete Remaining Phase 1 Environmental/Planning	($403)
Environmental/Planning Funding Surplus / (Gap)	**$3**

**Data as of Fiscal Year 2014/15*

STRATEGY FOR CURRENT FUNDING

We have allocated our available capital funding to specific projects and segments of the system in accordance with statutory requirements and in alignment with our implementation plan for the system (see Section 4). Our funding priorities include:

→ Completing environmental studies, planning and preliminary engineering in order to fully clear the Phase 1 system

- Fully fund the delivery of a high-speed rail line as part of the first segment of the California high-speed system – connecting the Silicon Valley to the Central Valley
- Make concurrent investments and deliver early, tangible benefits in Southern California

Completing Environmental on the Phase 1 System

We will use funds explicitly dedicated in Proposition 1A and in our federal grants to complete environmental studies and support planning and preliminary engineering in order to environmentally clear the Phase 1 system and secure Records of Decision.

- $1.05 billion has already been identified for planning and environmental activities across the system:
  - $315M in federal grants
  - $675M in Proposition 1A bond proceeds
  - $59 million in Cap and Trade proceeds
- $643 million has been expended through FY 14/15 and the remainder of the funds ($406 million) will be used to complete environmental and planning activities for the system.

Silicon Valley to Central Valley Extension

Extending the line to Bakersfield and making targeted improvements between San Francisco and San Jose will allow us to offer one-seat ride service from the Caltrain terminal at 4th and King Streets in San Francisco to downtown Bakersfield. These improvements are estimated to cost approximately $2.9 billion and include initial upgrades in the Peninsula corridor and full buildout from the southern terminus of Construction Package 4 to Bakersfield Station.

Completing the Silicon Valley to Central Valley Line

The three sources of funding that have already been committed to the program will be directed to constructing the Silicon Valley to Central Valley line, including previously appropriated federal grant funds, Proposition 1A bond proceeds and Cap and Trade proceeds.

- $5.774 billion has already been allocated for construction in the Central Valley:
  - $3.165 billion in federal grants
  - $2.609 billion in Proposition 1A bond proceeds
- We will seek an appropriation for $4.166 billion in Proposition 1A bond proceeds to help fund capital costs for this first high-speed rail line
- We will use Cap and Trade proceeds received through 2024 to help fund the capital costs

EXHIBIT 6.2 FUNDING AVAILABLE FOR PLANNING AND CONSTRUCTING FOR SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLY LINE)

FUNDING SOURCE	AMOUNT (IN MILLIONS)
APPROPRIATED FUNDS	
State Bonds (Proposition 1A)	$2,609
Federal Grants (ARRA/FY10)	$3,165 *
Planning Funds	$338 **
COMMITTED FUNDS	
State Bonds (Proposition 1A)	$4,166
Cap and Trade (Through 2024)	$5,341
FINANCING PROCEEDS	
Long-term Cap and Trade (2025-2050)	$5,237
Total Sources of Funds	**$20,856**
Construction Cost (see Section 5)	$20,680
Reserve	**$176**

**Planning Funds are comprised of State bonds (Proposition1A), Federal grants (ARRA/FY10 and Greenhouse Gas Reduction Fund proceeds allocated to planning.*

***Federal Grant Agreement amounts for construction funding. State appropriation for construction amounts to $3,240 due to prior year reallocations.*

for the Silicon Valley to Central Valley line. We estimate this amount to be $5.341 billion including amounts spent to date.

- We will use the $500 million of annual Cap and Trade proceeds received after 2024 to repay financing. The financing proceeds will be used to fund the remaining construction costs for the Silicon Valley to Central Valley line. There are a number of financing tools available including federal programs, revenue bonds and other sources. Depending on the mix of financing sources actually used, we estimate the amount of potential proceeds to be $5.1 to $5.3 billion to be repaid through 2050. We are using the midpoint of this range ($5.2 billion) for planning purposes (this does not include any Cap and Trade proceeds above $500 million per year).

As we go forward, we will pursue new federal funding to extend the Silicon Valley to Central Valley line north to make an initial investment in a one-seat ride to San Francisco and south to connect to Bakersfield. It has been five years since the last appropriation of federal funds for the program and, in the meantime, the State has significantly increased its funding contribution.

Burbank to Anaheim Corridor Improvements

The Authority reiterates its commitment to advance the program in Southern California with specific focus on early investments in the Burbank-Los Angeles-Anaheim corridor and to ultimately completing the entire Phase 1 system. These investments represent the Authority's continued commitment to advance regionally-significant connectivity projects with Proposition 1A and other funds as embodied in the Southern California Memorandum of Understanding which we entered into with our transport partners in 2012.

The Authority has worked to achieve early approval and release of Proposition 1A bond dollars for construction of regionally significant connectivity projects which include Positive Train Control throughout the region and the Metro Regional Connector Transit Corridor Project in Los Angeles. Through that agreement, we will work collaboratively with our partners to develop a strategy to identify necessary funding partners – regional, state, private, federal – and take all reasonable measures required to advance projects as quickly as possible in order to progress development of the system and expand the total amount of funding in the region.

As discussed in Section 4 (Implementation Strategy), we will work with our partners in Southern California to advance and accelerate these investments as part of the statewide rail modernization program and through the state's programmatic approach being developed for the 2018 State Rail Plan and network integration activities. Through this integrated approach we will make strategic investments in concert with our local partners and leverage our mutual resources to provide early benefits to transit riders and local communities, and deliver needed safety, mobility and air quality improvement projects, and laying a the foundation for high-speed rail in the future.

The Authority reiterates its commitment of $1 billion in total funding consisting of Proposition 1A funds and any other State funding sources. To date, $500 million of Proposition 1A funds has been appropriated through Senate Bill 1029 and committed to bookend improvements in Southern California. We are now in a position to fulfill these commitments and begin to advance discrete packages of projects in Southern California. Additional sources of potential public funding, revenue from the project and savings opportunities that will support development in this corridor are discussed below.

EXPANDING THE SYSTEM AND COMPLETING PHASE 1

There is now a clear path forward for funding the initial operating line from the Silicon Valley to the Central Valley with public funds that have been committed by the Legislature and the federal government. With these funds, we expect to be able to begin serving passengers in 2025. As work proceeds to complete this initial line, equal attention will be focused on advancing and extending the system through concurrent investments that provide early benefits – and with the goal of starting service on the full Phase 1 system by 2029.

Since the inception of planning for high-speed rail in California, it has been assumed that the program would be funded with federal funds, state funds and private sector investment, each at approximately one third. This was the underlying assumption when the Legislature and the voters approved Proposition 1A in 2008. However, there were no other established funding sources for the program in place at the time. But the Legislature and voters determined that it was appropriate to move forward, stating that, "It is the intent of the Legislature by enacting this chapter and of the people of California by approving the bond measure pursuant to this chapter to initiate the construction of a high-speed train system…." In addition to providing $9 billion in state bond funds, Proposition 1A directed that the Authority "...pursue and obtain other private and public funds, including but not limited to, federal funds, funds from revenue bonds, and local funds..." to augment the high-speed rail bond funds. In addition, Proposition 1A requires a 50 percent match for construction funds from other sources, none of which were identified by the Legislature, voters, or Authority at the time.

Subsequent to the passage of Proposition 1A by the voters in 2008, the federal government made funding for intercity and high-speed passenger rail systems available as part of the American Recovery and Reinvestment Act of 2009 (ARRA) and the Passenger Rail Investment and Improvement Act of 2008 (PRIIA). The Authority competed for and successfully secured $3.5 billion in federal funds. More recently, the Legislature provided an ongoing commitment of Cap and Trade proceeds to help fund the system. That commitment may provide over $10 billion of funding for construction for the Silicon Valley to Central Valley line. Clearly, between Proposition 1A and Cap and Trade, the state is stepping up to fund a significant portion of the system costs.

A fundamental goal of the program is to create a commercially successful high-speed rail transportation system to connect the State. As segments of the program are delivered, they are projected to generate significant revenues and positive cash flow which will support private investment. Over time, the value of the system as a commercial enterprise will be significant for the State of California creating the opportunity for private investment to support expansion of the system.

Traditionally, transportation infrastructure projects of this magnitude can rely on the federal government as a funding partner with grants of up to 50 percent or higher. Key transportation corridors, such as the Interstate Highway System, were built with 90% federal funding. A very recent example of this is the Gateway Tunnel Project to improve intercity and commuter rail services in the Northeast. In 2015, officials from the federal government as well as the governments of New York and New Jersey announced an agreement to fund the approximately $20 billion Gateway Tunnel Project. The Gateway project will add two new tunnels under the Hudson River to connect New York and New Jersey for both intercity and commuter railroads. The agreement calls for at least 50% of the cost of the project to be borne by the federal government with the states providing matching funds. This is consistent with historical precedent where the federal government plays an important role in funding large infrastructure projects, and it reaffirms the reasonableness of the assumptions in Proposition 1A.

Although there is always competition for federal funding, a strong case can be made, as was done for the Gateway Tunnel Project, that additional federal participation in the California high-speed rail program is warranted, starting with additional funding for the Silicon Valley to Central Valley line because it would leverage a significant increase in ridership, connectivity among major urban centers, revenues, and the value of private sector concession agreements. This investment should also be put in the context of other federal support for comparable rail programs, such as the Gateway Tunnel Project discussed above which is part of the Northeast Corridor from Washington, DC to Boston. In terms of population, distance, and percentage of national gross domestic product, the Northeast and California corridors are comparable. Just as it is justified for the federal government to continue to invest in the Northeast Corridor, it is reasonable for it to invest in California's corridor.

There are two key sources of funding to help complete Phase 1: (1) the positive cash flow generated from selling tickets and operating the system which can be leveraged for financing and private investment, and (2) additional public funds, including federal funds, which can help match project-generated funding. Although not a source of funding, as we advance the program, the Authority will continue working to identify opportunities to reduce costs and to deliver the program more cost-effectively through alternative delivery models such as public-private partnerships. This comprehensive strategy provides a reasonably foreseeable way to complete the Phase 1 system.

In the near term, we will continue to work with our partners to identify and secure funding from a variety of existing sources. Some of the sources of funding shown below would be primarily directed to freight rail improvements or passenger rail improvements for commuter rail and other rail operators; however, certain improvements for these purposes in the high-speed rail corridor will have co-benefits for future high-speed rail service in the corridor and reduce future high-speed rail costs. The State is actively developing programs involving state-directed funding, or in support of pursuing discretionary federal funding, that could facilitate getting both Phase 1 and Phase 2 projects (i.e., those identified in the 2012 Southern California Memorandum of Understanding) to shovel ready status. We have identified the following existing public funding sources as having potential for advancing the development of the shared system:

- Cap and Trade proceeds appropriated directly to the Authority for high-speed rail not committed to building the Silicon Valley to Central Valley line can be a source of funding for advancing the system.
- Fixing America's Surface Transportation (FAST) Act Section 1116 which allocates formula funds for a National Highway Freight Program of which California is expected to get $600 million over the next 5 years and for which highway-rail grade crossings are an eligible use.
- FAST Act Section 1105 which created a new Nationally Significant Freight and Highway Program which is a competitive grant program with $4.5 billion over the next 5 years and for which highway-rail grade crossings are an eligible use.
- Cap and Trade Transit and Intercity Rail Capital Program which receives 10% of Greenhouse Gas Reduction Fund proceeds (estimated at $200 million per year) for statewide rail modernization and greenhouse gas reduction.
- Additional Transit and Intercity Rail Capital Program funds. In his FY16-17 budget, the Governor is proposing to put an additional $400 million into next year's budget for this program.
- Unspent Proposition 1B funds could be allocated to specific projects if available.
- A variety of local and regional funding measures have been allocated toward projects in this corridor and could serve as an important component of an overall funding picture.

Another significant source of funding will be the revenues generated by the system itself. Once the Silicon Valley to Central Valley line is built and in operation, it will become a viable commercial enterprise, generating revenue and almost immediately producing positive cash flow. Upon demonstration of a level of operational maturity, this positive cash flow will be monetized through financing and private investment that will help fund future development of the system. As has been demonstrated in other high-speed rail markets, 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. Current estimates indicate that more than $21 billion, or nearly 1/3 of the total development costs, could be raised through the future sale of long-term concessions for the full Phase 1 system.

As each incremental section of Phase 1 is constructed, incremental revenue and positive cash flow is generated which in turn can be monetized either through options within an existing concession or through new larger concessions. While the timing and value of these sections will be driven by the interest of the private sector, this approach accelerates the completion of the Phase 1 system.

In the long term, the value of the system as a commercial enterprise will be quite significant for the State of California. After completion of the Phase 1 system and its first operating concession period, the State will have a fully developed and operable asset that it can continue to monetize over successive 20-30 year periods to generate funds for reinvestment, expansion (e.g., for Phase 2 extensions) or other purposes. Further value is also likely to be generated as the high-speed rail system connects with statewide planned transportation networks that will increase network integration, enhance the user experience and generate higher ridership. Additionally, planned connectivity to intra-state transportation networks will further enhance the value of the system.

At the regional and local level, the high-speed rail system will generate local value. The Authority could also seek funding linked to the local value that the railway is generating, in particular 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 right of way to provide optical fiber communication connectivity. Ancillary revenues and transit oriented development will provide further sources of funding that can contribute to system expansion or other costs.

Lastly, of equal importance to securing additional funding is delivering the project cost effectively. Alternative delivery models (such as public-private partnerships) will be utilized when appropriate to help reduce both capital and operating costs. After initial start-up costs, it is expected that cost efficiencies will increase as the high-speed rail industry grows in strength and maturity in California and as competitive pressures continue to drive industry costs down. Using these types of delivery models can also help accelerate the construction schedule which will help reduce costs and risk to the State.

California's high-speed rail program is unique in its magnitude and its complexity. At the same time, we are funding and implementing it in the same way that high-speed rail systems have been – and are continuing to be – developed throughout the world. Specifically, we have a clear long-term vision and a long-term plan for implementing it, 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. And just like other systems around the world, we will fund and build it in a series of overlapping, not sequential, phases. So just as we fund and proceed with constructing

Potential Future Federal Funding

Recently the President Obama proposed a new "21st Century Clean Transportation System" proposal that would increase federal investments in transportation infrastructure investment and would launch a series of transportation-related initiatives to address climate change. This new proposal comes two months after the passage of the five-year "Fixing America's Surface Transportation (FAST) Act" reauthorization bill for highway and transit programs. The proposal includes $20 billion per year on top of existing investment levels for transit, high-speed rail and other non-highway transportation options. The proposal that suggests the viability of future federal funds that might become available in future legislation. Evidience of this viability came on April 19, 2016 when the Sentate Transportation Appropriations Subcommittee on Transportation, Housing and Urban Development (THUD) and Related Agencies approved the THUD FY 2017 appropriations bill $56.5 billion. The bill proposes significant new funding for programs that will benefit high-speed and intercity passenger rail programs, including $1.42 billion for Amtrak, $50 million for the newly authorized Consolidated Rail Infrastructure and Safety Improvement grants, $20 million for the new Federal State Partnership for State of Good Repair (SOGR) Grants and provided $15 million for the new Rail Restoration and Enhancement Grants.

the Silicon Valley to Central Valley line, we are also moving forward with initial funding for system extensions and laying the building blocks for future phases.

Financing Long-Term Cap and Trade Proceeds

High-speed rail has been a priority investment for Cap and Trade proceeds since the inception of the Cap and Trade program, as noted in the Air Resources Board's 2008 Scoping Plan and recent investment plan. The 2012 Business Plan identified Cap and Trade proceeds as a potential backstop for the project and the 2014 Business Plan highlighted the benefits of an ongoing, long-term commitment of Cap and Trade proceeds to the program. In the 2014 Business Plan we discussed the need for:

- A committed, long-term funding stream to leverage financing, including federal loans and other public financing tools
- An established funding stream to attract private sector partners to leverage private sector financing which will yield significant cost savings through a long-term strategic partnership and which can reduce costs.

With a secure long-term revenue source, there is a range of financing programs available that the Authority will be able to tap into including federal financing programs such as the Railroad Rehabilitation and Improvement Financing (RRIF) and the Transportation Infrastructure Finance And Innovation Act (TIFIA) programs, state revenue bonds, Private Activity Bonds and potentially export credit and other private sector financing programs.

GENERATING FINANCIAL VALUE FROM SYSTEM REVENUES

Consistent with the 2012 and 2014 Business Plans, we continue to receive market feedback that private investment secured by future operating cash flow will be available once revenues are proven on the initial segment placed into operations. This investment to be an important source of funds for construction of future segments.

- As the system develops over time, it will generate financial value through positive net operating cash flow. Once the Silicon Valley to Central Valley line begins operation, allowing high-speed passenger service revenues to be demonstrated, the section is projected to have material value to a potential private sector investor as a stand-alone service.
- The extension of the Silicon Valley to Central Valley line to offer a one seat ride from San Francisco to downtown Bakersfield adds significant ridership and would greatly increase net operating cash flow and the value of the system.

EXHIBIT 6.3 DISCOUNTED CASH FLOWS FOR MEDIUM CASE FORECASTS: SAN JOSE-NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) (IN BILLION $)

DISCOUNT RATE	8%	11%	14%
San Jose to North of Bakersfield	$4.3	$3.1	$2.4
Extension to San Francisco and Bakersfield	$6.1	$4.4	$3.3
Total San Francisco to Bakersfield	$10.4	$7.5	$5.7

EXHIBIT 6.4 DISCOUNTED CASH FLOWS FOR MEDIUM CASE FORECASTS: PHASE 1 (IN BILLION $)

DISCOUNT RATE	8%	11%	14%
Incremental Discounted Cash Flows from Completing Phase 1	$19.6	$13.5	$9.7

- This value would be captured (monetized) by financing and private sector investment secured by the system's future net operating cash flows. The amount of additional capital to be raised would be determined based on the private sector's valuation of the future cash flows from the incremental phases of the system.
- The financing transactions for each phase of system expansion are likely to be structured as a combination of private debt financing, federally subsidized loans or other financing tools and private equity.
- The private financing analysis has been based on the discounting of the net operating cash flow after capital replacement at three illustrative discount rates: 8 percent, 11 percent and 14 percent.
- The discount rate applied by the private sector in valuing future net operating cash flow is based, in large part, on the level of risk transferred to a private sector partner. For example, it is more likely that the private sector would apply a higher discount rate to any net revenue from a section just placed into service. Conversely, a lower discount rate (and therefore higher valuation) would be used for proven cash flows from existing operational sections.
- Once the initial Silicon Valley to Central Valley line is built out and ridership and revenue is demonstrated, positive cash flows are projected based on the revenue, operations and maintenance and lifecycle forecasts and estimates discussed in Section 2.
- While we have provided ranges for both ridership forecasts and discount rates, based on the mid-point discount rate of 11% applied to the cash flows from the medium revenue and cost forecasts, we estimate $3.1 billion could be available in 2028 after ridership revenue and net operating cash flow have been demonstrated. If the Silicon Valley to Central Valley line is extended to reach San Francisco (4th & King St) and Bakersfield, ridership will increase significantly and an additional $4.4 billion could be available in 2027 for a total of $7.5 billion.
- This demonstrates that the requested federal investment of $2.9 billion to extend the line to San Francisco and Bakersfield may be able to unlock an estimated $4.4 billion in additional private sector investment in the program, generating additional leverage for those federal funds. These proceeds could then be used to help fund the capital costs for the remaining build out of the Phase 1 system.

> ***"Initial financing [based on ridership and revenue] would not [be] possible at a first stage but absolutely yes in a second phase when consolidated figures of ridership would be proven and consistent for several years."***
>
> *- Globalvia*

Completing Phase 1

Completing the Phase 1 system and extending the San Francisco to Bakersfield service to the Los Angeles and Anaheim markets generates significant incremental revenue and value once complete and in operation.

Using the same 11% discount estimate described above, completing the system to Los Angeles and Anaheim could result in an additional $13.5 billion.

When combined together, the total value from the initial monetization of through the completion of Phase 1 to Anaheim using the 11% discount rate is estimated at $21 billion. The overall increase from prior business plans is largely attributable to the increased service levels and ridership increase to Anaheim included in this 2016 Business Plan.

- This plan recognizes that the amount to be financed is very large in current private sector investment terms, and the transaction would likely need to encompass low-cost federal debt programs and be staged to allow for market capacity and competition.
- Additionally, given the size of the project, it is likely that the entire system delivery will be procured using multiple concession agreements for individual components that break the project into more financeable parts.

Section 7: *Forecasts and Estimates*

This section provides updated ridership and revenue forecasts as well as operations and maintenance (O&M) and lifecycle cost estimates based on the latest modeling and analysis that we have conducted. A breakeven analysis evaluating potential revenue and O&M scenarios is also presented in this section. Since the 2014 Business Plan, we have refined our forecasting methods and tools for ridership, revenue, O&M costs and lifecycle costs.

- There are two sets of forecasts and cost estimates below:
  - **Silicon Valley to Central Valley line -** One scenario assumes that operations begin on the Silicon Valley to Central Valley line from San Jose to a station north of Bakersfield in 2025 (construction completed in 2024) and on the entire Phase 1 system from San Francisco and Merced to Los Angeles and Anaheim in 2029.
  - **Silicon Valley to Central Valley Extension -** A second scenario evaluates the change in all forecasts and cost estimates if the Silicon Valley to Central Valley segment is extended to San Francisco and Bakersfield. This scenario also assumes operations starting in 2025 and the Phase 1 system opening in 2029. The electrification of the Peninsula corridor will allow high-speed rail trains to travel on existing tracks between San Jose and San Francisco with relatively minor initial investments.[6] Additionally, an extension south from Construction Package 4 to downtown Bakersfield will strengthen the connection to an important economic center and transportation hub. Together these extensions would provide a one-seat ride from Bakersfield to San Francisco.

All dates and numbers presented in this 2016 Business Plan are the best estimates we have available at this time but they are subject to change based on both internal and external factors. Detailed methodologies and assumptions for all forecasts are included in supporting technical documents and will continue to evolve over time as estimates, models and input assumptions change.

RIDERSHIP AND REVENUE

Ridership and revenue forecasts in this 2016 Business Plan reflect an enhanced travel demand model and changes to some key assumptions. There are several key differences between the forecasts presented in the 2014 Business Plan and the forecasts presented in this 2016 Business Plan including:

- The 2016 Business Plan assumes that service will start on the line from San Jose to north of Bakersfield (to an interim facility that functions as a temporary station) and evaluates an additional scenario extending service to San Francisco and Bakersfield that had not been analyzed in the 2014 Business Plan. It also assumes a Phase 1 system that offers a

How much will it cost to ride high-speed rail?

- We will establish fare guidelines and policies but ultimately, the ticket prices will be set by the operator.
- For purposes of producing forecasts of ridership and revenue, we have assumed the average cost for a trip from San Francisco to Los Angeles will be $89 (in today's dollars).
- However, like the airlines, the operator will set fares based on yield management techniques such as when buying a ticket last-minute with premium services will be more expensive than a ticket that is booked early and is non-refundable.

Using Monte Carlo

Monte Carlo simulations are an analytic technique used by many decision-makers, both public and private. The goal of a Monte Carlo simulation is to quantify the chances that risks that might impact future costs, revenues or other aspects of a program will occur and, if they did occur, what their impact would be. This allows decision-makers to make informed choices and/or develop strategies and plans to prevent, manage, or mitigate potential future risks.

Monte Carlo analysis involves running thousands of simulations where each of the risks may occur with a given probability; the simulation develops an overall probability distribution of potential cost or schedule outcomes. This distribution can be used to describe how likely it is that any given outcome might happen and what the chances are for the results to be above or below a given threshold. This allows decision-makers to thoroughly understand the level of confidence associated with a specific forecast.

These methods are used for a variety of purposes. For example, the banking and finance sector uses Monte Carlo simulations to help make investment decisions in an uncertain environment where risks have been identified and estimated. The decision reflects how much risk the financial institution is willing to take and how costly the risk would be based on the probability that this risk could actually occur.

one-seat ride to Anaheim; ridership and revenue forecasts in the 2014 Business Plan assumed a Phase 1 southern terminal in Los Angeles.

- Forecasts reflect an enhanced travel demand model that incorporates the latest available input data, new variables that better reflect travel behavior and adjustments to the transit access network and station locations.
- The above changes and model enhancements results in Phase 1 ridership increases of approximately 25% depending on the forecast year.
- The ridership risk analysis considers new risk variables and was conducted separately for each model analysis year and system implementation assumption (Silicon Valley to Central Valley line and Phase 1).
- At the same time, many elements of the ridership forecasts remain consistent with the 2014 Business Plan:
  - High and low ridership forecasts were developed through a rigorous risk analysis that provided a forecast range and associated probabilities for each Business Plan scenario through Monte Carlo simulations. The risk analysis model includes a range of assumptions relating to various risk factors having the greatest combination of uncertainty and impact on the results.
  - The ridership forecasts employ the same ramp-up methodology as the 2014 Business Plan, which assumes 40% ramp-up in year one, 55% ramp-up in year two, 70% ramp-up in year 3, 85% ramp-up in year 4 and 100% ramp-up in year 5. Separate ramp-up calculations are applied to each phase based on its assumed opening date.

For more information on the ridership and revenue forecasts, please refer to the 2016 Business Plan Technical Supporting Document: Ridership and Revenue Forcasting.

RTAP Review

In their review of the forecasts and methodologies for this 2016 Business Plan, the Ridership Technical Advisory Panel (RTAP), a group of international experts in travel demand forecasting, stated that:

"The review confirmed the Panel's previously expressed belief that the [Business Plan Model – Version 3] BPM-V3 model is suitable for use in business planning"

"The Panel reviewed the Authority's design for a risk analysis for the 2016 Business Plan, as well as preliminary results on the likely range of ridership and revenue. This risk assessment is of high quality, more advanced than usual practice based on the Panel's experience, and highlights those uncertain factors that have a strong bearing on the results."

– Ridership Technical Advisory Panel

EXHIBIT 7.1 RIDERSHIP: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF RIDERS)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Ridership	4.2	5.8	7.4	9.0	26.0	32.2	53.2	56.8	59.7	62.7	65.9	69.3
Medium Ridership	3.0	4.1	5.2	6.4	19.3	24.1	40.1	42.8	45.0	47.3	49.7	52.3
Low Ridership	2.3	3.1	4.0	4.9	14.9	18.6	31.1	33.2	34.9	36.7	38.5	40.5

EXHIBIT 7.2 RIDERSHIP: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF RIDERS)

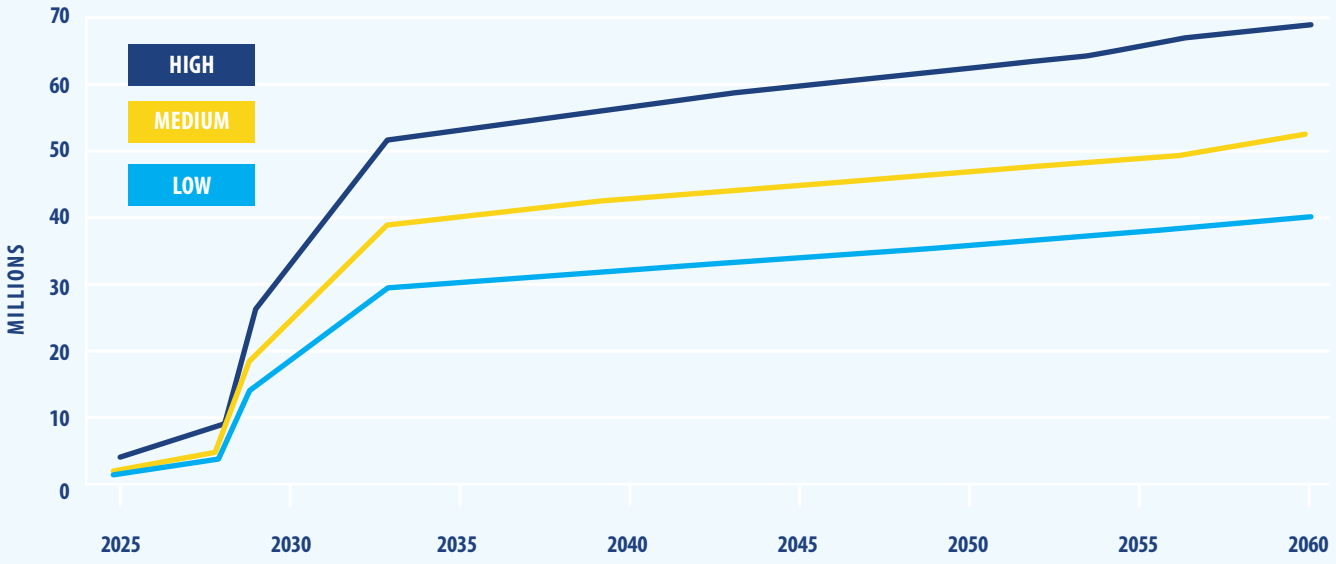
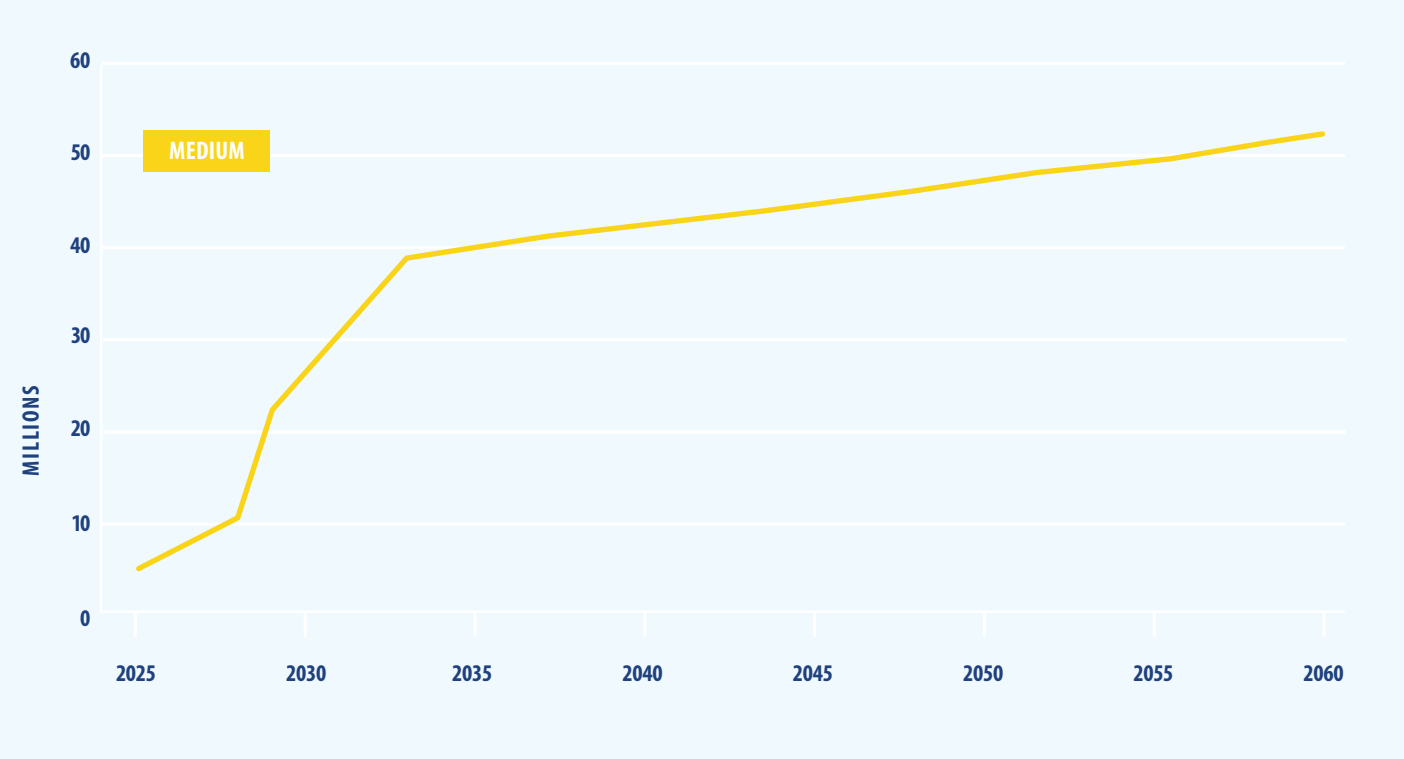


EXHIBIT 7.3 RIDERSHIP: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF RIDERS)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
Medium Ridership	5.3	7.3	9.3	11.3	22.8	26.7	40.1	42.8	45.0	47.3	49.7	52.3

EXHIBIT 7.4 RIDERSHIP: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF RIDERS)



Farebox revenue forecasts reflect the same enhanced model and revised assumptions used to estimate ridership. These changes have a similarly positive effect on revenue for the Phase 1 system. As a result of the changes above, the Phase 1 revenue forecast increases by approximately 35% over the 2014 Business Plan revenue forecast, depending on the forecast year.

Revenue forecasts incorporate the same ramp-up methodology as ridership and as the 2014 Business Plan. The cash flow analysis assumes 1% additional ancillary revenue. The same risk analysis employed to provide a forecast range for ridership and associated probabilities applies also to revenue projections.

EXHIBIT 7.5 FAREBOX REVENUE: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF 2015$)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Revenue	$261	$359	$457	$555	$1,469	$1,799	$2,927	$3,139	$3,218	$3,299	$3,383	$3,468
Medium Revenue	$184	$253	$323	$392	$1,104	$1,365	$2,250	$2,413	$2,474	$2,537	$2,601	$2,666
Low Revenue	$144	$198	$252	$306	$864	$1,067	$1,761	$1,889	$1,936	$1,985	$2,035	$2,087

EXHIBIT 7.6 FAREBOX REVENUE: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Revenue	$347	$492	$645	$807	$2,200	$2,776	$5,235	$6,508	$7,736	$9,194	$10,928	$12,988
Medium Revenue	$245	$347	$455	$570	$1,654	$2,105	$4,025	$5,004	$5,947	$7,068	$8,401	$9,985
Low Revenue	$191	$271	$355	$445	$1,294	$1,647	$3,150	$3,916	$4,654	$5,532	$6,575	$7,815

EXHIBIT 7.7 FAREBOX REVENUE: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

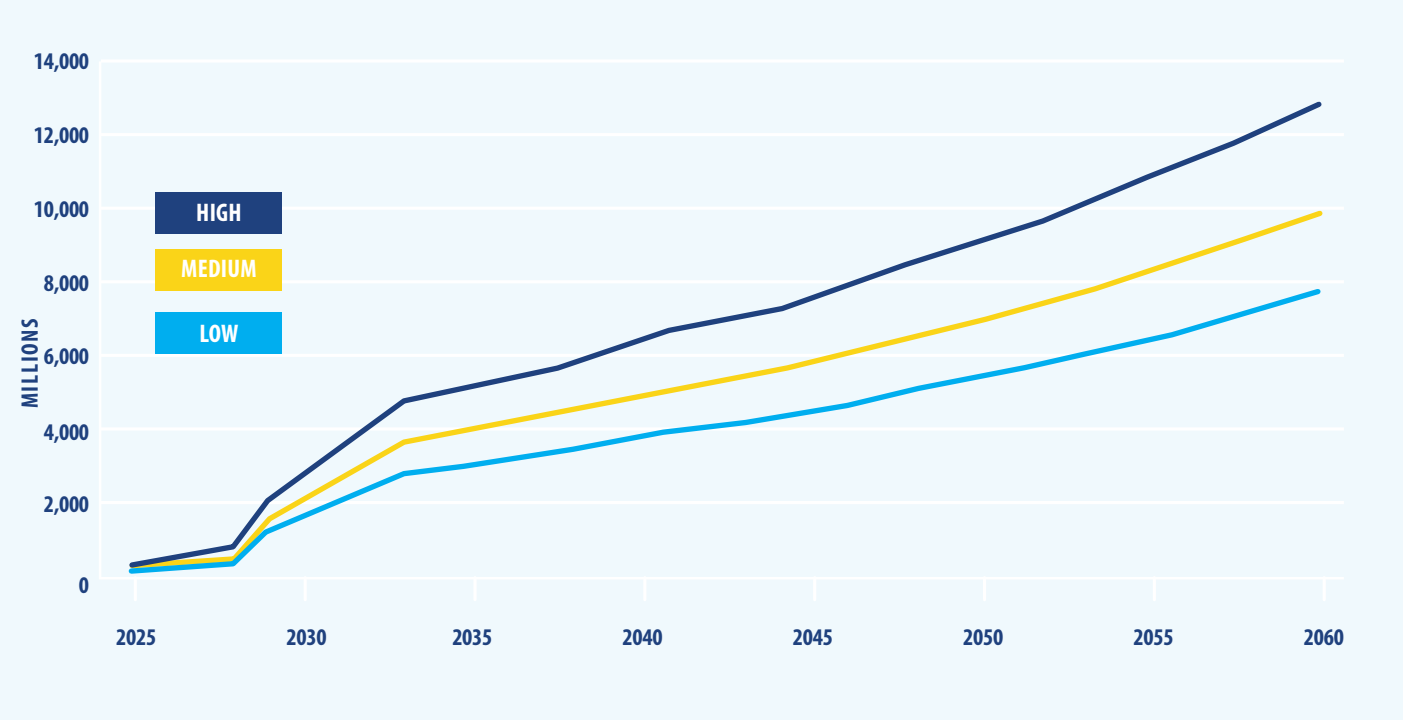


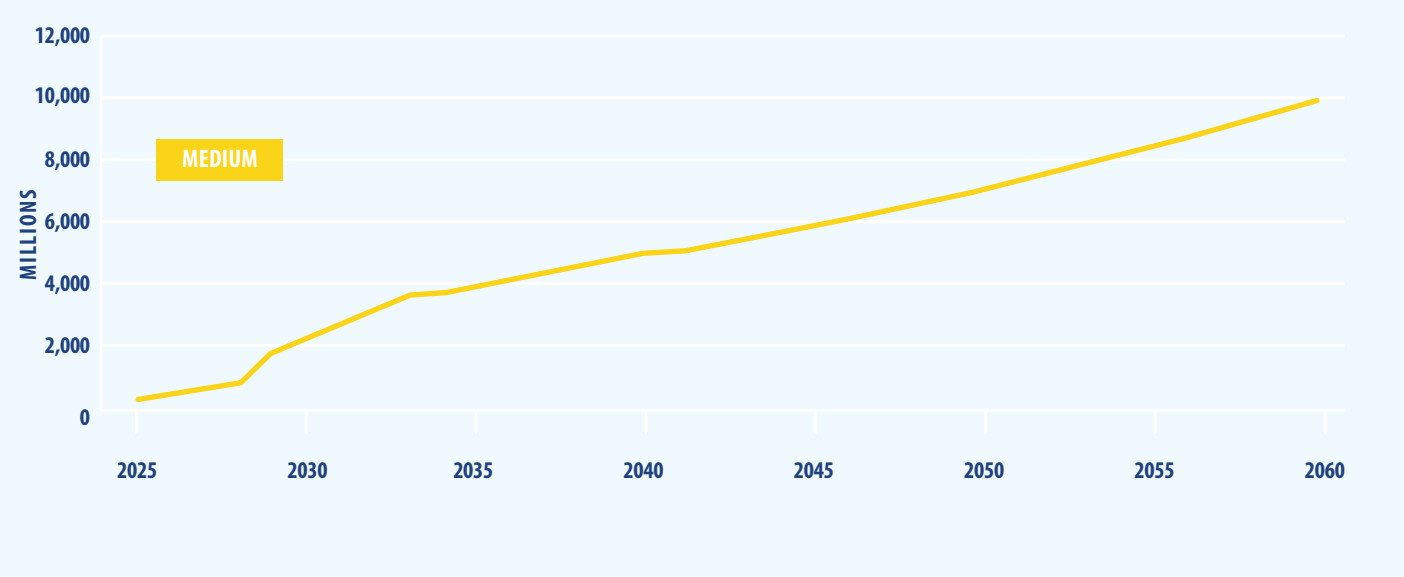
EXHIBIT 7.8 FAREBOX REVENUE: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF 2015$)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
Medium Revenue	$287	$396	$505	$614	$1,262	$1,485	$2,250	$2,413	$2,474	$2,537	$2,601	$2,666

EXHIBIT 7.9 FAREBOX REVENUE: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
Medium Revenue	$382	$542	$712	$893	$1,891	$2,290	$4,025	$5,004	$5,947	$7,068	$8,401	$9,985

EXHIBIT 7.10 FAREBOX REVENUE: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF YOE$)



OPERATIONS AND MAINTENANCE COST ESTIMATES

The 2014 Business Plan Operations and Maintenance cost model was developed using guidance from the US Department of Transportation Inspector General and incorporating feedback from international high-speed rail subject matter experts at the International Union of Railways (UIC).

- The 2016 Business Plan operations and maintenance cost estimates were derived by using the same operations and maintenance cost model that produced the 2014 Business Plan forecasts, but with minor adjustments based on new information and refined assumptions. All model assumption changes were reviewed and verified by Network Rail Consulting, the operator and maintainer of both the high-speed and conventional rail network infrastructure in the United Kingdom, to ensure international best practices are maintained in the forecasts.
- The model adjustments had a minimal overall effect on operations and maintenance cost projections, but phasing changes have a more significant impact on operations and maintenance cost forecasts.
- 2040 out-year forecasts in this 2016 Business Plan are within ~5% of the 2014 Business Plan projections as the changes have minimal net effect on operations and maintenance costs for the Phase 1 system.
- As in 2014, we conducted a Monte Carlo simulation to understand the risks and uncertainties associated with the forecasts and created a forecast range with associated probabilities of occurrence. The high and low operations and maintenance cost forecasts in the exhibits below reflect the results of these Monte Carlo simulations.

Operations and maintenance cost forecasts can be found by scenario in the exhibits below; additional information on the cost model and the model updates can be found in the 2016 Business Plan Technical Supporting Document: Operations and Maintenance Cost Model Documentation.

EXHIBIT 7.11 OPERATIONS AND MAINTENANCE COSTS: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF 2015$)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Cost Estimate	$249	$275	$300	$325	$798	$827	$939	$956	$962	$971	$977	$978
Medium Cost Estimate	$227	$251	$274	$297	$730	$755	$858	$874	$879	$887	$893	$894
Low Cost Estimate	$218	$241	$262	$284	$699	$724	$823	$837	$843	$850	$855	$856

EXHIBIT 7.12 OPERATIONS AND MAINTENANCE COSTS: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Cost Estimate	$331	$377	$424	$473	$1,196	$1,275	$1,680	$1,983	$2,313	$2,705	$3,156	$3,663
Medium Cost Estimate	$303	$344	$387	$432	$1,093	$1,166	$1,535	$1,812	$2,114	$2,472	$2,884	$3,347
Low Cost Estimate	$290	$330	$370	$414	$1,047	$1,117	$1,471	$1,736	$2,025	$2,369	$2,763	$3,207

EXHIBIT 7.13 OPERATIONS AND MAINTENANCE COSTS: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

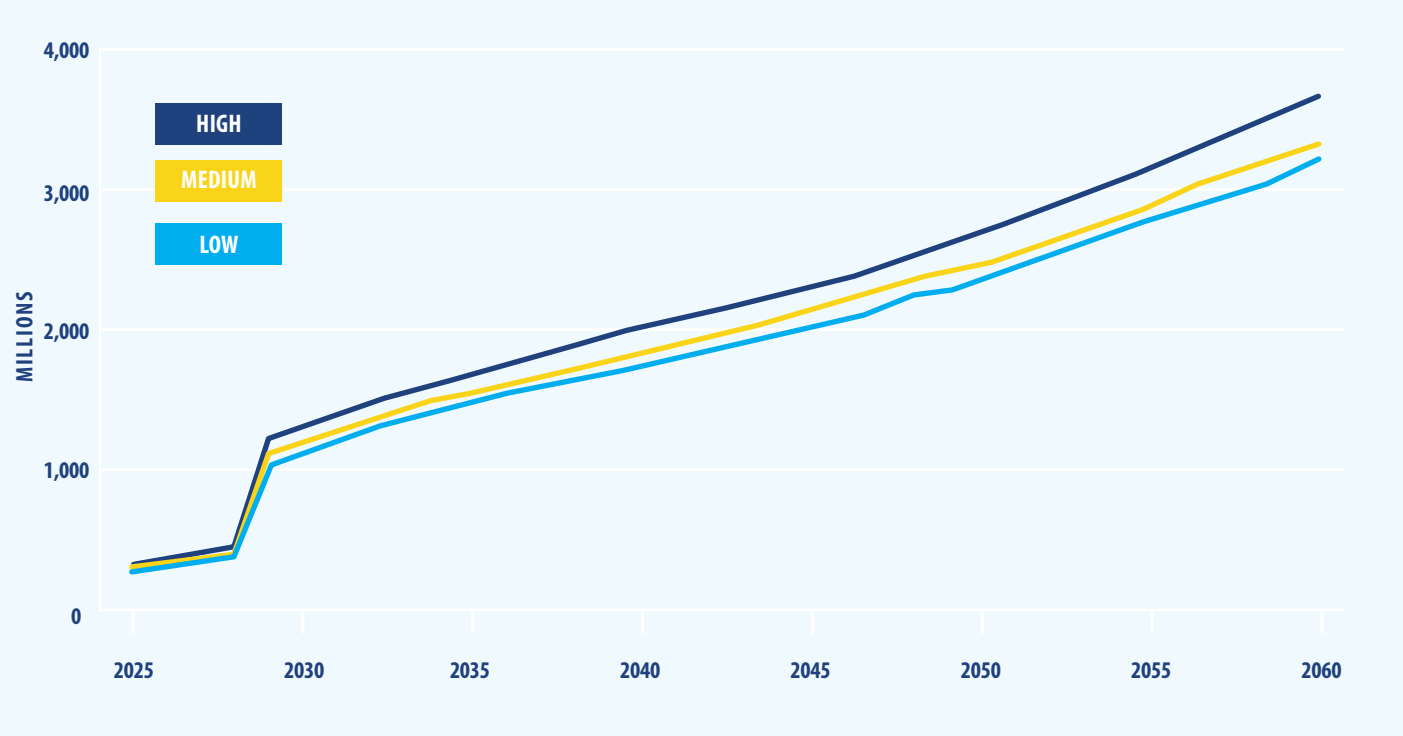


EXHIBIT 7.14 OPERATIONS AND MAINTENANCE COSTS: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF 2015$)*

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
Medium Cost Estimate	$237	$262	$286	$310	$738	$762	$857	$874	$879	$885	$890	$899

*Phase 1 O&M costs in 2015 dollars and YOE dollars, as shown in EXHIBITS 7.11, 7.12, 7.14 and 7.15, differ between the Silicon Valley to Central Valley Line and Silicon Valley to Central Valley Extension scenarios due to differences in recurring Maintenance of Equipment costs, which are a function of initial trainset phasing.

EXHIBIT 7.15 OPERATIONS AND MAINTENANCE COSTS: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	VALLEY TO VALLEY EXTENSION	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
Medium Cost Estimate	$315	$359	$404	$451	$1,105	$1,176	$1,532	$1,813	$2,113	$2,465	$2,876	$3,368

EXHIBIT 7.16 OPERATIONS AND MAINTENANCE COSTS: SAN FRANCISCO-BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

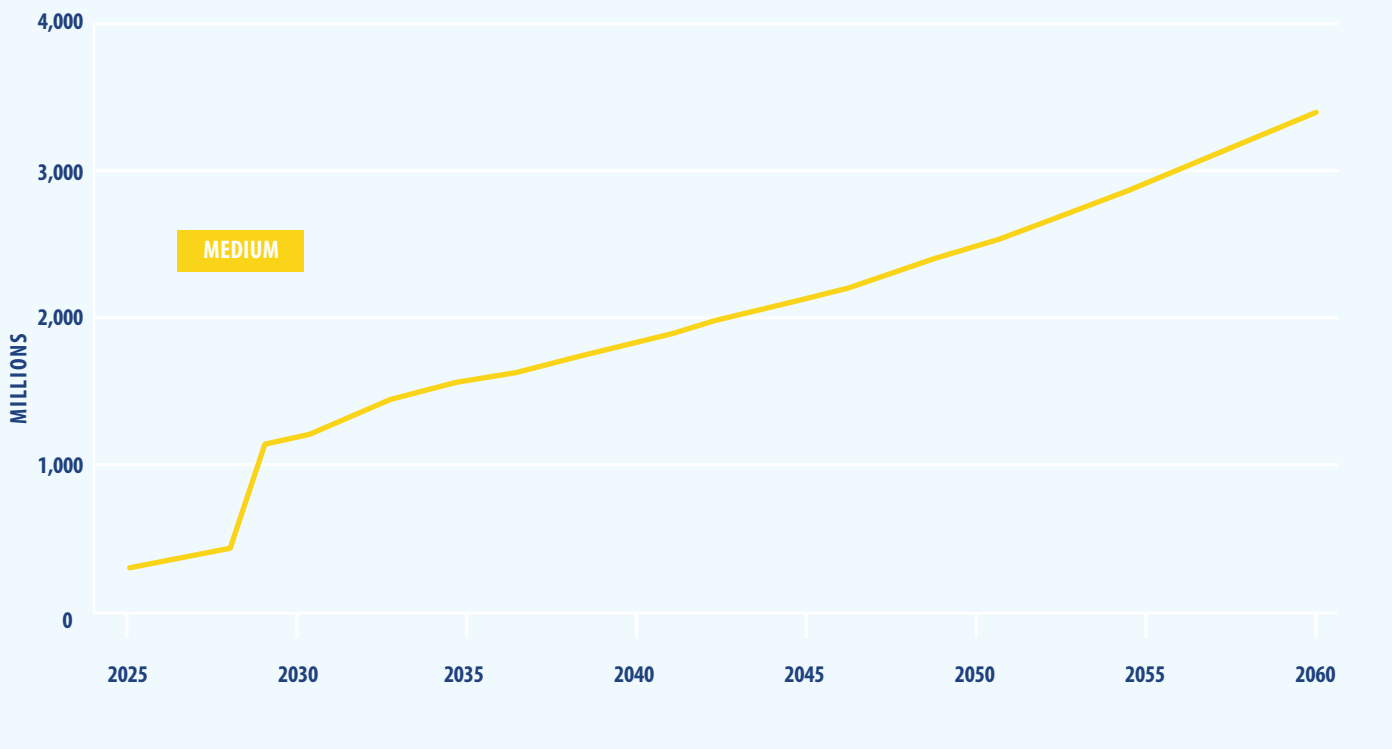
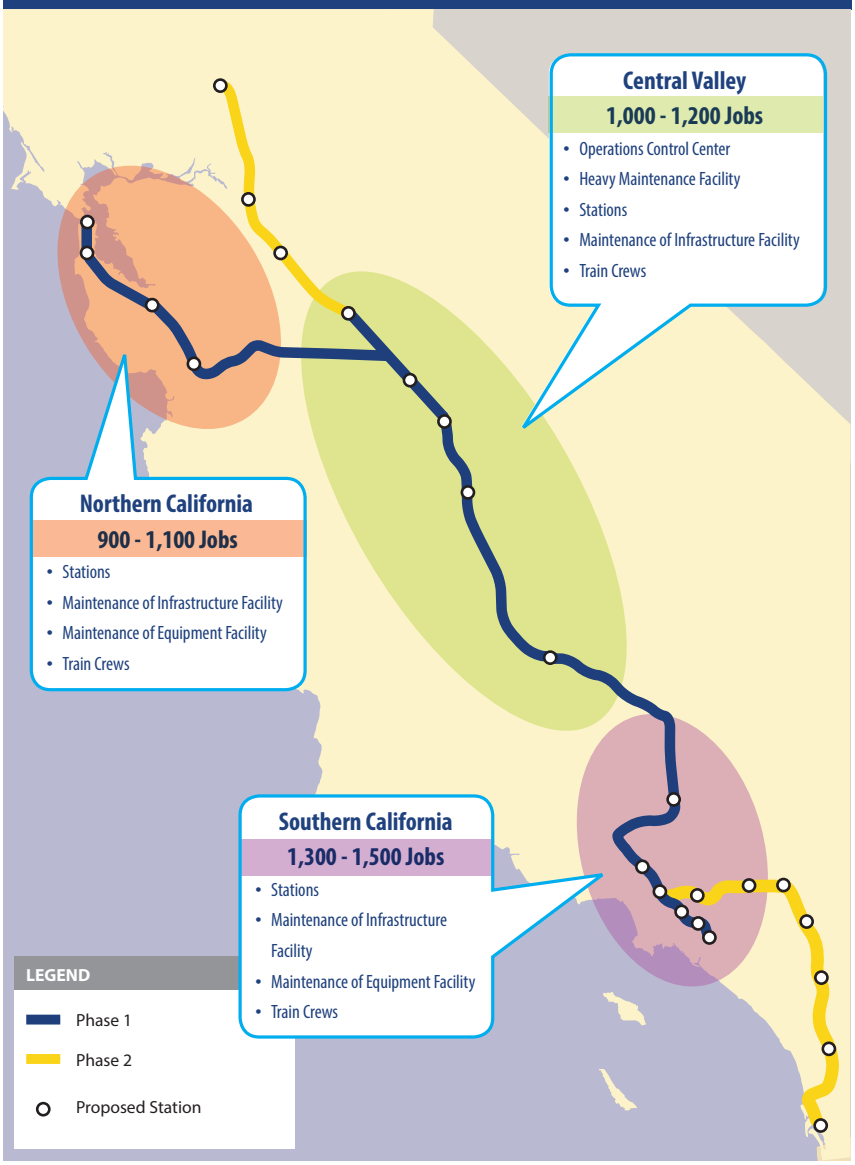


EXHIBIT 7.17 ESTIMATED REGIONAL OPERATIONS AND MAINTENANCE FACILITIES AND JOBS



Throughout the high-speed rail system there will be a variety of facilities built to support the high speed rail service. These facilities include heavy and light maintenance facilities to service trains, stations, maintenance of infrastructure facilities, a dispatching center and headquarters. All of these different railroad functions will create permanent jobs running and maintaining the system. These facilities will be spread around the state to meet the system's needs. We anticipate the following types of positions for each facility type:

- Stations – station managers, ticket agents, passenger assistance representatives, facility maintenance managers, station cleaners, train cleaning staff, police and security.
- Maintenance of Infrastructure Facilities throughout the state – inspectors, heavy equipment operators, laborers, mechanics, truck drivers, welders, track engineers, track maintainers, signal engineers, signal maintainers, communications engineers, systems engineers, wiremen, electricians and supervisory and support staff.
- Heavy Maintenance Facility in the Central Valley – mechanical technicians, electrical technicians, supervisors, laborers, cleaners and storehouse employees
- Light Maintenance Facilities in Northern and Southern California – similar personnel make-up but a lesser workforce than the heavy maintenance facility.
- Operations Control Center – operations directors, managers, dispatchers, supervisory and support staff. Train crew assignments will be dictated from this location and some train crews will report to this location. Train crews (engineers, conductors, assistant conductors and on-board attendants) will also report in other locations where trains start up service.
- Headquarters in the Central Valley – The railroad executive and corporate organizations will be housed at this location. The executive and corporate workforce will include operations, safety, legal, finance, human resources, contracts, planning, systems and information technology and public affairs and marketing professionals.

LIFECYCLE COST ESTIMATES

- Lifecycle costs forecast the capital rehabilitation and replacement costs for the infrastructure and assets of the high-speed rail system. Differences in lifecycle costs between the 2014 Business Plan and this 2016 Business Plan reflect changes in capital cost estimates and minor adjustments to some asset lifespans. All model assumption changes were reviewed and verified by Network Rail, the operator and maintainer of both the high-speed and conventional rail network infrastructure in the United Kingdom, to ensure international best practices are maintained in the forecasts.
- Lifecycle costs differ between the Silicon Valley to Central Valley and the Silicon Valley to Central Valley Extension scenarios because the extensions to San Francisco and Bakersfield that open in the earlier years in the Silicon Valley to Central Valley Extension scenario drive additional lifecycle costs. This impacts the recurring rehabilitation and replacement costs that accumulate on those segments.
- Similar to the operations and maintenance and revenue estimates, a Monte Carlo analysis was developed to evaluate a potential range of lifecycle cost forecasts shown in the exhibits below. The Monte Carlo methodology employed in 2014 applies also to the 2016 analysis. For more information on the lifecycle cost model, please refer to the 2016 Business Plan Technical Supporting Document: 50-Year Lifecycle Capital Cost Model Documentation.

EXHIBIT 7.18 LIFECYCLE COSTS: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF 2015$)

	2025	2030	2035	2040	2045	2050	2055	2060
High Lifecycle Cost	-	-	$29	$47	$170	$80	$397	$916
Medium Lifecycle Cost	-	-	$26	$43	$156	$74	$364	$841
Low Lifecycle Cost	-	-	$24	$39	$142	$67	$331	$763

EXHIBIT 7.19 LIFECYCLE COSTS: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

	2025	2030	2035	2040	2045	2050	2055	2060
High Lifecycle Cost	-	-	$48	$91	$383	$210	$1,200	$3,212
Medium Lifecycle Cost	-	-	$44	$84	$352	$193	$1,102	$2,949
Low Lifecycle Cost	-	-	$40	$76	$319	$175	$1,000	$2,675

EXHIBIT 7.20 LIFECYCLE COSTS: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

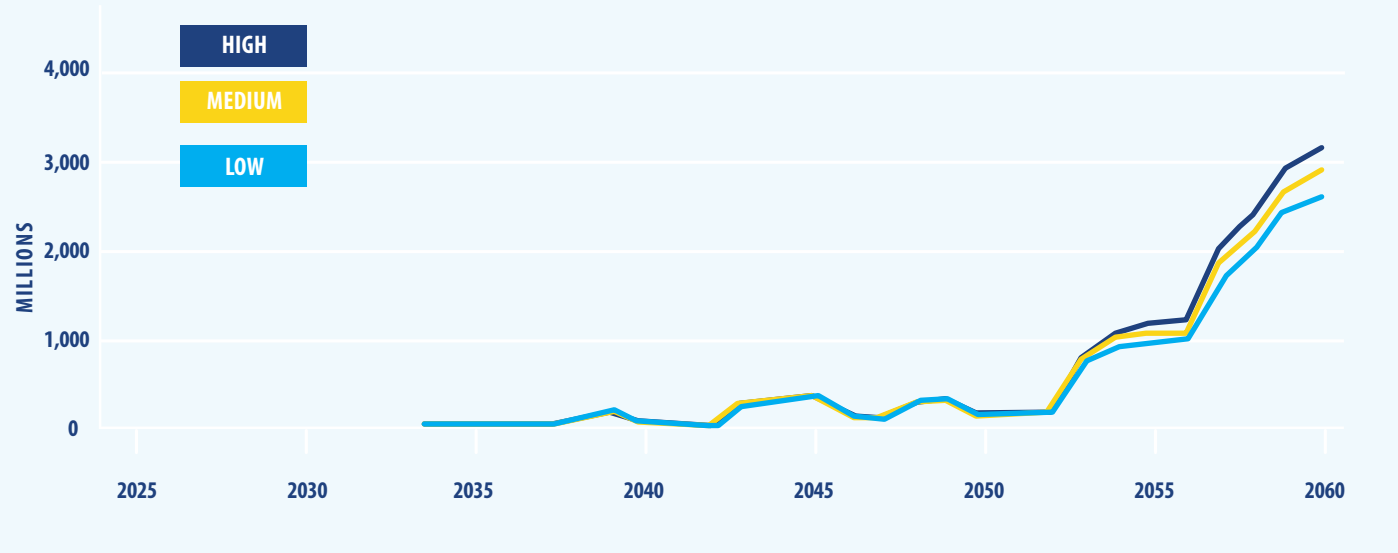


EXHIBIT 7.21 LIFECYCLE COSTS: SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1 – CUMULATIVE THROUGH 2060 (IN MILLIONS)

	2015$	YOE$
High Lifecycle Cost	$6,043	$18,253
Medium Lifecycle Cost	$5,549	$16,759
Low Lifecycle Cost	$5,033	$15,201

EXHIBIT 7.22 LIFECYCLE COSTS: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF 2015$)

	2025	2030	2035	2040	2045	2050	2055	2060
Medium Lifecycle Cost	-	-	$34	$52	$173	$74	$404	$802

EXHIBIT 7.23 LIFECYCLE COSTS: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

	2025	2030	2035	2040	2045	2050	2055	2060
Medium Lifecycle Cost	-	-	$57	$102	$390	$192	$1,222	$2,812

EXHIBIT 7.24 LIFECYCLE COSTS: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 (IN MILLIONS OF YOE$)

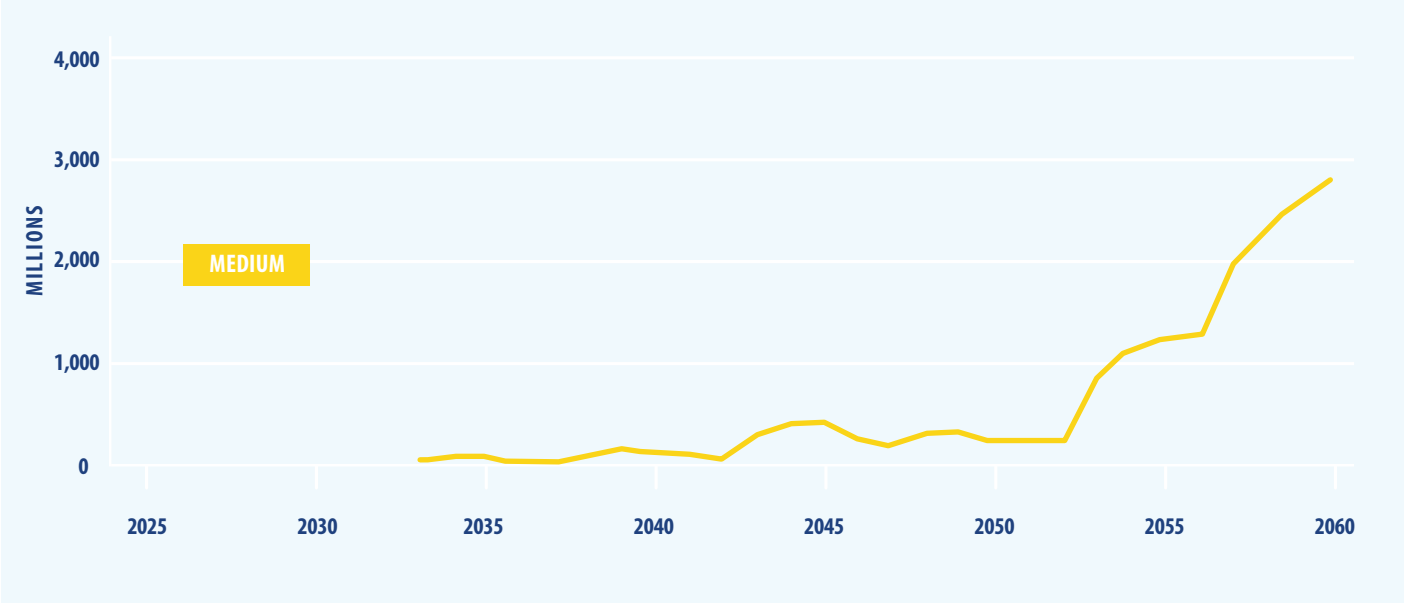


EXHIBIT 7.25 LIFECYCLE COSTS: SAN FRANCISCO – BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1 – CUMULATIVE THROUGH 2060 (IN MILLIONS)

	2015$	YOE$
Medium Lifecycle Cost	$5,716	$17,166

BREAKEVEN ANALYSIS

- As described above, the revenue and cost projections for this 2016 Business Plan have been updated and reanalyzed using enhanced models since the 2014 Business Plan and have undergone risk analyses to confirm their reliability.
- A breakeven analysis has been conducted on the Silicon Valley to Central Valley line from San Jose to North of Bakersfield and on the Phase 1 system. The breakeven analysis performed considers farebox revenue only.
- The Monte Carlo risk analysis performed on the system breakeven provides state-of-the-art statistical support for the projections that the system will perform at or above its breakeven point and will not require an operating subsidy. The breakeven probability for the Silicon Valley to Central Valley line opening year is 32% but this increases quickly as the system ramps up. It is anticipated that the system begins to cover annual operating costs in Year 2 and recoups the first year loss by Year 3 (in the Medium case). The Authority has a number of contracting strategies that will allow it to cover any early year losses based on revenues exceeding costs in later years within the contract structure. This will ensure that there will not be a time that the Authority will have to provide a subsidy to an operator.
- The quantitative risk analysis demonstrates that the breakeven probability reaches 69% over the initial ramp-up period for the Silicon Valley to Central Valley Line and is greater than 99% for the Phase 1 out year.

RISK ANALYSIS - MONTE CARLO SIMULATION

A Monte Carlo analysis (or simulation) is a tool to understand the probability or potential for an event to occur, in this case the probability that the system will breakeven. The analysis works as though there are two large bags full of marbles, one with 10,000 marbles each containing potential O&M costs, with more of the marbles having values around the median cost estimate than around the extreme (high or low) values. The second bag of 10,000 marbles contains potential revenue outcomes, again with more marbles with values around the median than the high or low outliers.

- A Monte Carlo analysis simply "picks" one marble at random from the revenue bag and one marble at random from the cost bag, subtracts the number written on the cost marble from the one written on the revenue marble and records the value.
- The analysis then puts the marbles back into their respective bags and repeats the process approximately 10,000 more times which builds up a distribution of potential results and generates a degree of confidence (or confidence interval, expressed as a percentage) as to the likelihood of project breakeven.

EXHIBIT 7.26 SUMMARY OF NET CASH FLOW FROM FIRST 5 YEARS OF OPERATIONS: SAN JOSE-NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1, HIGH SCENARIO (IN MILLIONS OF YOE$)*

	2025	2026	2027	2028	2029
Total Revenue (including Farebox, Ancillary and Bus)	$360	$510	$668	$836	$2,222
Less: O&M	($331)	($377)	($424)	($473)	($1,196)
Net Cash Flow from Operations	**$28**	**$133**	**$245**	**$363**	**$1,026**

*Bus revenue for the high and low scenarios is estimated by calculating the average increase/decrease from medium farebox revenue to high/low farebox revenue and applying that average to medium bus revenue each year. Ancillary revenue is assumed to be 1% as outlined in the Ridership and Revenue section. Numbers may not add exactly due to rounding. This footnote applies to EXHIBITS 7.26, 7.27, 7.28 and 7.29.

EXHIBIT 7.27 SUMMARY OF NET CASH FLOW FROM FIRST 5 YEARS OF OPERATIONS: SAN JOSE-NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1, MEDIUM SCENARIO (IN MILLIONS OF YOE$)

	2025	2026	2027	2028	2029
Total Revenue (including Farebox, Ancillary and Bus)	$254	$361	$473	$592	$1,671
Less: O&M	($303)	($344)	($387)	($432)	($1,093)
Net Cash Flow from Operations	**($48)**	**$16**	**$86**	**$159**	**$578**

EXHIBIT 7.28 SUMMARY OF NET CASH FLOW FROM FIRST 5 YEARS OF OPERATIONS: SAN JOSE-NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) THROUGH PHASE 1, LOW SCENARIO (IN MILLIONS OF YOE$)

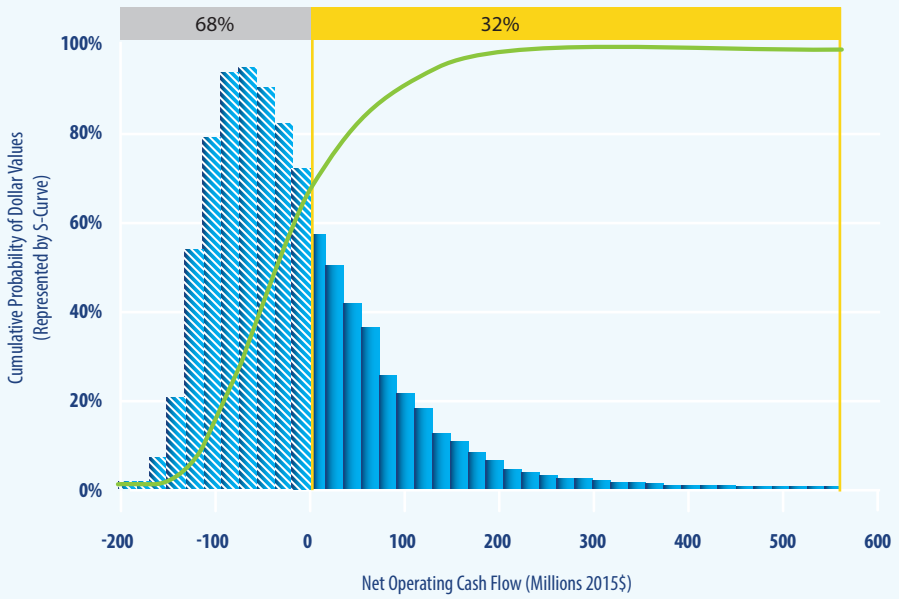
	2025	2026	2027	2028	2029
Total Revenue (including Farebox, Ancillary and Bus)	$199	$281	$369	$462	$1,307
Less: O&M	($290)	($330)	($370)	($414)	($1,047)
Net Cash Flow from Operations	**($91)**	**($48)**	**($1)**	**$48**	**$259**

EXHIBIT 7.29 SUMMARY OF NET CASH FLOW FROM FIRST 5 YEARS OF OPERATIONS: SAN FRANCISCO-BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY EXTENSION) THROUGH PHASE 1, MEDIUM SCENARIO (IN MILLIONS OF YOE$)

	2025	2026	2027	2028	2029
Total Revenue (including Farebox, Ancillary and Bus)	$394	$559	$734	$921	$1,910
Less: O&M	($315)	($359)	($404)	($451)	($1,105)
Net Cash Flow from Operations	**$78**	**$200**	**$330**	**$469**	**$805**

EXHIBIT 7.30 BREAKEVEN ANALYSIS: OPENING YEAR SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE) (2025)

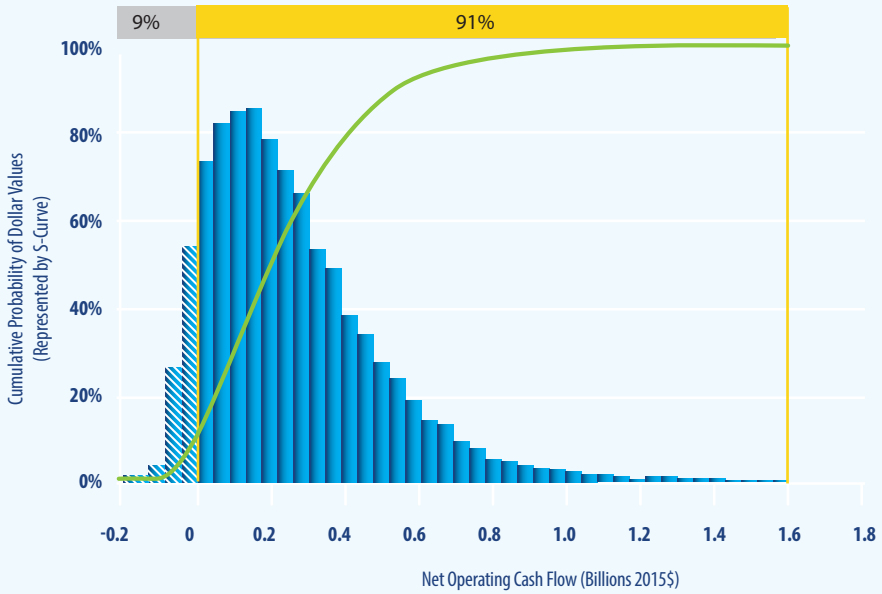
PROBABILITY DISTRIBUTION



DATA	
Minimum	($190m)
10%	($112m)
25%	($84m)
75%	$21m
90%	$88m
Maximum	$561m
KEY RESULTS	
Probability to breakeven	32%
Median Net Cash Flow From Operations	($39m)
Mean Net Cash Flow From Operations	($23m)

EXHIBIT 7.31 BREAKEVEN ANALYSIS: HORIZON YEAR SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE ONLY) (2029)

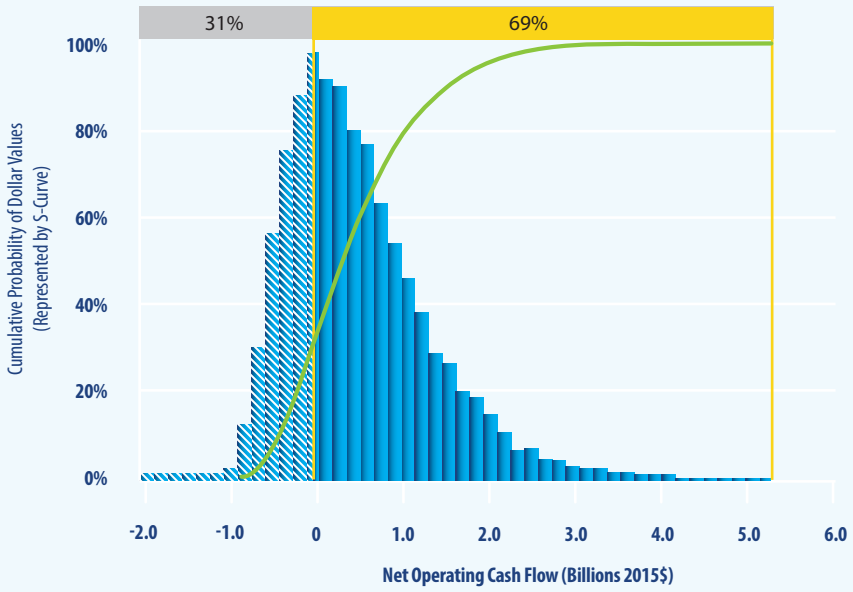
PROBABILITY DISTRIBUTION



DATA	
Minimum	($128m)
10%	$8m
25%	$85m
75%	$363m
90%	$539m
Maximum	$1,601m
KEY RESULTS	
Probability to breakeven	91%
Median Net Cash Flow From Operations	$204m
Mean Net Cash Flow From Operations	$246m

EXHIBIT 7.32 BREAKEVEN ANALYSIS: CUMULATIVE FOR SAN JOSE – NORTH OF BAKERSFIELD (SILICON VALLEY TO CENTRAL VALLEY LINE ONLY) (2025 – 2029)

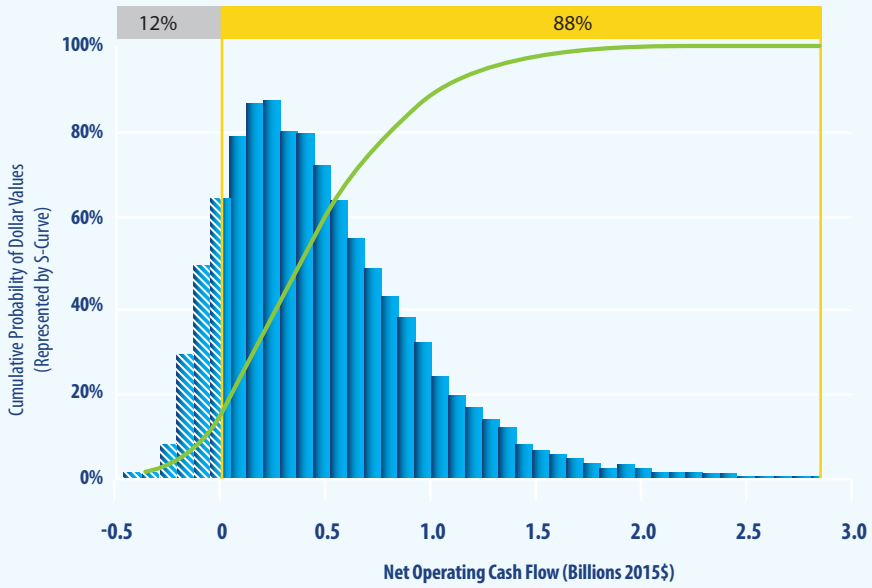
PROBABILITY DISTRIBUTION



DATA	
Minimum	($1,051m)
10%	($407m)
25%	($100m)
75%	$920m
90%	$1,570m
Maximum	$5,307m
KEY RESULTS	
Probability to breakeven	69%
Median Net Cash Flow From Operations	$349m
Mean Net Cash Flow From Operations	$485m

EXHIBIT 7.33 BREAKEVEN ANALYSIS: OPENING YEAR PHASE 1 (2029)

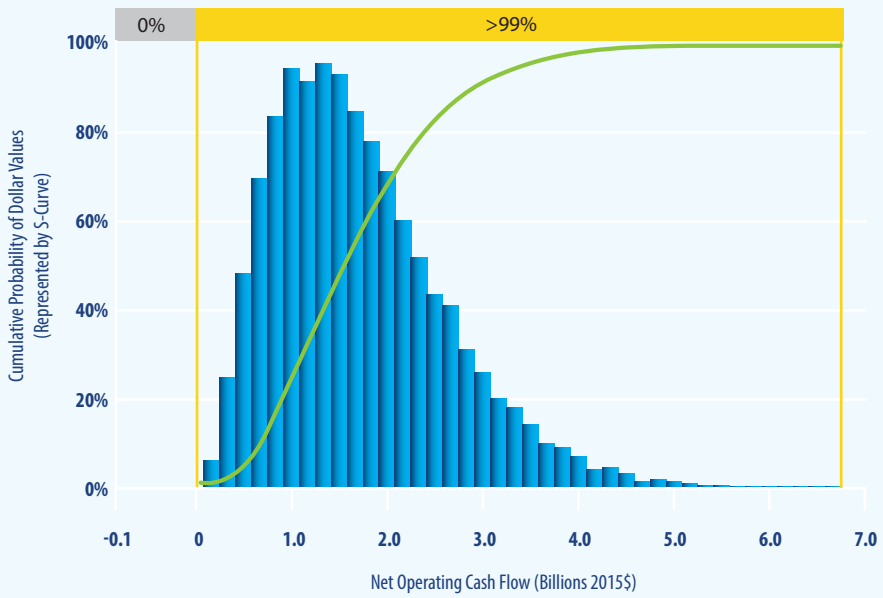
PROBABILITY DISTRIBUTION



DATA	
Minimum	($380m)
10%	($29m)
25%	$133m
75%	$699m
90%	$1,043m
Maximum	$2,861m
KEY RESULTS	
Probability to breakeven	88%
Median Net Cash Flow From Operations	$380m
Mean Net Cash Flow From Operations	$456m

EXHIBIT 7.34 BREAKEVEN ANALYSIS: HORIZON YEAR PHASE 1 (2040)

PROBABILITY DISTRIBUTION



DATA	
Minimum	$55m
10%	$662m
25%	$1,017m
75%	$2,211m
90%	$2,938m
Maximum	$6,769m
KEY RESULTS	
Probability to breakeven	>99%
Median Net Cash Flow From Operations	$1,545m
Mean Net Cash Flow From Operations	$1,695m

Section 8: *Looking Ahead*

As with all infrastructure projects of this magnitude, complexity and significance, our progress could be impacted by unforeseen challenges or unexpected opportunities. Our progress depends on many factors, some of which we will be able to control and some that we won't. As we advance, we will remain flexible yet focused on delivering on our commitment to implement a high-speed rail system—as part of a more comprehensive statewide rail modernization program—as quickly and cost-effectively as possible. While it is not always possible to predict the future, the timeframes below show the milestones we are targeting in the coming years.

BY 2020, IN 5 YEARS, WE ANTICIPATE THAT THE PROGRAM WILL HAVE ADVANCED SIGNIFICANTLY TO THE POINT WHERE WE WILL BE:

- Nearing completion of construction in the Central Valley – including electrification and signaling – and will be looking ahead to begin testing and commissioning the first high-speed trains in the United States
- Preparing for the delivery and testing of our first prototype high-speed trainsets
- Constructing stations in the Central Valley
- Outfitting the heavy maintenance facility in the Central Valley
- Completing environmental approvals and establishing the final alignment and station locations for the entire Phase 1 system from San Francisco/Merced to Los Angeles/Anaheim
- Working with the California Public Utilities Commission on eliminating grade crossings to improve safety at numerous locations throughout the state
- Finishing the electrification of the San Francisco to San Jose Peninsula corridor making way for a sustainable, modernized passenger rail system with commuter rail and eventually high-speed rail capabilities
- Providing continued improvements in Southern California through the Southern California Regional Interconnection Project which will create additional operational efficiencies and scheduling reliability for all trains using Los Angeles Union Station, including high-speed rail
- Creating, or having already created, thousands of jobs while also employing hundreds of small businesses on the program
- Beginning to expand construction beyond the Central Valley and planning ahead for the start of service

BETWEEN 2020 AND 2025, WE ANTICIPATE:

- Completing test track operations in the Central Valley in preparation for passenger service
- Delivering the remaining part of the first trainset order
- Opening day for high-speed passenger service in California – the first high-speed rail line in the United States

> ***"With high-speed rail, the rest of California can easily access Fresno, and Fresno can easily access the other major urban areas of the state. This is great news for our economy, both in the immediate term and in the long run."***
>
> *- Ashley Swearengin*
> *Mayor*
> *City of Fresno*

- Opening new stations in communities around the state, creating new multi-modal hubs and strengthening existing ones
- Continuing to collaborate with station communities to create vibrant neighborhoods around stations
- High-speed rail serving as an economic catalyst for new transit-focused development in commercial and residential properties
- Advancing toward completing the Phase 1 system with completion of construction projects around the state
- Continuing cooperation with partners to improve existing systems – including safety, capacity, reliability and access investments that will benefit the entire statewide rail network
- Laying the foundation toward future Phase 2 extensions between Merced and Sacramento and between Los Angeles and San Diego
- Developing light maintenance facilities needed for operations that will generate hundreds of local jobs
- Growing a California-based high-speed rail workforce that will deliver the system and spread expertise around the country

BY 2025 AND BEYOND, WE ENVISION THAT:

- The Phase 1 system will be completed – serving riders from the San Francisco Bay Area to the Los Angeles Basin through the Central Valley
- Many people will be choosing high-speed rail over flying or driving for fast, efficient, reliable convenient and environmentally-responsible travel throughout California
- Ridership will be growing for both business and vacation travelers because high-speed rail allows for:
  - Easy and quick access to a range of California economic centers, cultural and tourist attractions, sporting events and recreational destinations
  - More efficient use of airport and highway infrastructure (e.g., as airlines shift resources from intrastate to transnational and international service)
- Growth, economic development and revitalization will be taking place in high-speed rail station communities as the stations become increasingly important and convenient transportation and community focal points
- Continued job growth from expanded operations and maintenance of the system as well as construction and development surrounding high-speed rail stations
- Planning and project development work will continue, leading to eventual construction of Phase 2 extensions to Sacramento and San Diego
- California's high-speed rail industry and workforce will be leading the nation as other parts of the country develop their rail networks

Section 9: *Risk Management*

We have implemented a robust Risk Management Program that uses state-of-the-practice risk management tools and analyses (such as Monte Carlo simulations) in order to flag early warning signs associated with potential cost and schedule risk. These analyses are used to facilitate and drive prudent and timely risk response actions before program cost and schedule have the potential to be impacted.

- Our Risk Management Program has a direct reporting relationship established with the Board Finance and Audit Committee. This direct reporting enables daylighting to the risk management approach and encourages informed decisions.
- We have performed the pre-bid schedule and cost risk analyses for each of the construction packages. The identification of major risks and contingency recommendations in these pre-bid analyses were validated by the eventual contractor's scope and schedules.
- We are assisting other teams within the Program in making significant decisions using a data-driven analysis approach. For example, the probabilistic analysis performed on the containment of railroad intrusion protection barrier walls provided us, the Federal Railroad Administration and adjacent railroads an additional mechanism to make informed decisions.
- Through our ongoing efforts, we have identified various trends, both positive and negative, to the program cost and schedule milestones including, but not limited to, the following:
  - The right of way parcel acquisition risk analysis performed on the right of way acquisition forecast identified potential delays to our schedule. Our reviews highlighted the need for early identification and mitigation of actual right of way risks as well as other project risks. An alternative forecast was developed to reflect potential delays that were outside of our control and were more in line with recent trends.
  - We are updating cost risk analyses for Construction Package 1, which highlight cost overruns in three of the risk areas originally identified in the Construction Package 1 contract contingency analysis. These particular cost risks relate to intrusion protection and other requirements requested by the adjacent railroads, relocation of utilities, and right of way acquisition. The updated cost risk analysis for Construction Package 1 indicates the potential to exceed the current contingency envelope for the contract.
  - We are getting aggressive bids below engineer's estimates on recent construction packages.
- These trends are being analyzed and considered in the capital cost estimates.
- Our risk management team is working in concert with all parties involved in the delivery of the program to identify and implement risk mitigation strategies and potential savings such as alternative design and construction approaches.

- We are applying lessons learned from early construction packages to better quantify the uncertainties related to schedules and costs and improve the underlying risk analyses for future construction packages and the program.

As discussed above, we have developed and implemented a risk management plan and a quality management system that are designed to manage and mitigate risks and to ensure that the high-speed rail program meets or exceeds acceptable industry and government standards.

OVERVIEW OF KEY RISK AREAS

The key risk areas that we have identified and manage on an ongoing basis vary based on the individual section's design or construction phase. This section provides an overview of the most significant risks identified by the Risk Management Program, together with management strategies and mitigations.

We have grouped the key risk areas in three broad categories:

1. Program level risks
2. Construction risks
3. Technology risks

PROGRAM LEVEL RISKS

RISK: FINANCING AND FUNDING

- Funding risks include failure to receive the anticipated amount of public funding at the requisite time and failure to manage the timing of committed funds against the cash flow requirements of the program
- Financing risks include failure to attract lenders and/or investors, as well as potential increases in interest rates.
- Both of these risks can delay the development of the program and increase the cost of borrowing and investment
- Additionally, delay in the program could put some of the previously approved funding from the American Recovery and Reinvestment Act in jeopardy if it is not spent by September 2017

Management Strategies/Mitigation(s)

- Secured a long term continuous funding stream of proceeds from the Greenhouse Gas Reduction Fund
- Continue to identify all necessary sources for the $6 billion cost of the first construction segment in the Central Valley
- Continue to review and adjust scope of work over multiple phases to fit within available funding
- Advancing work with lenders and investors to accelerate private sector participation and get to operations as quickly as possible
- Continue to actively manage the construction projects and other expenditures to ensure that all federal funds are spent before their deadline

RISK: LEGAL AND LITIGATION

- Range of potential litigation challenges and adjudicatory administrative processes related to project funding, environmental clearances, property acquisition and contract disputes.
- These risks can adversely affect the project schedules, costs and financing.

Management Strategies / Mitigation(s)

- Work closely with affected stakeholders to address issues before they become formal lawsuits or, for legal issues raised through lawsuits, we typically seek to resolve them.
- In addition to court resolution processes, we also use alternative dispute resolution such as mediation or arbitration. For litigation purposes, we are represented by the Attorney General's office except in those cases where additional expertise may be required.

RISK: DECLINE IN STAKEHOLDER SUPPORT

- At the state level, a decline in public support could translate into problems with fiscal processes and regulatory functions.
- Locally, interest groups could attempt to prevent or delay advancement of the system by hampering the local authorization and permitting processes or inhibiting local collaboration.

Management Strategies / Mitigation(s)

- Demonstrate benefits through progress including construction, environmental process, the creation of jobs, and hiring of small businesses
- Regional Directors in Northern California, the Central Valley and Southern California were appointed in 2012, and their respective offices all opened in 2013. These Regional Directors and their staff have a program-level understanding of the cost implications of potential program decisions, and they use this information to act as a point of contact for local and regional stakeholders when addressing their needs and concerns related to potential project effects in their region
- Conduct regular outreach meetings to provide information and facilitate communication opportunities between the program and stakeholders.
- Appointed a Small Business Advocate in 2012 to serve as the main point of contact between us and small businesses to address small business concerns and cultivate what is expected to be a mutually beneficial relationship between us and small businesses across the state

RISK: RIDERSHIP AND REVENUE

- The ridership revenues need to be sufficient to cover the operations and maintenance cost of the system to comply with the no subsidy requirement from Proposition 1A.
- The expansion of the program is dependent on the ridership revenues to support access to private capital as the program matures

- Consequences for inaccurate ridership forecasts could decrease the level of private sector investment, increase the public funding required and damage stakeholder support

Management Strategies / Mitigation(s)

- Enhanced the travel demand model developed for the 2016 Business Plan (from the 2014 Business Plan) with the latest available input data and additional variables to better reflect travel behavior and current travel network information; this model has been reviewed and endorsed by independent peer review groups. More about the model can be found in the Travel Demand Model Documentation report.
- Developed a Risk Analysis Model to estimate a ridership and revenue forecast range and associated probabilities. The risk model is used to develop Monte Carlo simulations for each of the Business Plan scenarios and associated forecast years. For more information, please refer to the Risk Analysis Report.
- Consider bringing a train operator on board early to benefit from industry expertise on ridership and revenue risks. The operator will develop mitigation strategies based on real operations experience to help us make future decisions on how to maximize ridership and revenue.

RISK: OPERATIONS AND MAINTENANCE

- Similar to the ridership and revenue risk, differences between actual operations and maintenance costs and forecasts could damage the program's ability to meet Proposition 1A requirements and attract private sector investment
- Consequences for inaccurate operations and maintenance cost forecasts could increase the public funding required

Management Strategies / Mitigation(s)

- Estimates for the 2016 Business Plan account for all known cost categories and include appropriate contingencies (based on the U.S. Department of Transportation guidance) for each cost category in the baseline forecast
- We conducted Monte Carlo simulations that analyzed the risk to the total cost estimate based on the accuracy of other relevant Operations & Maintenance forecasts (reference cases)
- We have consulted extensively with the International Union of Railways (UIC) and other outside reviewers to evaluate international best practices.
- We leveraged the international expertise of Network Rail, the operator and maintainer of both the high-speed and conventional rail network infrastructure in the United Kingdom, to ensure that assumptions made in the 2014 Business Plan still apply, with changes and enhancements made as necessary. These efforts are also documented in the Operations and Maintenance Cost Technical Supporting document.
- We may bring a train operator on board early to benefit from industry expertise on operations and maintenance. The operator will develop mitigation strategies based on real operations experience and help us with future estimating, planning and allocation efforts.

RISK: CAPITAL REHABILITATION AND REPLACEMENT COSTS DIFFER FROM FORECASTS

- Differences between actual rehabilitation and replacement (lifecycle) costs and forecasts would damage the program's long-term financial performance
- Consequences for inaccurate lifecycle cost forecasts could decrease the level of private investment and increase the public funding required

Management Strategies / Mitigation(s)

- The model used in the 2016 Business Plan uses the same structure and approach as the 2014 Business Plan, but with enhancements and upgrades to accommodate capital cost estimate revisions and design changes
- The model includes detailed estimates for each cost category based on the design life and experience around the world for asset lifespans and rehabilitation requirements. Contingency was applied in the estimates to account for inherent risks and uncertainties with forecasting lifecycle costs. Similar to the Operations & Maintenance and revenue estimates, a Monte Carlo analysis was developed to evaluate a potential range of lifecycle forecasts. The analysis helped form the basis for low, medium and high lifecycle cost estimates
- All model assumption changes and enhancements were reviewed and verified by Network Rail[7], the operator and maintainer of both the high-speed and conventional rail network infrastructure in the United Kingdom, to ensure international best practices are maintained in the forecasts

CONSTRUCTION RISKS

RISK: RIGHT OF WAY (ROW) ACQUISITION DELAYS

- Difficulties in acquiring required parcels can delay construction by delaying start of construction and/or requiring inefficient sequencing of individual work elements, potentially resulting in overall program delays and increased costs that the contractor will pass through to us
- Additional costs can result from the contractor working for an additional period of time (e.g. overhead), additional mobilization and remobilization efforts over and above what would otherwise be required, or additional resources and lower productivity associated with acceleration efforts required to meet schedule requirements.

Management Strategies / Mitigation(s)

- Established a settlement team to focus on high priority construction parcels
- Executed Purchase Agreements for parcels required for Construction Package 1 and made substantial progress for Construction Package 2-3
- Assigned a dedicated right of way program manager charged with strategic planning and identifying and addressing procedural bottlenecks
- Joint work with the contractor(s) to potentially re-sequence or accelerate work as necessary based on parcel availability
- Secure adequate funding and staffing with appropriate skills to process the volume of acquisition in a timely manner

RISK: ENVIRONMENTAL

- Risk of obtaining approvals in the requisite time necessary to avoid delays to construction
- Delays and/or increased costs associated with environmental approvals
- Risk associated with conditions of the approval (e.g. review periods longer than anticipated)

Management Strategies / Mitigations(s)

- Implemented a number of identified federal and state environmental clearance strategies to achieve Notices of Determination (NOD)/Records of Decision (ROD) timelines
- Increased the Authority's and contractors' environmental resources
- Worked with the Federal Railroad Administration and resource agencies to assign sufficient resources for environmental approval processes
- Currently implementing project permitting strategies on parallel tracks

RISK: THIRD-PARTY AGREEMENTS

- Costs of intrusion protection and betterments requested by railroads
- Delays associated with railroad agreement review and approval
- Delays in agreements and the inability to relocate utilities because of Buy America requirements
- Additional costs of utility relocations attributable to late transfer of utility work to design-builder and potential for as-yet unidentified utilities

Management Strategies / Mitigation(s)

- Executed several agreements with railroads in the Central Valley that will serve as a basis for other regions
- Working cooperatively with railroads to identify engineering solutions for mitigating the adjacency issues within Construction Package 1 and Construction Package 2-3
- Collaborating with utilities and the Federal Railroad Administration for early identification of any potential Buy America issues, and negotiations are continuing on agreements to resolve remaining issues
- Managing utility design and construction requirements, and in finalizing all cooperative utility agreements, in coordination with the affected utility companies
- Changing utility work to be under the control of the design-build contractor to allow for better scheduling and control by the contractor to prevent delays
- Utilizing value engineering to make utility relocation designs more cost-effective
- Thoroughly reviewing contractor utility cost proposals and comparing against competitive market estimates

TECHNICAL RISKS

RISK: ENGINEERING AND ENVIRONMENTAL

- Engineering and environmental challenges associated with tunnels in mountainous terrains
- Design, constructability and commercial challenges
- Groundwater resources and geotechnical investigation

Management Strategies / Mitigations(s)

- Established a geotechnical steering committee to review and make recommendations for work and move forward with geotechnical investigations in the mountainous regions to support environmental analyses and confirm feasibility
- Complete preliminary Hazard Analysis on tunneling, ventilation and geotechnical risks
- Continue to explore provisions to cross active faults on at-grade alignments where practical or crossing faults in underground structures with seismic fault chambers that accommodate shifts in track alignment
- Employ design solutions such as pre-excavation grouting to control groundwater inflows and establish a groundwater resource monitoring program

RISK: ALIGNMENTS PASSING THROUGH ENERGY PROJECT AREAS

- Poses potential safety hazards, where the high-speed rail system would pass near or within fall zone of towers and rotor blades
- Electromagnetic field concerns with high-speed rail right of way passing near wind turbines
- Right of way challenge to negotiate relocation of existing turbines and adjustment of future wind and solar energy projects to accommodate high-speed rail

Management Strategies / Mitigation(s)

- Conduct engineering studies to investigate viable protection methods (e.g. protective cover)
- Identify different layers of stakeholders before reaching out. Provide plans/profiles to relevant stakeholders and discuss various alternatives
- Consider new alignments where feasible/desirable to avoid this risk

RISK: AVAILABILITY OF TRACTION POWER SUBSTATIONS TO SUPPLY POWER FOR OPERATIONS

- New utility construction or transmission network upgrades may be necessary for Pacific Gas & Electric (PG&E) and Southern California Edison (SCE) traction power substations, which requires long-term (up to 6 years) planning, permitting and engineering process for each substation connection to high-voltage grids. This work is ongoing but testing, commissioning and start of operations could be adversely impacted.

Management Strategies / Mitigation(s)

- Continue discussions with utility agencies (Pacific Gas & Electric, Southern California Edison, California Public Utilities Commission) to plan for additional network upgrades.

- Negotiate scope with all utility agencies for next contract to perform impact analysis study, design, engineering, environmental, and construction permits.
- Complete environmental clearances.

Appendix

Acronyms & Abbreviations

ARRA	America Recovery and Reinvestment Act
ARTIC	Anaheim Regional Transportation Intermodal Center
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FRA	Federal Railroad Administration
GGRF	Greenhouse Gas Reduction Fund (GGRF aka Cap and Trade proceeds)
UIC	International Union of Railways
YOE	Year of Expenditure

Footnotes

[1] Year of expenditure dollars are dollars that are adjusted for inflation from the present time to the expected year of construction.

[2] Cost-sharing decisions for this segment will be made in the future in concert with the California State Transportation Agency, which administers key programs associated with these improvements, and regional/local partners.

[3] As described in Section 6, there are significant funding sources that can be leveraged by the Authority and its partners to fund discrete projects between Burbank and Anaheim; at this time we have not reduced the capital cost we are carrying to account for funding that may be contributed by others to these projects.

[4] This figure encompasses the appropriation by the Legislature of $500 million of Proposition 1A funds for Southern California bookend projects as described in the Southern California Memorandum of Understanding. These funds will be matched by funding from other sources for a total investment of $1 billion in Southern California.

[5] This figure encompasses the appropriation by the Legislature of $500 million of Proposition 1A funds for Southern California bookend projects as described in the Southern California Memorandum of Understanding. These funds will be matched by funding from other sources for a total investment of $1 billion in Southern California.

[6] Additional investments would be made in the future to provide a higher level of one-seat ride service into San Francisco.

[7] Network Rail works with the Rail Delivery Partners as an advisor to the California High-Speed Rail Authority

Comparison of 2014 Business Plan to 2016 Business Plan

ITEM	2014 BUSINESS PLAN	2016 BUSINESS PLAN
CAPITAL COST	• $54.9 billion in 2013$ ($58.6 billion in 2015$), $67.6 billion in YOE$ • Delivery of Phase 1 by end of 2028.	• $55.3 billion in 2015$ and $64.2 billion in YOE$. Scope includes additional costs (net $2.1 billion in YOE$ relative to the 2014 Business Plan) for enhanced connection to Anaheim. • Capital cost estimates reduced through design refinements, incorporating contractors' viewpoints and other reviews, more advanced and detailed engineering and design work, and other changes. • The plan shows capital cost estimates for an operating segment between San Jose (Silicon Valley) and a station located north of Bakersfield (Central Valley) with construction complete in 2024/opening for service in 2025. • Same assumptions for completion date of Phase 1 system as the 2014 plan.
REVENUE & RIDERSHIP	• High, medium, low forecasts based on Monte Carlo simulations (probability analysis) • Ridership and revenue lower than in 2012 Business Plan.	• High, medium, low forecasts based on Monte Carlo simulations (probability analysis) • 2016 Business Plan ridership and revenue increased by approximately 25% and 35% respectively, depending on the year, from 2014 Business Plan because of model updates and improved one-seat ride service to Anaheim in Phase 1 forecasts. • Model runs were developed for the Silicon Valley to Central Valley line and an extension to San Francisco and Bakersfield.
OPERATIONS AND MAINTENANCE COSTS	• High, medium, low forecasts based on Monte Carlo simulations (probability analysis) • New model developed based on feedback from the International Union of Railways (UIC)	• High, medium, low forecasts based on Monte Carlo simulations (probability analysis) • Minor updates to models and estimates based on review by Network Rail Consulting, the operator and maintainer of both the high-speed and conventional rail network infrastructure in the United Kingdom (currently supporting the Authority). • Operation and maintenance costs are about 3% lower than they were in the 2014 Business Plan once Phase 1 is fully ramped-up. The cost variation with the 2014 Business Plan is marginal as the service level remained constant. The increased ridership is covered by the available capacity (higher load factors). • The plan offers new operations and maintenance cost estimates for the Silicon Valley to Central Valley Line and an extension to San Francisco and Bakersfield.

ITEM	2014 BUSINESS PLAN	2016 BUSINESS PLAN
LIFECYCLE COST	• High, medium, low forecasts based on Monte Carlo simulations (probability analysis)	• High, medium, low forecasts based on Monte Carlo simulations (probability analysis) • Changes in lifecycle costs are driven by reduced overall capital costs • Lifecycle costs over 50 years are approximately 4% lower than they were in the 2014 Business Plan due to the lower capital cost estimate for the system. • Minor updates to model assumptions based on review by Network Rail Consulting , the operator and maintainer of both high-speed and conventional rail network infrastructure in the United Kingdom (currently supporting the Authority)
CASH FLOW	• High, medium, low cash flow based on inputs from other analyses	• High, medium, low cash flow based on inputs from other analyses • 2016 Business Plan offers new cash-flows starting with high speed rail operations in 2025 on the line from San Jose to north of Bakersfield • 2016 Business Plan includes sensitivity analyses to assess effect of extending the line north to San Francisco and south to Bakersfield.
FUNDING/ FINANCING	• Lists current funding sources and assesses ability of project revenues to finance system expansion	• Lists current funding sources including Cap and Trade proceeds and assesses ability of project revenues to finance system expansion. • Includes more direct linkage between funding/financing and business model. • Lays out potential funding sources that can be pursued along with partners in Southern California to make improvements in the Burbank to Anaheim corridor.
BREAKEVEN	• Breakeven probability based on Monte Carlo simulations of farebox revenue and operations and maintenance (probability analysis) • Analysis shows that five years after opening (after ramp-up) there is a 97% chance of breaking even and the cumulative chance of breaking even over the first five years is 89%.	• Breakeven probability based on Monte Carlo simulations of revenue and operations and maintenance. • Analysis focuses on opening year of the Silicon Valley to Central Valley line in 2025 (32% chance of breaking even), the ramp-up period between 2025 and 2029 (69% chance of breaking even), Phase 1 opening year in 2029 (88% chance of breaking even) and Phase 1 out year in 2040 (>99% chance of breaking even).
RISK MANAGEMENT	• One chapter in the plan dedicated to risk management and risk mitigation, system assurance and quality.	• Presents the work performed in the past two years, the trends observed in terms of cost and schedule. • Outlines risks identified and mitigation/management strategies.
BENEFIT COST	• Benefit-cost analysis for IOS, Bay to Basin and Phase 1	• No benefit-cost analyses performed since the entire system did not change and • Benefit-cost analysis is not a requirement for the Business Plan.

Meeting Business Plan Statutory Requirements

The requirements for the 2016 Business Plan are included in the beginning of the document and the exhibit below shows which sections of the document address each of the requirements:

PUBLIC UTILITIES CODE SECTION 185033 REQUIREMENTS		
The authority shall prepare, publish, adopt, and submit to the Legislature, not later than May 1, 2016, and every two years thereafter, a business plan	The Final Plan will be adopted in April and submitted by May 1, 2016.	✓
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 2016 Business Plan was released on February 19, 2016.	✓
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 2016 Business Plan was submitted on February 19, 2016.	✓
THE BUSINESS PLAN SHALL INCLUDE, BUT NEED NOT BE LIMITED TO, ALL OF THE FOLLOWING ELEMENTS:		
→ A description of the type of service the authority is developing	Section 2	✓
→ The proposed chronology for the construction of the statewide high-speed rail system	Section 2 and 4	✓
→ The estimated capital costs for each segment or combination of segments	Section 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.	Section 7	✓
→ Alternative financial scenarios for different levels of service, based on the patronage forecast in subparagraph (above), 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.	Section 7	✓
→ The expected schedule for completing environmental review, and initiating and completing construction for each segment or combination of segments of Phase 1.	Section 8	✓
→ 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.	Section 6	✓

→ 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.	Section 6	✓
→ Alternative public-private development strategies for the implementation of Phase 1.	Sections 3 and 6	✓
→ 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.	Section 9	✓
→ 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	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 was taken at the regularly scheduled Board of Directors meetings on March 8, April 12 and April 21. The 2016 Business Plan was adopted at the April 28 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.	✓

California High-Speed Rail Peer Review Group

Gary Gallegos | Stacey Mortensen | Lou Thompson, Chairman | Martin Wachs

March 25, 2016

The Honorable Kevin de León
Senate President Pro Tem
State Capitol Building
Room 205
Sacramento, CA 95814

The Honorable Toni G. Atkins
Speaker of the Assembly
State Capitol Building
Room 219
Sacramento, CA 95814

The Honorable Jean Fuller
Senate Republican Leader
State Capitol Building
Room 305
Sacramento, CA 95814

The Honorable Chad Mayes
Assembly Republican Leader
State Capitol Building
Room 3104
Sacramento, CA 95813

Dear Honorable Members:

The California High-Speed Rail Peer Review Group is required by provisions of Proposition 1A (AB 3034) to provide comments on Business Plans developed by the California High-Speed Rail Authority. We have previously reported on Business Plans in 2009, 2012 and 2014. This letter reports our comments on the draft 2016 Business Plan.

The draft 2016 Business Plan is a marked departure from earlier Plans. It is the first Plan based on actual experience following the start of construction, and it shows how the Authority is learning from experience. It is also the first Plan in which the Authority is shaping its approach in accord with the funding it considers available rather than relying on unspecified sources. This shift from an "unconstrained" approach to a "constrained" approach lays out the Authority's assessment of what, given certain assumptions, they can deliver using existing funding sources.

In particular, shifting the Initial Operating Section (IOS) from one connecting Merced with the Los Angeles Basin as described in the 2012 and 2014 Business Plans to an IOS connecting a temporary station 20 miles north of Bakersfield with San Jose reflects the fact that the high costs

of traversing the Tehachapi Mountains south of Bakersfield cannot be covered from identifiable sources of funding available in the short term. Under the constrained approach, the Authority is acknowledging that there are not sufficient existing funds to complete the southern leg, but is arguing that existing sources of funds are adequate to complete the specified northern segment. While it is understandable that costly segments of the project may need to be deferred until funds become available, and while early completion of less costly segments could in time encourage the closure of remaining costly gaps in the system, it should also be clearly acknowledged that inflation will increase the costs of these expensive segments in Year of Expenditure (YOE) dollars if necessary funds are not identified in a timely fashion.

The high-speed rail program has from its inception been a roadmap leading to partnerships. To complete its mission of transforming the California economy and landscape, the Authority must partner with many other public and private entities. Another important way in which the draft 2016 Business Plan differs from earlier ones is in the extent to which required partnerships have been initiated and are now in operation. Private construction contractors and California labor are at work on the project. The legislature has strengthened the partnership between California's HSR program and the state's leading greenhouse gas reduction programs, including local efforts as well as state-wide programs. Plans for blended operations and the upgrading of rights- of-way on which other agencies and railroads operate trains are progressively being implemented. Utilizing grants from the Authority, local governments and regional planning agencies are now engaged in land use and ground access planning, and a few cities are already building facilities that eventually will serve HSR passengers. The Peer Review Group takes note of this progress and urges that the work of partners be made more explicit in future business plans. For example, recognition of progress on ground access and land use planning in terminal areas should gradually play increased roles in land acquisition and in the timing and location of construction packages.

While the draft 2016 Business Plan reflects progress that has been made, it also serves to emphasize the important challenges and questions that remain for the Authority, for local governments and for the Legislature. A summary of our comments on the draft Plan, also incorporating conclusions in our letter to the Legislature of January 14, 2016, is that:

1. The new sequence adopting an IOS north to San Jose rather than south to the Los Angeles Basin was driven by financial limitations and leaves the gap in rail service from south to north unfilled until completion of Phase 1;

2. If the initial northern IOS is completed as planned, the lack of a connection into Bakersfield and the lack of a fully functional connection from San Jose to the Transbay Terminal in San Francisco will limit system ridership and passenger revenue: closing the gap should be a matter of priority;

3. The ability of the Authority to finance the IOS north to San Jose depends on assumptions about: (a) significantly lowered construction costs, (b) availability of Proposition 1A funding, (c) spending the full amount of federal American Recovery and Reinvestment Act (ARRA) funding; and, most important, (d) the authority's ability to securitize Cap and Trade (C&T) funding when needed in the future;

4. Completing the full Bakersfield to San Francisco link will depend on $2.9 billion in new funding not currently identified, though the Authority suggests applying for Federal funds. The outcome of such an application is hard to predict; and

5. Despite demand, revenue and cash flow projections that are significantly more favorable than those included in the 2012 and 2014 Plans, completion of the Phase 1 system from Anaheim through Los Angeles Union Station to the Transbay Terminal in San Francisco continues to face roughly a $19 billion gap in firmly established funding in the total $55 billion cost even after projected private investment is included.

Given these issues, the Legislature could establish an adequate and stable funding stream for the Authority so that it could securitize some income streams such as C&T and extend availability payment guarantees to potential private sector partners. In addition, expansion of Federal participation in the form of RRIF or TIFIA loans also would need to identify reliable repayment mechanisms. Given the Legislature's continuous appropriation of C&T funds, the Authority's assumption may be reasonable for purposes of the draft Plan, but the ultimate validity of the assumption depends upon further Legislative action. Extending the C&T program beyond 2020 and defining the Authority's share of the proceeds is one potential way to achieve at least part of the funding objective, but other mechanisms also should be considered.

These conclusions are not intended as criticisms. The Authority is learning from experience and is employing state-of-the-art methods for demand and revenue forecasting and for risk prediction and management. The Authority has undertaken a massive project in an extremely litigious environment. The project is in its early days, and all forecasts should acknowledge considerable uncertainty and be interpreted with caution. The Authority's forecasts do so by using Monte Carlo simulations to set forth a range of possible outcomes. Some issues such as right-of-way acquisition, utility relocation and future tunneling in the Tehachapi Mountains are proving more difficult than expected and make final costs difficult to project.

The primary unresolved issue remains the assumptions, gaps and uncertainties in funding. The private sector Expressions of Interest (EOI) showed that risk-based private investment will not become available until demand has actually been demonstrated, leaving at least the gap in funding for the proposed initial IOS north to be filled by public sources. The gap is influencing the implementation of the project as the unexpected shift from south to north shows. In the Attachment to this letter, we discuss in more detail questions relating to system structure, the new business model including the potential role of private funding, revised capital costs, revised demand forecasts and how the Legislature may wish to respond to them in the year's activities.

The Authority asserts in the draft 2016 Business Plan that building a line connecting northern California to the Central Valley and commencing revenue service will position it to attract private investment and unlock additional capital to help complete the system. A review of experience with high speed rail systems in Europe and Asia shows that, after initial ramp-up, patronage tends to grow gradually over long periods of time even where established markets have existed for rail service prior to upgrading to high speed operations. In some cases the rate of development of markets caused actual financial returns to be lower than forecast. In

California, the intercity rail travel market remains limited and the initial IOS will not link the state's largest population centers. The Peer Review Group believes that, until the full linkage is established, the assertion that the IOS will unlock access to significant amounts of at-risk capital remains subject to uncertainty. Completion of the IOS and the initiation of operations will be an important milestone, but it will not reduce the importance of identifying a stream of public capital to undergird the possible investment of private capital in the foreseeable future.

We believe that the continuing uncertainty over the adequacy and stability of the funding for the project will make effective planning and management increasingly difficult. In this regard, we share the conclusions of the recent Legislative Analyst's Report[1] that the Legislature should consider taking action to ratify the Authority's plans for building the system, to clarify and stabilize its funding and to improve the Legislature's ability to oversee the project as it moves forward. On oversight, we raised a similar question in our January 14th letter "[l]ooking at the project as a whole and given its manifest importance to the State, is the current oversight adequate or should the Legislature create a focused committee along with a dedicated and adequately funded oversight staff lodged, for example, in the Legislative Analyst's Office?"

Please let me know if you have any questions about this report or if you would like to meet with members of the group to discuss the conclusions.

Sincerely,

Louis S. Thompson
Chairman, California High-Speed Rail Peer Review Group

cc: Hon. Jim Beall, Chair, Senate Transportation and Housing Committee
Hon. Anthony Canella, Vice Chair, Senate Transportation and Housing Committee
Hon. Jim Frazier, Chair, Assembly Transportation Committee
Hon. Katcho Achadjian, Vice Chair, Assembly Transportation Committee
Brian Kelly, Secretary, California State Transportation Agency
Mac Taylor, State Legislative Analyst
Ken Alex, Director, Governor's Office of Planning and Research
Dan Richard, Chair, California High-Speed Rail Authority
Jeff Morales, Chief Executive Officer, California High-Speed Rail Authority
Members, California High-Speed Rail Peer Review Group

[1] Legislative Analyst, "Review of High-Speed Rail Draft 2016 Business Plan," March 17, 2016, Summary page.

ATTACHMENT
Discussion of detailed issues

Issues of System Structure

The draft 2016 Business Plan lays out a three-stage approach to constructing the state's high-speed rail system. The first step would be to connect a temporary station at a point 20 miles north of Bakersfield through Merced and Fresno to San Jose. Including track, electrification, signaling, stations and rolling stock, the Authority asserts that this would constitute an initial operating segment (IOS) and would demonstrate actual demand. The Authority asserts that it can finance this section from existing sources.

A second step would extend the system into Bakersfield and would look to providing service through San Jose to the existing 4th and King Station in San Francisco. The third step would be the completion of Phase 1 by completing the connection to the Transbay Station and by extending service from Bakersfield through Burbank and the Los Angeles Union Station to Anaheim, initially using blended service south of Burbank that would be similar to the blended approach to providing service between San Jose and San Francisco.

This approach is a significant departure from earlier Plans that proposed extending the system south from Bakersfield first, with extensions to the north later. In our comments on the 2012 draft Business Plan, we urged the Authority to commit to either the IOS south or IOS north as soon as possible and we supported the Authority's ensuing decision in the final 2012 Business Plan to begin with the IOS south because it would close the most important remaining gap in passenger rail service in California. The draft 2016 Business Plan proposal to adopt the northern connection is explicitly driven by funding considerations and will leave the southern gap open for many years to come if added funding is not identified.

The second stage – service into Bakersfield and to San Francisco from San Jose – was not a separate part of earlier Plans and was again driven by funding considerations discussed below. We note several emerging issues that could cause funding and service problems in the San Jose to San Francisco section.

First, the draft plan leaves unclear how the required link from the existing Caltrain terminus at 4th and King Streets to the new Transbay Terminal will be completed. In part, this reflects the fact that the City's plans for completion of the link are not yet completed or funded, but the eventual performance of the project will be strengthened with full access to Transbay Terminal.

Second, presentations to the SamTrans Board acknowledge that Caltrain's long-planned Positive Train Control (PTC-compliant) signal system (CBOSS) faces cost and schedule overruns; these will have to be resolved by Caltrain well before initiation of high-speed service.[2]

Third, the project to electrify the blended system lines, partly funded by the Authority, may also be experiencing cost overruns and schedule delays, some of which are linked to delays in release

[2] Caltrain staff presentation, "Communication Based Overlay Signal System Project Status," made to Board of Directors, February 4, 2016

of the Proposition 1A funding. Since these issues could affect the Authority's budget and quality of service, we recommend that the Legislature request a joint report from San Francisco city agencies, Caltrain and the Authority as to the status of these issues and how they can be resolved. This will be especially important if the proposed IOS north is implemented first.

The proposed completion of Phase 1 contains an added element – blended service from Burbank through Los Angeles Union Station to Anaheim – which is consistent with the PRG recommendations in our comments on the 2014 Business Plan. According to the Authority's demand modeling, a single seat connection from the Anaheim station would significantly increase demand for HSR and the distance from Anaheim to Los Angeles Union Station is short enough not to need high-speed service.

The Authority also proposes in the draft 2016 Business Plan a series of "concurrent investments," which are near-term projects, such as elimination of grade crossings and the run-through tracks at Los Angeles Union Station, that will have immediate benefits for current users but will also be needed when the high-speed service arrives. These improvements reflect the 2012 Memorandum of Understanding (MOU) between the Authority, SCAG, LA County Metro, Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC), SANDAG, SANBAG, and Metrolink to identify and prioritize "a program of early investments in regional and local rail systems to facilitate the blended approach… regarding coordination of increasing interregional connectivity of the existing system (rail, bus, airports, and highways)."[3] We believe this will contribute to the growth of rail patronage in Southern California and will be useful for the state no matter how high-speed service plans evolve. It also leads to the establishment of a working relationship between the Authority and Southern California transportation agencies that will be beneficial when later and more complex elements of the program are undertaken.

Finance

The Authority states that it can finance the first step (20 miles north of Bakersfield to San Jose) as follows:[4]

Appropriated Funds	Amount ($ billions)
State Bonds (Prop 1A)	2.609
Federal Grants (ARRA/FY10)	3.165
Planning Funds	0.338
Committed Funds	
State Bonds (Prop 1A)	4.166
Cap and Trade (C&T)	5.341
Financing Proceeds	
Long-term Cap and Trade (2025-2050)	5.237
TOTAL SOURCES OF FUNDS	20.856
Construction Cost	20.680
Reserve	0.176

[3] Memorandum of Understanding (2012). Available at: http://www.hsr.ca.gov/docs/brdmeetings/2012/April/brdmtg041212_MOU3120404.pdf
[4] Draft 2016 Business Plan, page 61.

This plan is based on a number of significant assumptions. First, it assumes that the litigation over Prop 1A funding will be resolved favorably and in a timely way; if there are no successful appeals of Judge Kenney's March 4th ruling, this assumption may eventually prove correct. Second, it assumes that all of the money available under ARRA will be spent before the September 30, 2017 deadline.[5] Third, the estimate of $5.341 billion in C&T funding is based on an assumption as to the future money raised by the C&T program and the share of those funds that the Authority will receive. Either assumption could be incorrect, although it is possible that the amounts received could vary upward or downward from estimates. Fourth, and most important, the estimated $5.237 in C&T Financing Proceeds is based on securitizing C&T funds expected to be received between 2025 and 2050. This may be feasible if (1) the C&T program survives legal challenges alleging that it is a tax that should have received 2/3 approval; (2) the C&T program is extended by law beyond 2020; and (3) the Authority's proceeds are guaranteed as to share and preferably as to absolute amount. Most of these assumptions are not under the control of the Authority, and addressing the issues related to C&T will require Legislative action.

The cost estimates for the completion of step 2, the extension into downtown Bakersfield and from San Jose to San Francisco, are also based on significant assumptions. It is assumed that $2.9 billion will be found from an unidentified source of grant funding, though the Authority intends to seek federal support. It also is assumed that funding for the Transbay Terminal link on the part of the City of San Francisco will be found and that the project will proceed essentially as planned while service terminates in the interim at the 4th and King Station. Neither of the funding streams is under the control of the Authority and it is difficult to predict the outcome of applications for additional federal support.

There is an additional gap in funding for the full Phase 1 system.[6] If we assume that the project is completed through the full connection from Bakersfield to the existing 4th and King Station, the cost will be $20.68 billion for the first step plus $2.9 billion for the second step, for a total of $23.58 billion funded by assumed existing funding plus an added $2.9 billion from assumed federal (or other sources).[7] The total cost of Phase 1 is now estimated at $55.295 billion,[8] leaving a gap of $31.7 billion. The Authority's medium estimate of the net discounted cash flow the project might generate if the Phase 1 system is operated through 2060 is $20.9 billion[9], with $10.8 billion left to be funded (in addition to the amounts based on assumptions above), even if all demand, revenue and O&M cost assumptions (which we consider to subject to a wide range of uncertainty) should prove to be true.

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[5] The provisions of the ARRA funding require that any money not spent by September 30, 2017 must be returned to the U.S. Treasury. It is not "all or nothing": it only affects the amounts not spent.

[6] To be accurate, as noted in previous letters, this gap has persisted in various forms since the initiation of Proposition 1A. The law always looked to unidentified sources of funding (Federal, State, local governments, private sector) to make up the difference between the $9 billion provided and the much larger total cost of the program.

[7] 2016 Draft Business Plan, page 61.

[8] Op cit, page 56.

[9] Op cit, page 64. This is the sum of the discounted cash flow generated through step 2 and the incremental discounted cash from completion of Phase 1. The comparable number for 8% is $29.9 billion, which would nearly erase the gap as compared with the $15.5 billion for 14%. These cash flow estimates do not appear to include the potential impact of taxes on a private investor. If taxes are due on positive cash flows (earnings), the value of the sums should be reduced accordingly.

Legislative action will be required to address the $5.2 billion in C&T securitization that cannot be completed under some interpretations of current law.[10] Another $2.9 billion will be needed, in assumed federal (or other) grants; and at least $10.8 billion more will be required to complete Phase 1 even if the Authority's net cash flow projections are fully realized – a total of $18.9 billion. The Legislature could close a part of this gap by extending the C&T program and guaranteeing the Authority's share. If the Authority were given the authority to pledge the full faith and credit of the state in making availability payments or in applying for RRIF or TIFIA funding, an added part of the gap could be closed. As we have stated in earlier letters, there are a number of potential tax measures, such as a tax on transportation fuels, sales or real estate taxes (which finance part of BART's needs), or various value capture measures at the state or local levels that could fully fill the gap if the state is committed to the program.

Business Model

The basic business model proposed in the draft 2016 Business Plan is for the Authority to manage and complete the construction under HSRA control and funding.[11] Operation of the initial IOS north would be managed by the Authority using a management contractor to demonstrate demand and grow revenues, whereupon there could be private capital available to invest in completing a concession for the entire system that the Authority's demand, revenue and cost forecasts argue will generate positive cash flow. Because of the decisions and commitments established by the work already done, and the requirements of Proposition 1A, this is probably the only available model, but it means that almost all technical and integration risks will remain with the Authority, unless they can be transferred to contractors. We emphasized this point in our letter of January 14, 2016. The model's viability also rests on projections we consider to be subject to a wide range of uncertainty (as measured by the Authority's Monte Carlo simulation work) that there will be a positive cash flow after operations commence large enough to support a significant investment from other potential partners.

A review of the responses (EOIs) from the private sector underlines another point that is addressed in the draft 2016 Business Plan – the need to get the skills and viewpoint of a potential operator into the Authority's decision-making process as soon as possible. We have emphasized this in many of our earlier letters and continue to urge the Authority to develop and implement a way to obtain an operator's inputs earlier than planned in prior Plans. For example, the Authority plans to initiate operations with a management contractor (similar to the approach of

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[10] This issue is discussed in the EOI response by Barclay's Bank. "No long-term stand-alone cap-and-trade financing is possible until ***four threshold issues*** are resolved:

• CARB and CHSRA must prevail against pending legal challenges to the cap-and-trade auctions and to the use of GGRF revenues for the high-speed rail project

• The Authority must create the "plumbing" in law to support borrowing against GGRF revenues

• The Legislature and CARB, respectively, must extend the cap-and-trade program in law and regulation beyond 2020

• The Legislature must protect the 25% of GGRF revenue flowing to the Authority from future impairment by the Legislature as long as financing obligations are outstanding.

See Barclay's response dated September 28, 2015, at pages 9 and 11.

[11] We note that the major share of actual engineering and construction management is being assumed by contractors, of which Parsons Brinckerhoff is the largest.

Caltrain and Metrolink) and later to shift to a more commercial, at-risk franchise after demand has been demonstrated. It might be possible to bring the management contractor in at a very early stage as an advisor and early operator without prejudicing the later ability to have a fully open competition for the eventual franchise.

While the Authority's business model lays out its plans for management of the construction project and discusses the administration of the initiation of operations, it does not fully detail the relationship between the Authority and eventual operator(s) as to how the rail passenger business is actually to be conducted. Who will set the fares, and on what basis? Will the operator be free to charge whatever maximizes cash flow (which would maximize any net income and thus capital contribution the operator might make) or will the operator be required to cap fares for ordinary passengers at some lower level (which would maximize public benefits but lower positive cash flow)? Who will control the "commuter" fares for shorter haul passengers? Who will oversee the safety of the system? Will the Authority's management contract and eventual concession serve to define its regulatory powers, and will the state let the Authority serve as the regulator, or will there be a separate regulator? These may appear to be distant issues, but they will eventually affect the value the state gets for its investment. While the details do not necessarily need to be settled immediately, we urge the Authority to provide more discussion in the final 2016 Business Plan so that the Legislature will be able to express its opinions on the policy aspects as soon as is feasible.

Changes in Capital Cost and in Demand/Cash Flow Forecasts

One notable aspect of the capital cost projections is the stability or even slight decrease (especially in cost/mile) in the capital cost estimates in the 2012 Plan and later. This permitted the addition in the draft 2016 Plan of a link to Anaheim while staying within the total dollar forecasts from prior Plans.

Another important aspect of the capital cost estimates is the shift within the total of costs from north to south. A technical document[12] indicates that the estimated capital costs of the Merced/San Jose and San Jose to San Francisco link fell from $20.8 billion to $13.0 billion (over 36%), while the estimated costs to complete from Merced to Los Angeles rose from $33.1 billion to $35.3 billion (6.6%). This estimate is based in part on the Authority's belief that lower bid costs and cost saving measures used in civil construction in the Central Valley will be carried over into the connection from Merced to San Jose as well as on a significant reduction in the costs associated with a revised and less costly design for the Diridon Station in San Jose and the Authority's assumed lower contribution to the costs of the extension to the Transbay Station. Without this shift, the initial IOS north, as proposed, would be significantly harder to finance within existing resources. The shift also highlights the facts that the Authority is not changing its estimates of the tunneling in the Tehachapi Mountains significantly (an increase of 17.6% from the comparable work in the 2014 Plan) and that its estimates of the cost of the link from Palmdale to Los Angeles have increased by only 0.1% from the 2014 Plan.

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[12] See "Capital Cost Basis of Estimate Report, Draft 2016 Business Plan: Technical Supporting Document," pages 14 and 15.

We agree that the Authority's forecasts are based on appropriate techniques and best information available, including experience to date. In particular, the Authority's growing experience with value engineering and allowing contractors to suggest more cost effective approaches has been positive. But, we continue to believe that it is too early to have confidence in future capital cost, demand and net revenue forecasts. For example, the claims experience is not yet available for the first construction packages and, given the learning curve with ROW acquisition and costs, this could yet be significant. The cost of the extensive tunneling required in the Tehachapi Mountains has not yet been verified by actual bids and experience. Major uncertainties remain, including costs in the Los Angeles Basin (where the final routing is not yet fixed) and in the costs and potential delays in the link from San Jose to the Transbay Station in San Francisco, though some of these costs may eventually be borne by others.

As we have stated in prior letters, the Authority's demand and revenue analysis is technically sophisticated and their Monte Carlo simulations to quantify uncertainty are more advanced than those available for most major rail passenger projects. With this said, the changes made by the Authority in its demand forecasting (primarily related to use of later demand surveys for input into the demand model) yielded results that are favorable when compared with the 2014 and 2012 Business Plans. While this is certainly not bad news, it also serves to highlight the sensitivity of demand models to input data and the modelers' assumptions, especially when forecasts relate to entirely new service rather than to improvements in existing service. Even accepting the results of the new modeling, cash flow varies by more than a factor of 100% from low to high ridership projections[13], with the low estimate suggesting a very small ability of private investors to contribute to overall project investment.

As we have observed before, however, if the Legislature continues to support the project, the demand, revenue and cash flow forecast changes in the draft 2016 Business Plan do not affect any near-term decisions. The Authority will have to build, or not build, the initial part of the IOS north without any further knowledge of demand. The later decision to go south (at least as the 2016 BP shows) will be based on actual and demonstrated demand from the management contract operation from Bakersfield (or 20 miles north of Bakersfield) to San Jose (with connections to San Francisco via Caltrain). At this point, demand will be revealed and it will be the at-risk concession operator who will decide what demand forecasts to rely on in investing (or not) in the full Phase 1 system.

[13] See "High, Medium, Low Cash Flows, Draft 2016 Business Plan Technical Supporting Document," Exhibits 4, 5 and 6.

California High-Speed Rail Peer Review Group

Gary Gallegos | Stacey Mortensen | Lou Thompson, Chairman | Martin Wachs

January 14, 2016

The Honorable Kevin de León
Senate President Pro Tem
State Capitol Building
Room 205
Sacramento, CA 95814

The Honorable Toni G. Atkins
Speaker of the Assembly
State Capitol Building
Room 219
Sacramento, CA 95814

The Honorable Jean Fuller
Senate Republican Leader
State Capitol Building
Room 305
Sacramento, CA 95814

The Honorable Chad Mayes
Assembly Republican Leader
State Capitol Building
Room 3104
Sacramento, CA 95813

Dear Honorable Members:

On June 22, 2015, the California High-Speed Rail Authority issued a request for expressions of interest (EOI) from potential private sector partners.[1] The request posed 12 questions intended to identify the roles that the private sector might be willing to play as a partner in the construction, financing and operation of the project. The responses, 33 in total, were received in September.[2] Appendix A attached to this letter contains a list of the questions and Appendix B contains a list of those who responded.

The Peer Review Group believes it is useful to provide the Legislature with comments on these responses because the responses have greatly clarified critical aspects of the potential private role. This clarification highlights the importance of a thorough discussion of the Authority's

[1] CAHSRA, "Request for Expressions of Interest for the Delivery of an Initial Operating Segment, RFEI HSR#15-02, June 22, 2015.
[2] The full set of responses may be found at http://tinyurl.com/2015rfei

proposed business model in the upcoming 2016 Business Plan that could help the Legislature to ensure that the project remains on a course to serve the State's needs.

In summary, the responses show that significant private sector participation will be based on several factors: (1) private risk capital based on revenues will not be available to the project until travel demand has been demonstrated; (2) the life of the cap-and-trade program and the share of the Authority in the funds generated will need better definition; and, (3) the State may need to back the ability of the Authority to carry out its financial commitments. These points are discussed in detail below.

The private sector's perspective. Contrary to some public comments, there is strong interest from the private sector in the project. The responses varied considerably in their range of proposed involvement – some taking a global view of the project and its management, some focusing more narrowly on a single element such as rolling stock – but the request definitely generated interest and responses, as Appendix A and B show.

The responses demonstrate, however, that the objectives and capabilities of the private sector are different from those of the Authority and the State. The Authority and the State aim to capture broader economic benefits in addition to passenger revenues, including lowered accidents, reduced road and airway congestion, lower air pollution, reduced energy consumption and CO_2 emissions, enhanced economic development, added employment, and increased minority involvement, among many others. The State has a much longer time horizon, and has the capability to take larger financial and economic risks than corporations. By comparison, private partners necessarily aim for profits – revenues from riders and ancillary benefits such as development in stations minus operating and financial costs -- and are acutely sensitive to risk because they have immediate and critical "skin in the game." Each partner must be willing to assess its benefits in line with the investments, operating costs and performance risks it is prepared to accept. This difference in perspective pervades the issues of public and private roles.

Risks that are difficult for the private sector to take. Although the EOIs confirm that the private sector is willing and able to take some of the construction cost and schedule risks, there are risks that the private sector will probably find it difficult to carry:

- *Demand and revenue risk.* Because the HSR project is an entirely new system rather than an upgrade of an existing system, there is no actual ridership history. This means that the demand forecasts are primarily based on surveys of what potential riders say they would do if offered high-speed rail (stated preferences) rather than on usage of an actual service (revealed preferences). Although the Authority's demand studies are state-of-the-art, they are nevertheless inherently subject to a wide range of possible outcomes, some of which would be financially unacceptable to an investor. The potential private sector partners have indicated that they will defer taking demand or revenue risk until demand has actually been demonstrated on a significant part of the system. Instead, private partners prefer a commitment to an "availability payment" (where the Authority guarantees to pay an investor for providing a stated level of operating capacity whether or not the forecast usage actually occurs) prior to the point at which demand has actually been demonstrated. Since demand cannot be effectively proven on less than a significant part of the system (an Initial Operating Segment), this means that significant private demand-based investment cannot be expected before 2025 at the earliest in the absence of an assured system of availability payments. In

addition, most new services face a "ramp-up" period in demand, during which initial losses might be expected. This could conflict with the prohibition of an "operating subsidy" in Proposition 1A. A clearer definition of the term "operating subsidy" to allow initial losses would be useful.

- *Financial and investment risks.* The potential private partners identified a number of financing risks emerging from the fact that nearly all of the existing financing sources face varying degrees of uncertainty. Proposition 1A financing ($9 billion) requires a 50/50 match and is presently tied up in litigation; it is thus not yet fully available and is subject to legal risk. The ARRA grant money from the Federal Government ($2.5 billion) must be spent by September 30, 2017, and project delays (many not within the control of the Authority) place at least some of that money in question. The expiration deadline can only be extended by Congress. Cap and Trade (C&T) funding is based on the Authority's current 25% share of C&T revenues, amounting to roughly $500 million annually, but (1) the legal foundation of the overall program is arguably not established beyond 2020, (2) the Authority's future share could be changed by the Governor and Legislature in the face of stiff competition from other potential claimants and, (3) estimates of future C&T total income are uncertain. As a result, the C&T income, desirable as it is, cannot be effectively securitized as it is currently constituted and, in any event, would only fill part of the gaps. More broadly, the responses indicated that potential private partners question the ability of the Authority to make or to fulfill major commitments such as availability payments without access to the backing of the State. This is particularly important because there are no other currently available significant Federal or State grant programs; the existing programs (TIFIA or RRIF) are loans that would have to be repaid, and the likely source of repayment would be the State.
- *Project structure risks.* There was common agreement among potential participants that the project should be awarded in packages no larger than $4 billion to $6 billion in order not put the work beyond the capability of even the very largest contractors. There was also consensus that the packages might be a combination of geographically-based civil construction (as is the case with the current construction packages) along with broader, system-wide elements such as signaling, rolling stock or electrification. At the same time, the responses identified potential integration and compatibility risks that are posed by separated packages in which, for example, track and electrification could be provided by one contractor and rolling stock by a different contractor. In its current approach, if rolling stock and track or signals are not compatible, the Authority will be responsible. In principle this set of risks could be minimized by bringing a private coordinating partner in as early as possible, especially one with the operating and commercial skills that will be needed when the system begins carrying passengers. Doing so would require a shift in roles from the exiting contractors to new contractors. This could conflict with the way the project is currently structured and managed and could even now be difficult because the integration of the work and design commitments already made might pose risks to a new partner.

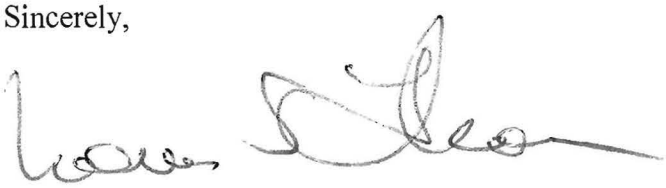
In summary, the EOIs have underlined a major issue the Authority faces: the known sources of funding will need to be modified if the Authority is to be able to manage the risks and potential financial demands that the project faces. It will be critical that the 2016 Business Plan identify and carefully evaluate the options for moving ahead in the light of these challenges.

Along with the discussion in the upcoming 2016 Business Plan, we believe the Legislature may want to consider several questions:

- Could the Authority be given the ability to commit the backing of the State to execution of an availability payment scheme if that is an effective way to secure private investment?
- Should the C&T program be changed to give it clearly established status beyond 2020? Should the current 25% share of funding for the Authority be increased to a higher percentage and the expected income to the Authority guaranteed against future reduction so that securitization will be possible in order to unlock this source of funding?
- Would the State want the Authority to apply for Federal loan funding such as TIFIA and RRIF even though that would mean that the State may need to commit to repay at least a major share of such loans?
- Looking at the project as a whole and given its manifest importance to the State, is the current oversight adequate or should the Legislature create a focused committee along with a dedicated and adequately funded oversight staff lodged, for example, in the Legislative Analyst's Office?

As stressed in earlier letters, the peer review group does not see its role as either criticizing the project or supporting it, though we do strongly support the concept of better rail passenger service, including high-speed rail service, in the State's future transport system. We hope to ensure that the critical issues and questions are identified as they emerge and in time for effective consideration by the Governor and Legislature. Please let me know if you have any questions, need further information about our comments, or would like to meet with the Group directly.

Sincerely,



Louis S. Thompson
Chairman, California High-Speed Rail Peer Review Group

cc: Hon. Jim Beall, Chair, Senate Transportation and Housing Committee
Hon. Anthony Canella, Vice Chair, Senate Transportation and Housing Committee
Hon. Jim Frazier, Chair, Assembly Transportation Committee
Hon. Katcho Achadjian, Vice Chair, Assembly Transportation Committee
Brian Kelly, Secretary, California State Transportation Agency
Mac Taylor, State Legislative Analyst
Ken Alex, Director, Governor's Office of Planning and Research
Dan Richard, Chair, California High-Speed Rail Authority
Jeff Morales, Chief Executive Officer, California High-Speed Rail Authority
Members, California High-Speed Rail Peer Review Group

Appendix A

Specific Questions Posed for Response

Commercial Questions
1. Is the delivery strategy (i.e., combining civil works, track, traction power, and infrastructure) likely to yield innovation that will minimize whole-life costs and accelerate schedule? If so, please describe how. If not, please recommend changes to the delivery strategy and describe how those changes will better maximize innovation and minimize whole-life costs and schedule.
2. Does the delivery strategy adequately transfer the integration and interface risks associated with delivering and operating a high-speed rail system? What are the key risks that will be borne by the State if such risk transfer is not affected? What are the key risks that are most appropriate to transfer to the private sector?
3. Are there any other components of a high-speed rail system that should be included in the scope of work for each project (e.g., rolling stock, train operations, stations)? If so, how will this help meet the Authority's objectives as stated in this RFEI?
4. What is the appropriate contract term for the potential DBFM contract? Will extending or reducing the contract term allow for more appropriate sharing of risk with the private sector? If the Respondent recommends a different delivery model, what would be the appropriate term for that/those contract(s)?
5. What is the appropriate contract size for this type of contract? What are the advantages and disadvantages of procuring a contract of this size and magnitude? Do you think that both project scopes should be combined into a single DBFM contract?
6. Does the scope of work for each project expand or limit the teaming capabilities? Does it increase or reduce competition?
Funding and Financing Questions
7. Given the delivery approach and available funding sources, do you foresee any issues with raising the necessary financing to fund the IOS-South project scope? IOS-North project scope? Both? What are the limiting factors to the amount of financing that could be raised?
8. What changes, if any, would you recommend be made to the existing funding sources? What impact would these changes have on raising financing?
9. Given the delivery approach and available funding sources, is an availability payment mechanism appropriate? Could financing be raised based on future revenue and ridership (i.e., a revenue concession)? Would a revenue concession delivery strategy better achieve the Authority's objectives?
Technical Questions
10. Based on the Authority's capital, operating, and lifecycle costs from its 2014 Business Plan, describe how the preferred delivery model could reduce costs, schedule, or both. Please provide examples, where possible, of analogous projects and their cost and/or schedule savings from such delivery models.
11. How does this compare to separately procuring each high-speed rail component (i.e., separate contracts for civil works, rail, systems, power separately)? Please discuss design/construction costs, operating/maintenance/lifecycle costs, and schedule implications.
12. For each project, are there any technical changes to the respective scope of work that would yield cost savings and/or schedule acceleration while still achieving the Authority's objectives? If so, please describe.

Appendix B

Responses Received

01 Cintra Ferrovial

02 AECOM

03 Vinci Concessions

04 Italferr

05 Japan HSR Consortium

06 Ashurst

07 Acumen

08 China Railway Signal and Communication (CRSC)

09 OHL Infrastructure

10 INABENSA (Spain)

11 China Railway International (CRI)

12 John Laing

13 FCC (Spain)

14 Ericsson

15 Sacyr (Spain)

16 DB International

17 Kiewit

18 Indra (Spain)

19 Fluor/Balfour Beatty

20 Isolux Corsan (Spain)

21 Siemens

22 Thales

23 TYPSA Group (Spain).

24 Skanska (Sweden)

25 Plenary Group

26 Bouygues (France)

27 Acciona (Spain)

28 GLOBALVIA (Spain)

29 Parsons

30 Bechtel/Arup/Systra

31 Barclay's

32 Airtrain

33 ACS/Dragados/Cobra*

34 Meridiam

35 Macquarie

36 Elecnor (Spain)

* Currently has the contract for CP2 and CP3

Responses in bold type are more comprehensive