2024 California State Rail Plan

DECEMBER 2024

CalSTA

Caltrans

RAIL PLAN
California State
Rail Plan

Cover photo: Caltrain electric commuter train at Diridon Station, with a state-owned intercity locomotive visible on the adjacent track - San Jose, California, USA - September 15, 2024. Editorial Credit: Michael Vi / Shutterstock.com

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Fellow Californians:

California is a national and global leader in innovation and environmentally sustainable economic growth. The state's transportation system is vital in connecting our world-renowned built and natural environments, diverse population and economy, as well as our universities and employment centers, people, places and goods. An attractive and competitive California requires a 21st century transportation system, and the California State Transportation Agency (CalSTA) envisions passenger rail as the backbone of mobility for all people across our great state

The California State Rail Plan establishes the vision and framework for investing in rail and significantly improving mobility for the next twenty-five years and beyond. The state rail network will connect more people to more places and is specifically well-positioned to capture regional trips of more than ten miles, as well as longer distance trips of fifty miles and greater. Together, trips of these distances currently make up 75% of all auto travel mileage in California. We envision a 2050 future when passengers will travel nearly 200 million miles per day on an integrated zero-emission rail and transit network. All regions of California will have well-designed connections into a world-class system, which will connect Californians to opportunity and will make the cost of car-ownership an option rather than a nearly-universal requirement for full inclusion in the state's economy.

This strategic and comprehensive plan lays the foundation for a network that will move Californians to destinations throughout the state, from Arcata to National City, and outside the state, including Las Vegas and Phoenix, using a unified system consisting of transit, regional, intercity and high-speed rail. The State Rail Plan blends the work of the California Department of Transportation's (Caltrans) Division of Rail, the California High-Speed Rail Authority (Authority) and dozens of local and regional rail and transit agencies with a comprehensive vision for coordination and integration within regions and across the state.

This State Rail Plan comes at a pivotal moment. The COVID-19 pandemic significantly altered how Californians move around the state; as rail ridership has recovered, travel demand has become more uniform throughout the day and less-focused on peak-hour commutes. Instead, this State Rail Plan establishes the direction for operators to focus on delivering all-day, bi-directional service that can accommodate many trip types. Metrolink and Capitol Corridor have found success by redistributing service to meet this new demand, and the State Rail Plan harnesses these new patterns into a more equitable and affordable vision.

As local governments turn their attention toward accelerating housing growth, new policies and tools have become available to build transit-oriented homes near high-quality rail and transit services, connecting neighborhoods and jobs throughout the state. The State Rail Plan works towards a future where rail stations are access points to a broad, robust network, but are also hubs for anchoring housing, services and economic opportunity for communities. The State Rail Plan supports our vision and mission by building on the work and investments already underway on California's rail system, making rail more appealing with faster, more frequent and more reliable services. It is a customer-focused initiative, identifying ways to provide access to more destinations with coordinated connections, simple fare payment, easy-to-understand schedules and journey times that are competitive or even better than driving and flying. At the same time, the State Rail Plan identifies investments that will strengthen the freight rail system, thereby increasing capacity, resilience and economic competitiveness.

The State Rail Plan is a critical step in ongoing efforts to create a stronger, more equitable and more resilient rail network for all. Implementing the State Rail Plan vision will require continuing our close work with federal, state and local partners to help ensure that we deliver a network that reflects CalSTA's Core Four principles of Safety, Equity, Climate Action and Economic Prosperity.

Thank you to everyone who participated in the development of the 2024 California State Rail Plan as that feedback is important to us as we evaluate and navigate transportation needs for all people over the next twenty-five years and beyond.

Sincerely,

Toks Omishakin

TOKS OMISHAKIN
Secretary

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A state-owned intercity rail train passes through an orchard in the San Joaquin Valley.

Statewide Rail Stakeholders

We would like to thank the following agencies and consultants:

INTERCITY AND REGIONAL PASSENGER RAIL AND RAIL TRANSIT

Bay Area Rapid Transit/BART
Capitol Corridor Joint Powers Authority
Los Angeles – San Diego – San Luis Obispo Rail Corridor Agency Joint Powers Authority (LOSSAN)
Los Angeles County Metropolitan Transportation Authority
North County Transit District
Peninsula Corridor Joint Powers Board/Caltrain
Sacramento Regional Transit/SacRT
San Diego Metropolitan Transit System
San Francisco Municipal Transportation Agency/MUNI
San Joaquin Joint Powers Authority
San Joaquin Regional Rail Commission
Sonoma Marin Area Rail Transit
Southern California Regional Rail Authority/Metrolink
Santa Clara Valley Transportation Authority
Brightline West

STATE AND FEDERAL AGENCY PARTNERS

California Air Resources Board
California Freight Advisory Committee
California High Speed Rail Authority
California Public Utilities Commission
California Transportation Commission
Federal Railroad Administration
Governor's Office of Business and Economic Development (GoBiz)
National Railroad Passenger Corporation/Amtrak
State of Arizona Department of Transportation
State of Nevada Department of Transportation

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Chapter 1: Strategic Vision

The status quo is not an option.

To meet California's environmental, economic, and equity goals, the State must continue to build towards a fully integrated, zero-emission rail and transit network. The California State Rail Plan (Rail Plan) provides solutions for congested corridors across California and identifies how the State will prioritize investments that provide Californians with more frequent, reliable rail service to more destinations, with travel times that are competitive with traveling by air and auto. The Rail Plan was coordinated with partners and communities to provide a strategic framework for delivering the State's vision and empowering decision-making. The Rail Plan carries an ambitious agenda for the development of California's rail network.

A Caltrans-owned intercity train travels along California's South Coast.

DEFINING THE VISION

By 2050, Californians will have a world class, zero-emission rail network, providing mobility to every region of the state. Tickets will be purchased through a simple, integrated platform, trip planning will be intuitive, and transfers between trains will be seamless. This vision is real and achievable, and the Rail Plan provides the foundation to get there. Caltrans and CalSTA (State) in partnership with regional and local agencies, have already started much of this work. Projects totaling more than $65 billion of federal, state, local, and private investment will be completed in the next 10 years, including more than 440 miles of electrification and the introduction of the first zero-emission mainline trains. Funding has already been identified for these projects, and in many cases, construction has already begun. The Rail Plan builds on these successes and positions projects for funding programs, such as Solution for Congested Corridors (SCCP) and Federal-State Partnership for Intercity Passenger Rail (FSP).

1.1. BUILDING THE VISION

Achieving an integrated network requires a common, statewide approach to rail planning. For three decades, California has served as a national model for state-supported intercity passenger rail. The Program's success is attributable to the work of regional partners, as well as political commitment, consistent funding, and technical know-how. The 2024 California State Rail Plan affirms the progress that has been achieved with a bold vision for growth.

Committing to an Integrated Network

The 2018 California State Rail Plan articulated the vision of an integrated statewide rail network. The comprehensive plan included strategic investments to intercity and regional rail services, as well as intercity bus connections, to maximize the benefits of the system, ensuring increased accessibility and mobility for communities across California. This represented a departure from previous siloed planning, moving towards a fully integrated statewide rail network that can capture significant mode shift onto a high-quality, zero-emission passenger rail system.

The 2018 plan established the vision for delivering ridership increases, operational cost savings, modal integration, improved access to the rail network, and decreases in vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions. The State is committed to building off this foundation.

Moving Forward: 2024 and Beyond

The 2024 California State Rail Plan reaffirms the 2018 goals while refining service concepts and project specific elements in response to new research, evolving policies, and additional funding source. Key priorities from the previous plan remain, such as maximizing the use of existing rail corridors, capitalizing on funding opportunities, and advancing the transition to a zero-emission rail network. By emphasizing these core strategies, the 2024 plan aims to enhance the state rail system's efficiency and sustainability, ensuring continued progress toward a safe, integrated, and zero-emission future.

Since 2018, progress towards delivering the vision has been made, including route extensions, fleet procurements, and electrification.

The State is leading service-led planning to design an intuitive rail network. This approach identifies improvements that are needed to operate the network-wide service plan rather than planning services based on what the existing infrastructure can accommodate – not the other way around; and the schedule is designed to meet demand and opportunities to connect more of the network.

Looking toward the next decade

The next decade represents a significant expansion of rail services. Substantial capital investments are being made to enhance reliability and increase service. Since the release of the 2018 Rail Plan, more than $15 billion in state funding has been directed towards improving California's intercity rail and transit system. In addition, construction of the California High Speed Rail System between Merced and Bakersfield has accelerated through additional federal funding and full appropriation of state bond funding. Local transit projects continue to be competitive and successful in receiving major federal funding commitments, leveraged by local and state matching funds.

California is committed to building a zero-emission rail system, including overhead electrification segments, as well as use of battery-electric and hydrogen fuel cell- technologies. By 2050, the State Rail Plan envisions approximately 1,500 miles of overhead electric power on our busiest and high-speed rail segments, including segments that connect the state to Las Vegas and Arizona. A total of about 440 miles will be constructed by 2034, up from the 51 miles on the Caltrain corridor that opened in 2024.

Multi-billion-dollar corridor investments will electrify routes with catenary and deliver high-speed service. These include the statewide high-speed rail system, extension of electrified rail service from San Francisco to Sacramento through a new tunnel under the Bay, service from the Los Angeles (LA) Basin to Las Vegas and Arizona, and extension of electrified operations north of Merced to Sacramento.

The investment in new, zero-emission vehicles also expands the opportunities to run different service patterns within a corridor. In addition to the investments for more dedicated passenger rail rights-of-way, improved vehicle performance characteristics create an opportunity to provide high-quality local and express services together in a corridor. This has the potential to open the state rail network to dozens more local communities.

In total, over $65 billion will be spent over the next ten years to transform the state's rail network. The scale of investment outlined in the plan provides significant benefits that will support progress towards long-term goals. The capital program is directly linked to specific service improvements across each corridor and reflects the dedicated funding that has been secured to date. Every project included in the 4- and 10-year capital program is either fully funded or has a clear pathway to secure full funding and complete construction by 2034. This strategic approach not only ensures that projects can move forward but also reinforces the State's commitment to enhancing rail services in a coordinated and efficient manner.

1.2. STATE RAIL PLAN PURPOSE

The Rail Plan is the strategic investment framework for rail in California. In compliance with federal and state laws, the Rail Plan proposes a unified and integrated statewide network that aligns needs for passenger and freight service and connects rail to other modes. As the agency responsible for developing the Rail Plan, the California Department of Transportation (Caltrans) partners with stakeholders to define, refine, and deliver strategic policy and implementation planning. Strategic decisions, investments in technology, and delivery of capital infrastructure to realize the network are complex, dynamic, and implemented over decades. The Rail Plan articulates strategic and technical guidance to coordinate state resources and guide implementation planning in a complex, dynamic environment.

The Rail Plan is a road map to deliver on key state goals and plans, including CalSTA's Core Four priorities of Safety, Equity, Climate Action, and Economic Prosperity. The Climate Action Plan for Transportation Infrastructure (CAPTI) provides a framework for aligning State transportation infrastructure investments with climate, health, and social equity goals. The Rail Plan furthers CalSTA's Core Four priorities and the investment framework laid out in CAPTI by building a network that fosters economic growth, improves environmental outcomes, and increases equity by providing the seamless mobility Californians need. The vision shifts travel demand to zero-emission, high-capacity transportation options that support efficient, sustainable land use.

Key Benefits of the Plan

- **Shift in Passenger Travel**: The vision anticipates shifting nearly 200 million daily passenger miles from highways to the statewide rail network, significantly reducing road congestion and vehicle emissions.
- **Increased Access to Zero-Emission Transportation**: The vision enhances access to lower-cost transportation options, with frequent services that connect passenger

rail customers to a broader range of destinations, improving overall mobility and accessibility. All passenger rail services in California will operate using zero-emission vehicles by 2050.

With trends of increasing fuel costs and focus on decreasing the transportation sector's greenhouse gas emissions, the vision enhances access to lower cost, zero-emission transportation options. The vision includes more frequent services that connect passenger rail customers.

- **Safety Improvements**: Rail transportation is significantly safer than automobile transportation and delivering the vision increases safety across the transportation system. According to 2022 data from the National Safety Council, the passenger vehicle death rate for car travel is 17x greater per passenger mile than rail travel. The vision also incorporates safety enhancements such as grade-crossing and grade separation improvements.
- **Economic Return**: The vision includes a direct capital investment of $307 billion, with an estimated economic return of over $537 billion by 2050, representing a significant boost to California's economy and nearly twice the return on investment.
- **Environmental Benefits**: Nearly half of all climate changing pollution in California comes from the transportation sector. The vision supports California's GHG goals VMT.
- **Integration with Other Modes of Transportation**: The vision for a fully integrated, statewide rail network features high-quality connections with connecting buses and local transit systems, making rail a more attractive option compared to car or air travel.
- **Equity**: The vision addresses transportation inequities by increasing access to affordable and frequent services, particularly benefiting communities that have been historically underserved by transportation infrastructure.

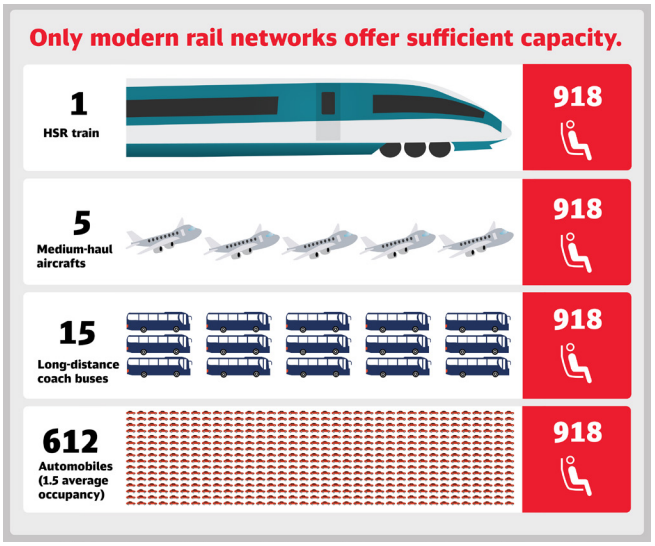


Figure 1: Capacity of rail per trip versus other modes.

- **Long-term Climate Resilience**: Many rail corridors in California are at risk of disruption due to sea level rise and increasingly common severe weather; some already experience flooding and erosion annually, leading to costly delays and repairs. The vision includes measures to protect rail infrastructure from climate risks such as sea-level rise and flooding, ensuring the long-term resilience of California's rail network.

1.3. THE VALUE OF AN INTEGRATED NETWORK

An integrated rail and transit network facilitates connections with transit while safely and reliably delivering more service to more destinations more often. Effective integration between high-quality transit and rail services has the potential to shift significant demand away from highway and air travel. Regularized regional, intercity, and high-speed rail service with high-quality connections to local transit services provides customers with better access to the entirety of the state's network. Within this type of fully integrated network, customers can travel between any origin and destination throughout the day. Timed connections ensure short, seamless transfers for all levels of service, from local transit to high-

speed rail, while higher frequency, all-day, bi-directional service patterns reduce the risk of travel disruptions. More frequent service and shorter connection times mean less time waiting. Modern equipment and better infrastructure maintenance mean faster, more reliable trains.

Even without massive capital infrastructure investments, the integration of rail and high-quality transit in the statewide network reduces trip times and makes more trips competitive with car travel, increasing ridership and enabling rail and transit to capture a larger share of travel in California. As this coordination and service enhancement happens at the local, regional, intercity, and high-speed service levels, Californians will enjoy improved access, faster trip times, and enhanced mobility for communities throughout the state.

Caltrans has developed a standard methodology and toolset to guide rail network planning at a statewide, systematic level. With common tools and datasets for service planning, ridership, cost modeling, and infrastructure analysis, Caltrans works with partners across the state to set a shared vision and identify the work needed to achieve that vision. Regional coordinators in the Division of Rail serve as liaisons with partner entities and provide access to the common planning tools and resources.

While Caltrans doesn't directly operate transit, the Division of Transportation planning has an Office of Transit Planning which works closely with California's over 300 local transit operators to plan, fund, and support the state's transit systems. The Office of Transit Planning plays a key role in coordinating local transit projects, funding, and promoting policies that align with statewide goals, such as the Rail Plan. This interaction will be key to developing the types of local transit service that can support the rail investments called for in this plan.

California's Strategic Leadership

While the Rail Plan's vision will ultimately be delivered by a coalition of federal, state, regional, local, and private partners, the State has a specific role to play in articulating the vision and developing the technical framework for strategic implementation. Funding programs and governance structures can create hurdles for the types of coordination and investment required to build the vision; Caltrans is uniquely positioned to take on strategic challenges that are bigger than any one agency or any one region to solve on their own.

Passenger Strategy

Since the 2018 State Rail Plan was released, Caltrans has committed to developing and deploying service-led strategic planning. This approach prioritizes the schedule (or timetable). The schedule must be intuitive to the traveler, guide local, regional, and intercity operators to support each point with regular, high-quality service, and be derived from market demand and connectivity opportunities. The schedule drives infrastructure improvements – not the other way around.

Please refer to Chapter 2: Passenger Network Strategy and Appendix 4: Passenger Planning Strategy for more detail on the technical design process.

Empowering Decision-Making

To achieve the vision, projects need to be delivered efficiently. Too often, potential improvements to the network are studied or planned over and over or in silos – with insufficient connection to decision-making and funding processes that establish commitments, accountability, and a clear path to delivery.

While regulatory and permitting reforms will be crucial to delivering on a reasonable timeline for a reasonable cost, Caltrans has established clear technical parameters, network goals, planning horizons, and investment strategies to support local and regional planning agencies so that projects can move from planning to implementation. Caltrans has established the "Caltrans Service Led Planning Methodology" with accompanying technical modelling and resource support for partner agencies to conduct reproducible, documentable technical analysis with shared assumptions and integration with regional and statewide planning. More detail on this process is available in Chapter 2.

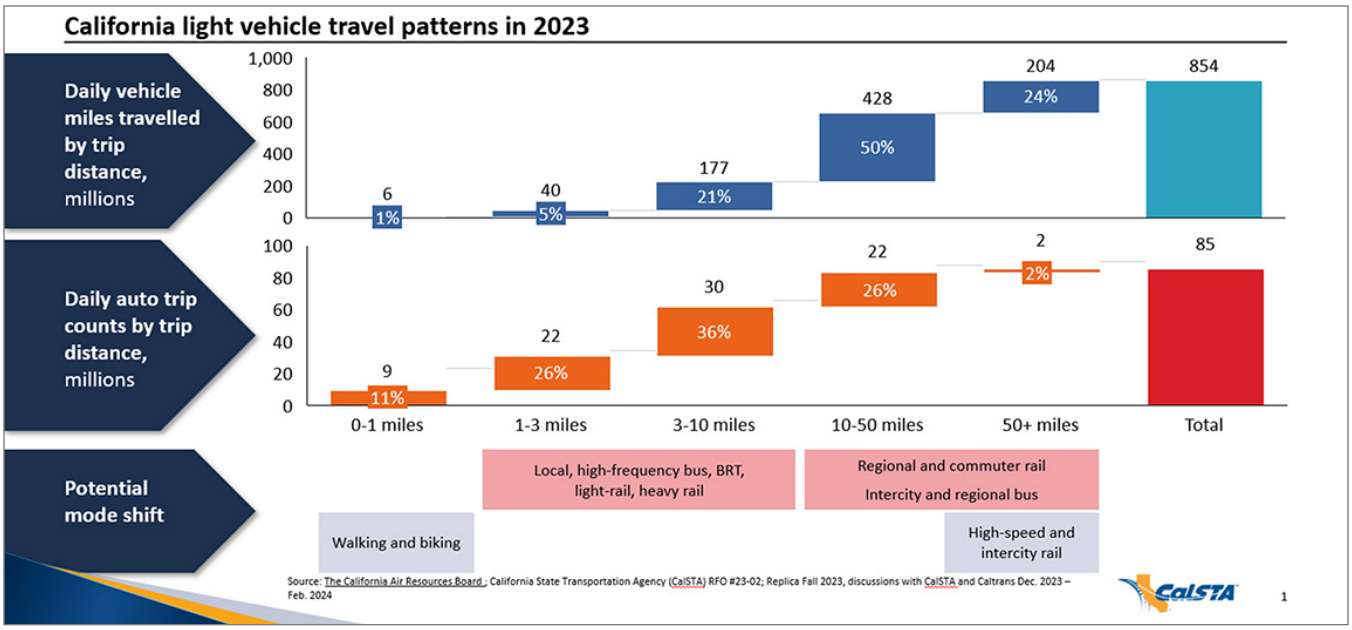


Figure 2: CARB, CalSTA; California Light Travel Patterns 2023. Source: The California Air Board; California State Transportation Agency (CalSTA).

Reducing VMT

Developing California's rail system is not about just moving people from cars to trains; it represents a broader transformation in how Californians travel. As intercity and regional rail services have infrequent stops compared to local transit, an over-arching transformation of how these services interact and support each other must be achieved to really change how Californians travel. In order to meet the State's GHG reduction goals, the California Air Resources Board's (CARB) Scoping Plan calls for a 30 percent reduction (over 2019 levels) in VMT by 2045. To help the state achieve the CARB's VMT reduction targets, the Rail Plan must ensure that at least 20% of passenger miles traveled are shifted to rail and transit. The Rail Plan's integrated network is designed to maximize connectivity and capacity, enabling it to capture a substantial share of the state's travel demand as long as high-quality local transit services can collect travelers from and distribute travelers to the rail system efficiently.

The integrated rail network has the capacity to accommodate growth. The shift to rail and high-quality local transit is expected to reduce the need for highway expansion, which has historically contributed to urban sprawl and increased GHG emissions. By focusing on rail, California can achieve a more sustainable and equitable transportation future, where environmental justice is a central pillar. The transition to a zero-emissions network is not just about reducing pollution; it's about ensuring that all communities, particularly those historically burdened by transportation-related pollution, benefit from cleaner air and improved health outcomes.

This comprehensive approach, combining immediate climate adaptation measures with long-term strategic planning, positions California to lead in the global fight against climate change. The Rail Plan is not merely a transportation strategy; it is a blueprint for a sustainable future, where mobility supports rather than undermines the state's environmental and equity goals.

Capturing the Longer-Distance Market

Integrated rail and high-quality local transit networks have the potential to capture mode share on par with international best practices. Research completed by the Senate Bill (SB)125 Transit Transformation Taskforce found that median trip lengths in California are between 10 and 50 miles; but the majority of California's total VMT is created by trips longer than 10

miles, with a quarter of VMT produced by trips 50 miles or more. An integrated network of high speed, intercity, and regional rail connected to local transit services that efficiently serve every scheduled arrival and departure is perfectly suited to compete for, and capture these longer trips. By targeting the market share of longer trip distances and supporting first and last-mile connections, the Rail Plan can help the state deliver on VMT reduction and mode shift goals.

Intercity Bus

Intercity bus service is intended to act as an extension of the state's rail network to provide service to areas where there is low demand or rail service is not financially viable to implement. Highly reliable and frequent intercity bus service with guaranteed connections to rail at hub stations are a necessary piece of an integrated network and already support California's three existing intercity rail routes. Partnerships with existing regional bus services can be developed to extend today's intercity bus network even further and connect to more destinations. In all cases, these intercity bus stops should be viewed as train stations without the tracks and should be efficiently served by high-quality local transit services designed to support the statewide services at these locations.

Leading the Zero-Emission Transition

California has long been recognized as a leader in setting environmental goals with specific targets, deadlines, and paths to implementation. In 2020, Governor Newsom challenged the status quo by setting a bold agenda to transition new vehicles, including heavy-duty equipment like transit vehicles and locomotives, to be zero-emission. Caltrans immediately stepped up to the challenge and delivered the California Intercity Passenger Rail Zero-Emission Strategy to meet the zero-emission transition goal ahead of both the Governor's deadline and the CARB implementation timeline. This strategy will support regional and intercity rail operators across the state to transition their existing fleets to zero-emissions over the coming decade.

Zero-Emission Fleets and Infrastructure

The vision for California's zero-emission rail system encompasses all passenger rail in the state. The State and its regional partners are already making progress to this goal, decreasing the emissions of the current passenger rail fleet and deploying the first parts of the zero-emission passenger rail fleet. To achieve a zero-emission passenger rail network, 1,500 miles of track will have catenary by 2050. Battery-electric and hydrogen technologies will extend zero-emission

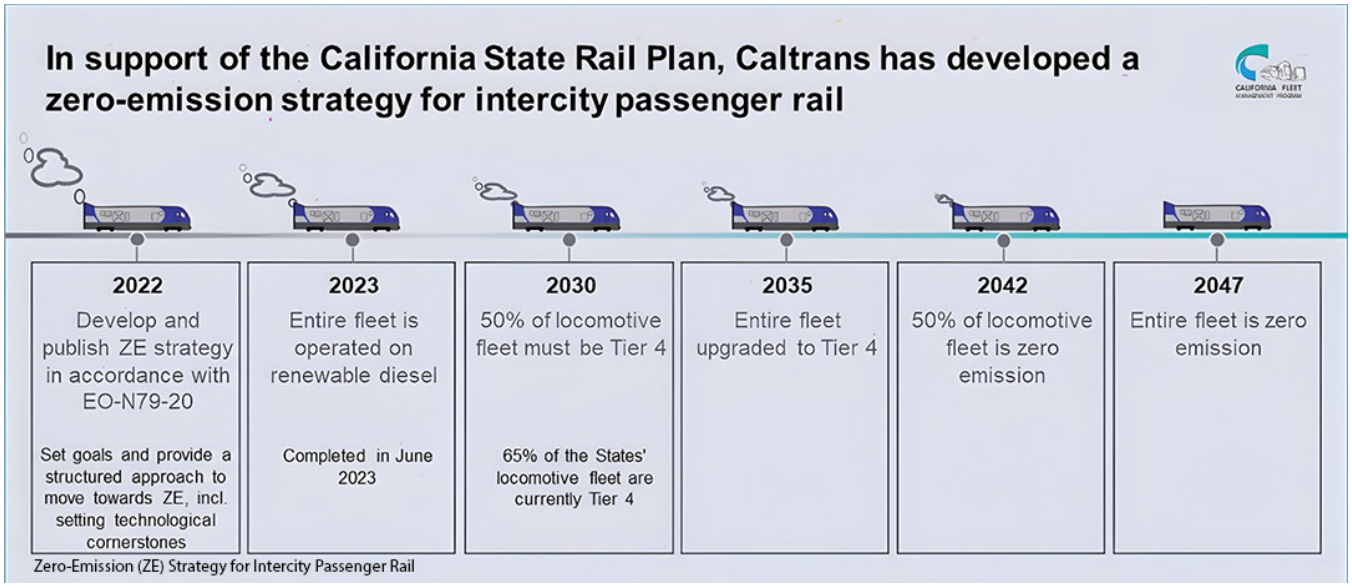


Figure 3: Zero-Emission Strategy for Intercity Passenger Rail.

rail service where catenary is not feasible. This transition has significant environmental benefits and meets the requirements of CARB.

Demonstration Projects: All Options Are on The Table

All propulsion options are under evaluation for converting fleet to zero-emissions, including hydrogen fuel cell, battery-electric, wayside electrification, and overhead catenary wire configurations.

CalSTA has funded several demonstration projects, working with Caltrans and Caltrain. These demonstration projects will uncover new advances in zero-emissions technology and strengthen California's position as a global clean technology leader. What Caltrans learns from zero-emission demonstrations will inform future fleet decisions.

Since hydrogen fuel cell and battery technologies can be deployed faster and cheaper than overhead electrification, these demonstration projects help Caltrans and Caltrain deploy zero-emissions service faster. Hydrogen and battery technology can not only replace diesel-hauled operations on corridors with less frequent service, they can initiate passenger service into new markets quickly.

Hydrogen and Battery Electric Technologies Are Flexible

Caltrans is designing its future hydrogen fuel cell trainsets to be easily reconfigured to collect power from overhead wire wherever overhead catenary electrification is constructed. These technologies can be configured to charge batteries using shorter stretches of overhead catenary or a charging interface in station. Caltrans will align fleet propulsion technologies to what is most economically efficient and practical for service in a variety of future scenarios.

Hydrogen fuel cell technology is currently the most practical option to help California begin its zero-emission rail transition, as it has a much longer range than battery-electric trains. Hydrogen fuel cells provide a balance of environmental benefits. Caltrans is working with federal, state, and private partners to develop a substantial supply of affordable green hydrogen –produced only with renewable electricity – over the next five to ten years. This hydrogen supply effort will reduce costs for long-distance trucking and other heavy-duty hydrogen applications in the private sector, along with Caltrans and the public rail and transit agencies making this investment.

Currently, when a customer rides from San Francisco to Gilroy, they must transfer from Caltrain's new fleet of electric trains to a diesel-hauled train in San Jose, which will take them the remaining 30 miles to Gilroy. Caltrans and Caltrain are now partnering on a battery-electric demonstration project which will allow electric trains to operate "off wire" to rail lines that are not electrified.

Lessons learned from these zero-emission demonstrations, along with the inventions and innovations they spur in the next ten years will inform the State's additional fleet decisions in the future.

Expanding Benefits through Electrification

California is committed to building a high-performance, zero-emission rail system. Railroad electrification – including overhead electrification, battery-electric, and hydrogen fuel cell-battery hybrid technologies – provides benefits to railroad operations. In addition to the environmental benefits from reduced emissions and noise, electric trains can accelerate more quickly than today's diesel-electric trains, allowing for more frequent service, multiple service types on the same corridor (local, express, high-speed), increased passenger capacity, and higher utilization of constrained railroad infrastructure assets.

Caltrain completed the Peninsula Corridor Electrification Program in September 2024, heralding a new era of electric railroad operations in California. Their 51 miles will contribute to approximately 440 miles of electrified railroad that will be constructed in the state by 2034. By 2050, California envisions 1,500 miles of electrified railroad. Routes slated for eventual overhead wire electrification will do so with multi-billion-dollar corridor investments that are coupled with high-speed and/or very high service frequencies. These include

Figure 4: Expected statewide network electrification by 2050.

the statewide high-speed rail system, extension of electrified rail service from San Francisco to Sacramento through a new transbay tunnel, trains from the Los Angeles Basin to Las Vegas, and the extension of electrified operations north of Merced to Sacramento.

Hydrogen fuel cell-battery hybrid and battery-electric technologies can be deployed faster and cheaper than overhead electrification, replacing diesel trains in operation on current rail corridors that do not yet have high frequency service. Caltrans will have a small fleet of hydrogen fuel cell-battery hybrid trains available for demonstration service beginning in 2028. As more routes are electrified, these hydrogen and battery trains can extend electric operations to low-density services where overhead electrification isn't economically justified.

1.4. KEY STRATEGIES TO ACHIEVE THE VISION

Increase Competitiveness of Passenger Rail

Provision of frequent, all-day, bi-directional service connecting California's urban cores will grow rail ridership because it increases the utility of rail for more riders and trip types. The ability to show up and go - and know that you can get to your destination - will make rail much more competitive with modes such as private automobile.

Maximize Investments in Corridors on Publicly Owned Rights-of-Way

The electrification of the Caltrain corridor, wholly owned by a public agency, is one example of what a high-capacity corridor can do to maximize a popular service. The electrification of Caltrain has made the service highly competitive with car travel and prepared for the introduction of high-speed rail.

Instead of a single transformational project like Caltrain electrification, improvements to service on the Los Angeles-San Bernardino corridor will be an evolution comprised of smaller, tactical capacity projects over time. In the short and medium term, that means projects needed to provide reliable all day regional service in the corridor. In the long term, additional projects will culminate in electrification and the introduction of blended high-speed and intercity service.

Maximize Throughput at Major Stations

The State has invested in and supports significant improvements at Los Angeles Union Station (LAUS).

This project is intended to be completed in two phases. In the first project phase, early benefits from an interim two-track run-through configuration at LAUS will be utilized by regional and intercity rail operators. Eventually, high-speed rail will utilize the run-through tracks on its route from Anaheim to Northern California.

The improvement will dramatically improve ridership, reduce travel times through LAUS,

and will significantly lower operating costs by eliminating the need to turn trains.

The same concept will be implemented in the Bay Area beneath the Salesforce Transit Center (STC), where a vault for high-speed rail and electrified regional services was constructed. Instead of services solely heading south from STC to San Jose, this station will be connected to a future second transbay crossing, allowing maximum regional, high-speed, and intercity rail throughput at this key downtown San Francisco location.

Zero-Emission Fleet Strategy

Caltrans ensures the vision for California's rail network can be met by procuring, designing, retrofitting, and owning the fleet for intercity passenger rail. Rolling stock maintenance is managed by the joint powers authorities (JPAs) and performed by contracted maintenance through third party agreements. Like much of planning and delivering the rail network, collaboration is critical to procuring, deploying, transitioning to zero-emission, and maintaining the State's fleet. Caltrans' Division of Rail publishes the Fleet Management Plan and Zero-Emission Strategy for Intercity Passenger Rail, which are documents that guide short- and long-term fleet planning and procurement efforts, the zero-emission transition for passenger rail, and the overhaul of the legacy fleet.

Caltrans Will Continue to Exhibit Leadership and Foster Innovation

Caltrans leads several industry-wide working groups and serves as a center of excellence for innovation in passenger rail rolling stock technology. Caltrans launched the Rail Fleet Consortium (RFC) in 2020, bringing together over 25 agencies across the United States (US) and Canada to foster collaboration and knowledge sharing on fleet-related topics. The Zero-Emission Working Group is a subgroup of the RFC and focuses on zero-emission passenger rail transition efforts across North America.

Caltrans also leads the Platform-Train Interface Working Group, which was established to develop a plan for the future of level-boarding in California. In addition to significant positive accessibility impacts, level boarding also has positive impacts on network integration and on-time performance. By reducing dwell and increasing reliability, improved platform train-interfaces also improve operations in a rail corridor.

Implementation of the Senate Bill 125 Transit Transformation Task Force

In 2023, SB 125 was signed into law, which established a Transit Transformation Task Force (TTTF) led by CalSTA to develop policy recommendations to grow transit ridership, improve the transit experience, and address long-term operational needs. The TTTF meetings are generating new statewide strategy concepts and will leave California with a toolkit to respond to the changes in transit use experienced since the pandemic.

The TTTF includes representatives from CalSTA, Caltrans, various local agencies, academic institutions, nongovernmental organizations, and other stakeholders. CalSTA, in consultation with the task force, is required to prepare and submit a report of findings and policy recommendations to the Legislature on or before October 31, 2025. The report must include a detailed analysis of specified issues and strategy recommendations on specified topics, including reform of the Transportation Development Act (TDA) of 1971 (Also known as the Mills-Alquist-Deddeh Act of 1971), opportunities to increase ridership and revenue, and how to deliver affordable and accessible transit.

The TTTF meets in person every two months and is on track to deliver the final report on findings and policy recommendations. The final report will be structured around:

- **Principles**: Value statements of the report organized around themes such as increasing ridership, safety, equity, sustainability, etc. that guide the recommendations in the report.
- **Strategies**: Strategies form the "issue areas", often drawn from the SB 125 enabling legislation. Recommendations may be larger, strategic moves to enhance transit.

It is expected that many of these strategies will center around conforming new transit and passenger rail investments to work together efficiently so they have maximum impact on travel times and customer experience.

- **Policy Recommendations**: Policy Recommendations are the specific steps and initiatives that can be considered by stakeholders such as the Legislature, the Executive Branch, or Transit Operators.

A key strategy is to reform the TDA, which provides funding to counties for transit and other transportation purposes.[1] Consequently, Regional Transportation Planning Agencies (RTPA) were set up after the Act was signed into law,[2] but are required to work within the context of the TDA to deliver transportation services to their residents.

Because TDA was passed over 50 years ago, some of the well-meaning regulation does not support contemporary ideals about good transit service.[3] The TTTF final report will include recommendations for TDA reform, supported by a holistic analysis of how to improve the performance, safety, security, efficiency, and overall customer experience.

SB 125 also authorized the distribution of $5.1 billion in General Funds to regional transportation planning agencies, allowing agencies to use the money to fund transit operations or capital improvements.

Use Existing Rights-of-Way

In parts of the state where rail corridors pass through sparsely populated areas or decentralized development patterns, existing rights-of-way, especially the State-owned highway network, will be considered to reduce costs and speed implementation. The Las Vegas to Rancho Cucamonga and Rancho Cucamonga to San Diego sections of high-speed rail are key examples of this strategy. If these services can be inserted into existing rights-of-way, property acquisition costs will be much lower.

In addition to being a significant component of the 2050 Vision, the high-speed rail to Las Vegas project is also a useful example for future projects. Attracting private investment reduces the total amount the State needs to invest to realize its goals. Furthermore, the project takes advantage of existing corridors outside of urban areas, utilizing the median of Interstate 15. This further reduces costs and speeds construction, and the State will take advantage of similar existing infrastructure corridors.

Leverage High-Speed Rail Investments in the Central Valley

Getting the most value out of the Central Valley Segment (CVS) of high-speed rail from Merced to Bakersfield will require convenient and efficient connections to rail services that can expand the reach of the initial 171 miles of high-speed rail service. Merced will be the first place where regional, intercity, and high-speed rail networks interface in California which makes Merced the key location to prioritize network improvements to maximize the benefits of high-speed rail.

The State supports the Merced Intermodal Track Connection project which will allow easy, cross-platform transfers between high-speed service terminating in Merced in the mid-term, and regional and intercity services that provide connections to Stockton, San Jose, and Sacramento. Intercity services already serve Merced at the BNSF station which is just over ½ mile from Merced's downtown core and the Union Pacific right-of-way which will host regional and high-speed services.

Ongoing investments to support an electrified Sacramento-Stockton-Merced corridor by 2050 will leverage and enhance the benefits delivered

1 https://www.sco.ca.gov/aud_transportation_development_act.html
2 Ibid.
3 https://libraryarchives.metro.net/DPGTL/employeenews/RTD_Flyer_1971_Nov12.pdf

by the completion of high-speed rail between Anaheim and San Francisco.

Strategies to Anticipate and Address Climate Change Impacts

Caltrans understands that climate change poses many challenges to statewide transportation operations, including heat, flooding, fire, and coastal impacts. The Rail Plan's strategy to address these impacts is focused on coastal impacts, as these have deeply impacted passenger rail service operations over the last several years and show no signs of ebbing. Specific near-term investments are already being advanced in San Diego, Orange, Ventura, and Santa Barbara counties, but many more will be needed, and long-term rail line relocation may be necessary in some cases. See section 4.4. Climate Resiliency, for a deeper dive into these issues.

In corridors that host passenger service, the State will review the desired service levels, the improvements needed to enhance resiliency in the corridor, and the interest levels of host railroads to partner with the State to make the necessary improvements.

Federal Partnership

The Infrastructure Investment and Jobs Act (IIJA) - also known as the Bipartisan Infrastructure Law - has the power to invest up to $100 billion in rail across the US if Congress appropriates the full amount of advance appropriations and authorized funding. IIJA sunsets in 2026 and Caltrans, as well as the intercity JPAs, are working with industry and state partners across the country to develop an equally bold reauthorization proposal. See 4.6. Bipartisan Infrastructure Law for more information.

Unprecedented ongoing federal support for intercity passenger rail planning and project development was established by the Corridor Identification and Development (CID) Program, also created under IIJA. Through this program, the Federal Railroad Administration (FRA) has established a process to develop plans and fund rail corridor investments across the country. With the CID Program, the federal government is establishing a dependable rail development program on par with historic highway and transit capital funding programs.

Caltrans has been awarded funding to scope the Service Development Plans for five CID Program corridors, and there are four additional corridors that connect to or have an impact on California's rail planning and implementation activities. More detail of this coordinated planning process can be found in sections 2.5 and 4.6.

Southwest Multi-State Planning

Caltrans will also pursue interstate partnerships including projects identified in the Southwest Multi-State Rail Planning Study (2014). The study is part of a national effort to develop high-performance interstate passenger rail networks through a common preliminary technical vision and strategic planning at the multi-state and megaregional level. Additional planning work will commence to support this development.

1.5. STATE LAW COMPLIANCE

California Government Code Section 14036 requires Caltrans to prepare a Rail Plan that aligns federal and state requirements.

Trolley at University Town Center (UTC) in San Diego, California.

Chapter 2: Passenger Network Strategy

The Passenger Network Strategy identifies service goals, phasing, and capital investments needed to achieve the vision for a fully integrated statewide passenger network. As established in the 2018 Rail Plan, the vision for a modern, fully integrated, zero-emission passenger rail network with simple transit connections is a pillar in the State's strategy to continue to grow California's economy while achieving critical equity and environmental goals.

A rendering of the zero-emission, hydrogen intercity passenger FLIRT train, under development by Caltrans and Stadler. See https://dot.ca.gov/news-releases/news-release-2023-034 for more information.

The vision for California's statewide rail network provides all-day accessibility and auto-competitive mobility, across modes and markets, decarbonizing passenger transport and proactively addressing the impacts of climate change.

As a part of Caltrans' service-led strategic planning methodology, the timetable-based planning approach designs for timed transfers between services at hub stations where a transfer is required to complete a trip across the state, or to a location served by local transit. A repeating timetable allows for easy trip planning and seamless travel by ensuring connections between trains can be made throughout the day, with minimal transfer times.

2.1. NETWORK DESIGN PRINCIPLES

Policy goals for addressing equity, the environment, and the economy inform what the rail network aims to accomplish. Network design principles inform how policy is translated to technical service planning and service operations.

The network covers corridors and regions across the state that are served by different agencies, types of equipment, infrastructure owners, operating constraints, and governance structures. To improve consistency and ease of use for the customer and operator, the Rail Plan identifies a standardized and simplified set of strategic design principles, based on international best practice in modern passenger rail operations. These are applicable statewide and guide service and implementation planning from the outset.

The design principles enforce a coherent, coordinated network. They will evolve in implementation planning and be refined by local priorities and stakeholder concerns, while ensuring the whole of the network is greater than the sum of its parts.

These design principles include:

- **Service-led design**: designing a network to support service goals, and only identifying infrastructure needed to support the network.
- **An intuitive network**: simplifying and standardizing service patterns, schedules, connections, operations, and ticketing.
- **Direct connections**: minimizing physical and temporal distance to facilitate easy and well-timed transfers across a platform or to a bus bay.
- **Hub stations**: service is organized to meet at stations at regular intervals.

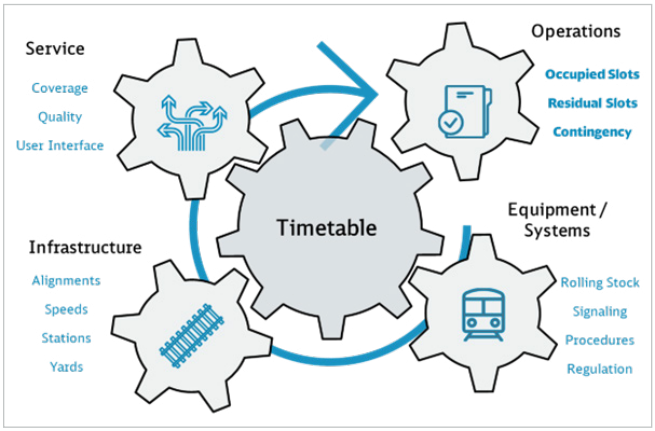


Figure 5: Service, operations, equipment, and infrastructure are taken together to develop a networked timetable.

The Rail Plan vision is oriented towards the customer experience. Likewise, the technical design principles underpinning the outputs of the Rail Plan are also tailored to the customer experience. When the above principles are applied, many technical outputs are developed to facilitate coordination more seamlessly amongst planning partners. To communicate the technical outputs of this planning work more easily to the public, timetables are created.

The timetable captures how often and at which times trains arrive at a station, how long journeys take, what connections are available between services, and serves as a summary of what the network is, how it operates, and what value it offers potential passenger rail customers. By articulating goals and designing solutions through the timetable, it centers the passenger in every tradeoff analysis and recommendation.

SPRINTER regional rail spans 22-miles and connects Oceanside, Vista, San Marcos, and Escondido in Southern California.

Service Goals

Service goals describe the train frequencies on the passenger rail network, reflect travel times needed to be auto and air competitive, and provide for timed connections at hub stations. Service goals balance travel times with the need to schedule connections between services where transfers are needed for travel between different travel markets. Timed connections between services are critical to extending the reach of the statewide network, reducing trip times, increasing trip availability, and minimizing operating and capital costs. All markets need not be served by direct service when timed connections can deliver competitive trip times with higher frequency at a fraction of the cost.

Service goals are also operator-neutral and strategic, rather than prescriptive.

Service goals assume local transit will continue operating, with planned improvements to provide necessary local connectivity. Where connection hubs have been identified on the network, the State will work with regional partners to co-locate all service types to enhance mobility and transfers. For transit services not identified on the statewide network, connectivity to the rail network will be important for local mobility. The State supports and invests in local connectivity as critical to providing a door-to-door platform for statewide mobility.

Pulse Scheduling

Network planning is based on pulse scheduling, which requires regular, uniform service patterns that repeat throughout the day on recurring time intervals. From the customer's perspective, it's simple and intuitive to understand when trains arrive without needing to constantly refer to a schedule because of irregular patterns.

Hour	Departures			
5				
6	01			
7	01	04	31	34
8	01	04	31	34
9	01	04	31	34
10	01	04		
11	01	04		
12	01	04		
13	01	04		
14	01	04		
15	01	04		
16	01	04	31	34
17	01	04	31	34
18	01	04	31	34
19	01	04	31	34
20	01			
21				
22				
23				

High Speed Service Reg Express Service

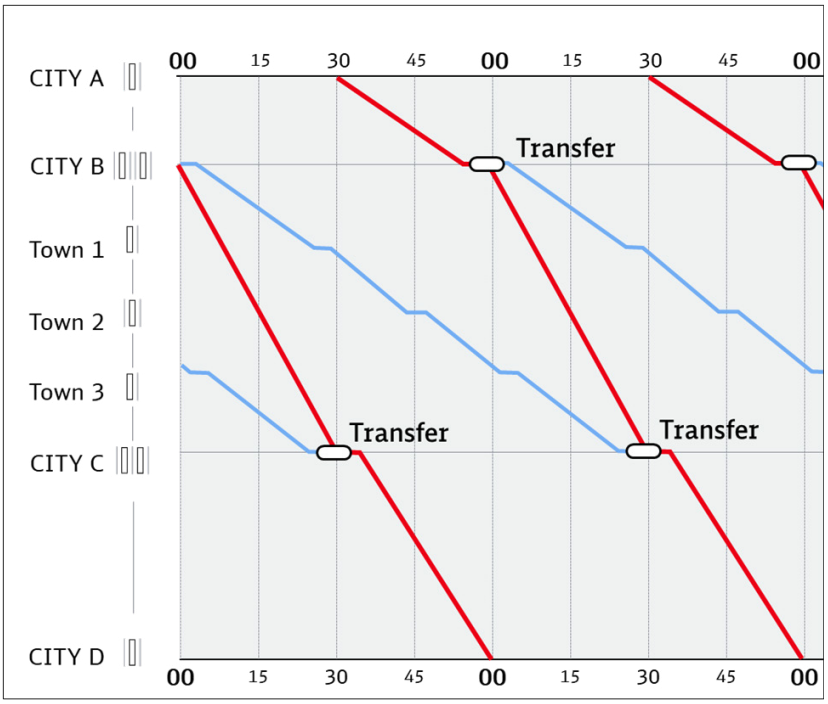


Figure 6: String chart diagram shows how local services can be designed to facilitate connectivity with higher speed regional and intercity services.

For operators, it standardizes the operating plan throughout the day, allowing for more efficient use of equipment, crew resources, and infrastructure.

Connections by Design

This timetable-based planning approach allows for timed transfers between services at hub stations where a transfer is required to complete a trip across the state, or to a location served by local transit. A repeating timetable allows for easy trip planning and seamless travel by ensuring that connections between trains can be made throughout the day, with minimal transfer times.

Driving Efficiency Through Reduced Operating Costs

The State expects that increased passenger rail revenues generated from increased use of the system will, in the ultimate vision, allow network services to operate without a subsidy, and generate profits in some corridors that can be reinvested in maintaining and improving the system. Capital costs are only half the equation to establishing a financially sustainable passenger rail service. The other half consists of operating and maintenance (O&M) costs for providing the service. Although operating passenger rail service is costly, there are massive efficiencies and economies of scale to be captured through well-planned, fast, and frequent service. In this way, the more frequently and faster the trains run, the more people ride, and the more cost-effective it is to provide the service per passenger mile traveled.

Key factors to lowering costs include:

- More efficient train rolling stock, largely through electrification and modern trains that are cleaner and lighter than traditional diesel locomotive-hauled trains;
- Faster train speeds, allowing for shorter trips and more hours of revenue service, with more efficient train crew service;
- Faster train turns, reducing the amount of time trains are idling at stations or in rail yards; and

- Changes in travel distances, largely through integrating regional and statewide services to ensure market sensitivity in route and service planning.

Taken together, these changes reduce unit costs for train operations, crews, and other overhead, resulting in more service available for far lower unit prices. Although the O&M costs for the 2050 integrated network seem higher than the O&M costs for existing rail services, increased train speeds and frequencies, newer equipment, longer consists (i.e., higher capacity), longer travel distances, and improved operating efficiencies all contribute to driving down the average cost per train mile and cost per seat mile. In short, growth makes the system more efficient to operate. Each additional passenger adds revenue with little marginal additional cost. The 2050 integrated network has a 45% lower cost per train mile, and a 65% lower cost per seat mile over today's service.

Minimizing Infrastructure

Pulse scheduling allows the network to serve more destinations through connections, as airlines use hubs to allow smaller communities more frequent access to more destinations at a lower cost. A pulse schedule allows cost savings by reducing the set of infrastructure improvements needed to only those necessary to operate the repeating timetable. As such, the capacity of a single-track railroad can be maximized before additional track infrastructure is needed. The Rail Plan has identified a 30-minute or 60-minute service frequency (or headway) across most portions of the state by 2050.

Renewing California's Intercity Fleet

Caltrans has begun efforts to convert its full fleet of intercity rolling stock to zero-emission. Caltrans' entire locomotive fleet currently runs on renewable diesel, a relatively new fuel alternative that contains up to 85% less polluting sulfur than ultra-low sulfur diesel. The fleet conversion was completed in June 2023.

Caltrans will overhaul its 13 F59PHI locomotives over the next few years. This project will extend their service life, improve fuel efficiency, and meet stricter environmental standards.

Metrolink passengers.

Caltrans plans on making investments in other areas of propulsion technology and procedures to make the fleet more energy-efficient, including:

- Purchasing next-generation rail cars and multiple-unit trainsets;
- Converting to regenerative braking that recovers and stores energy, reducing the demand for so-called head-end power such as heating/air conditioning systems and lighting;
- Adopting energy-efficient driving techniques.

Caltrans looks to lead and promote pioneering initiatives in zero-emission vehicles, integrate statewide efforts to accelerate implementation, partner with Caltrans' Division of Equipment and transit agencies to develop heavy-duty fueling infrastructure, and engage in public outreach that promotes the benefits of rail.

The Fleet Modernization Project will redesign California's existing 139 bi-level passenger rail cars. This will extend the life of these vehicles by 15 years and improve reliability, efficiency, and the passenger experience.

2.2. STRATEGIC PLANNING AND PUBLIC ENGAGEMENT

Decisions required to manage, improve, and expand the public transport network are complex. Decision-making involves large groups of stakeholders, consequential social equity considerations, and is time and resource intensive. Public agencies must navigate a range of technical questions supporting service planning, environmental impact analyses, civil engineering, project development, funding strategy, and, ultimately, project delivery and revenue service operations.

Effective strategic planning requires agency staff, executives, and boards to be empowered through transparent, reproducible analyses scaled to the level of detail and specificity appropriate to the decision in question. Given the interconnected nature of the state's transport network and the overlapping responsibilities of funding and operating agencies, clear documentation and coordination of processes, parameters, and recommendations are critical to working across multiple stakeholder groups, jurisdictions, and planning horizon years.

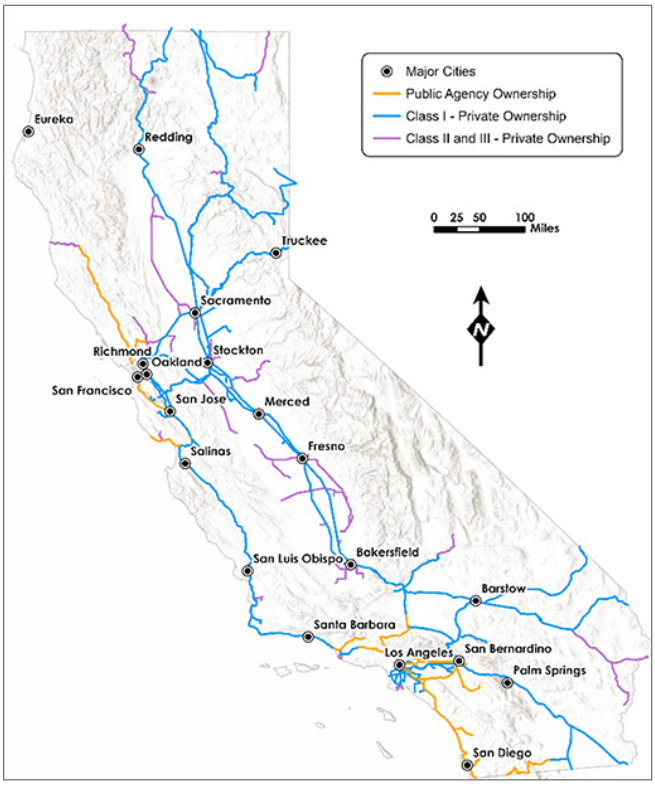


Figure 7: Track ownership in California.

Effective engagement must respect partners' values, intelligence, and time, providing meaningful opportunities to understand critical issues and provide actionable feedback.

That respect demands a robust technical process that provides a platform on which partners can understand tradeoffs, develop informed opinions about options, and ask relevant critical questions. Service-led Strategic Planning provides that platform.

2.3. HOST RAILROAD COORDINATION

The State's goal is to enable continued, market-responsive growth in goods movement by freight rail, while providing for increased passenger

capacity. This will be achieved through early and continuous dialogue with the freight railroad partners, and progressive identification of shared opportunities.

Pathing Studies

Since 2018, the State has supported several pathing studies in collaboration with or led by host railroads, to identify current and future capacity constraints and identify strategic infrastructure needs. Where freight and passenger services share a corridor, opportunities exist to expand or reorganize agreements for additional capacity. While solutions are context-specific, the State's leadership in coordinating planning and supporting detailed technical analyses will continue to facilitate increased dialogue with freight partners.

The network- and corridor-based pathing study methodology allows for an open, cross-jurisdictional process that weighs operational and capacity impacts on rail operations. The methodology examines trade-offs, trade corridor impacts, and joint passenger and freight effects.

2.4. PLANNING YEAR HORIZONS

Planning horizons described in the Rail Plan identify specific service planning and analysis needed to develop and integrate the network over time, responsive to local and regional stakeholder needs. Planning horizons are not tied to a specific completion year of a given project. Some projects may be completed ahead of the horizon year; others may be near completion. Horizon years and corresponding plans serve as important markers and meet statutory planning requirements. The four and ten-year horizons are based on realistic projections for what can be built in those timeframes. These projects are fully funded in the near term, and mid-term projects are fully programmed and mostly funded with all agreements in place and plans for immediate construction in the mid-term. However, these planning year horizons are fluid; if the funding landscape changes, projects can be accelerated. The State is committed to working with partners to develop and deliver projects efficiently.

Near-Term (~4-years): Project Delivery

The near-term service goals and associated capital program identifies improvements that are fully funded or committed, helping to ensure successful, timely, and on-budget project delivery.

Mid-Term (~10-years): Implementation Planning

The mid-term service goals and associated capital program identifies improvements that are either fully funded or have a path to full funding and construction within 10 years. Looking ahead to service improvements and capital expansion expected in the mid-term, Caltrans will resource and support partners finalizing implementation and funding plans for future improvements that demonstrate alignment with the State's vision and provide specific utility to delivering the vision. Services and associated projects in this timeline are either fully funded or have a path to full funding and construction within 10 years.

Long-Term (~25-years): Strategic Planning

Utilizing the framework and vision provided by the Rail Plan, Caltrans will support long-term strategic planning to support initial project development from feasibility to pre-environmental and pre-engineering work, identify tradeoffs in delivery approaches, and prepare funding strategies for downstream implementation planning.

2.5. STATE PLANNING PRIORITIES

Corridor Identification and Development Program

The CID Program is a new tool to advance implementation of the State Rail Plan by establishing an intercity passenger rail planning and project development program that will set forth a capital project pipeline ready for sustained federal funding. For many decades, the State has been the primary funder for intercity and high-

speed rail investment in California. Through the CID Program, the federal government is ready to invest. This joint federal-state partnership for planning and project delivery will help the intercity passenger rail operators and partners more efficiently develop and deliver projects in partnership with ongoing support and approval from their two most significant funding partners.

There are three steps in the CID Program:

1. **Scoping & Program Initiation**: FRA will grant up to $500,000, with no state or local match required, for the sponsor to develop a scope, schedule, and budget for a Service Development Plan (SDP) and create staff capacity to undertake the service planning effort.
2. **Service Development Planning**: The sponsor will collaborate with FRA to develop an SDP in accordance with the scope of work (SOW) and provide a 10% match to FRA funding, as determined from the SOW in Step 1. An SDP is a multi-year planning effort to establish the service concept and necessary capital projects to operate that service.
3. **Project Development**: If FRA accepts the SDP, the sponsor will coordinate with FRA to complete preliminary engineering and environmental review for capital projects and will provide a 20% match to FRA funding, as determined from the SDP in Step 2.

Caltrans is the sponsor for five CID Program corridors and in that role, manages the program administration, facilitates partner coordination and collaboration, creates and deploys standard tools and methodologies, develops and oversees technical analysis, and guides corridor service planning development in alignment with the State Rail Plan. This is necessarily a collaborative process and Caltrans will work with corridor partners to leverage their expertise to efficiently deliver an SDP. Caltrans is also working closely with other agencies responsible for CID plans, including the High-Speed Rail Authority, High Desert Corridor Joint Powers Agency, Nevada Department of Transportation and Amtrak.

The Northern California Megaregion

In the Northern California Megaregion, creating the network envisioned by the Rail Plan will require a combination of new infrastructure, existing infrastructure improvements, the bridging of key network gaps, and improved coordination of services across the system to provide the frequencies needed to meet growing demands and policy goals.

Solano County and the North Bay Area

Enhancing and expanding the passenger rail corridor between Novato and Solano County, along the highly congested State Route 37 (SR37), will generate significant economic benefits, including job creation and increased access to services and opportunities for residents and businesses. Many people who work in the North Bay cannot afford to live in Marin or Sonoma Counties and a reliable passenger rail alternative connecting the North Bay to Solano County, Sacramento, and the rest of the Bay Area will significantly expand economic benefits and opportunities. Additional planning is underway to explore opportunities to further expand connections to Vallejo and Napa, utilizing this east-west passenger rail corridor as a connection point.

Transbay Crossing

One critical priority for the State in Northern California is a second transbay crossing that supports an electrified, standard-gauge rail crossing, available for all rail service types. This is necessary to create a single, integrated corridor between major markets from Sacramento to Oakland, San Francisco, Silicon Valley, and San Jose. This high-quality corridor will connect several of California's largest cities, world-class universities, international airports, and identified priority populations (low-income and disadvantaged communities).

Historically, ridership demographics for regional rail skewed towards higher income riders when compared to the income of riders on local transit services, but this will change with the investments planned for the statewide network.[4, 5] Additionally, megaregions are densifying, and working hours and travel patterns are changing. Regional and intercity rail services are reacting to changes in ridership demographics and daily commute trends. The second transbay crossing infrastructure positions the passenger rail network to provide frequent, all-day, bi-directional service across the Northern California megaregion to better serve all Californians and all trip types, including multiple points of connection to the existing Bay Area Rapid Transit (BART) system.

Building on the work already begun by BART and the Capitol Corridor Joint Powers Authority (CCJPA), the State's commitment to continuing to develop this corridor with critical rail agency partners in the Bay Area and Northern California is unwavering. Extensive collaboration with CCJPA, Caltrain, Transit and Intercity Rail Capital Program and BART, along with other key stakeholders, will help the State present a unified emphasis on the transbay crossing in its strongest context and phase of corridor development. Additional federal support through the CID program leverages existing and future state project development resources. The CID program establishes a focused process for engaging partners and developing and delivering complex megaprojects, like the transbay crossing, within a broader corridor and megaregional context.

Leveraging Mega-Investments

Because of the networked effects of delivering rail projects, there are opportunities to leverage each investment to expand the benefits of all the investments. There are also opportunities to streamline planning and project development to ensure the full range of impacts and dependencies are accounted for between major projects in a corridor or megaregion. Finally, there are bottlenecks in the region that must be resolved for other megaprojects to realize their full benefits.

One example of expanding benefits is that the transbay crossing investment will increase ridership through the Portal (the former Downtown Rail Extension). The Portal is a multi-billion-dollar investment to bring Caltrain and high-speed rail service into the new STC in San Francisco's Financial District, a project that is on track to solidify its remaining funding and be constructed by 2034. This investment will be maximized by through-running trains across the Bay in the new transbay crossing, rather than using valuable time and space in the STC to turn trains at a terminal station. Through-running trains will attract more riders by connecting critical markets and result in better utilization of the facility. The transbay crossing project will be developed in its corridor-wide context to maximize the benefits.

One significant bottleneck in the megaregion today is the Carquinez Strait lift-bridge. Due to required deference to marine traffic, each bridge lift interrupts train traffic – both passenger and freight – for 20 minutes or more. Not only does this bottleneck create significant operational delays, but it precludes future service increases between Sacramento and the Bay Area. Coordinated planning is needed to determine the best strategy for replacing this bridge in alignment with the broader megaregional goals, including creating a unified corridor between San Jose, the Peninsula, San Francisco, the East Bay, across the Carquinez Straight and up to Sacramento and Roseville. There are opportunities to study how different bridge alignments could serve new markets and expand the benefits of this investment throughout more of the megaregion. The second transbay crossing and bridge replacement projects are two megaprojects that support corridor-wide improvements to deliver improved travel times,

4 https://www.pbssocal.org/history-society/from-bus-riders-union-to-bus-rapid-transit-race-class-and-transit-infrastructure-in-los-angeles

5 Manaugh, K., & El-Geneidy, A. (2012). Who benefits from new transportation infrastructure? Using accessibility measures to evaluate social equity in public transport provision. In Accessibility analysis and transport planning (pp. 211-227). Edward Elgar Publishing.

reliability, and comfort to travelers around the megaregion.

Western San Francisco

In addition to the direct benefits and new one-seat rides that a transbay crossing enables, the megaregional transbay crossing program will phase the implementation of projects to maximize cost-efficiencies and create opportunities to serve additional new markets, like Western San Francisco. The high-speed, intercity, and regional rail services provide the backbone for the longer distance travel market that can facilitate reliable, timed transfers to existing and new rail and transit services.

San Francisco's strategy to combat housing affordability and availability is to focus on expanding housing capacity along transit corridors, with a specific emphasis on the opportunities in Western San Francisco. Displacement concerns are reduced if the developments are spread out across entire transit corridors, while enhancing access to jobs and services with proximity to transit. By looking at rail enhancement and expansion to these same neighborhoods – either as high-quality connections to the state rail network at STC or via standard gauge rail in Western San Francisco – the region and the state will see significant ridership increases. There is significant opportunity to build affordable housing and thus capture that ridership market on the state rail network. The State is interested in working to ensure integration with the statewide rail network, so people in Western San Francisco have mobility choices that reach far beyond San Francisco.

Sea Level Rise

Sea level rise poses a significant risk to the Martinez Subdivision—the railroad corridor that hosts the freight and passenger rail operations between Sacramento and Oakland along the San Francisco and San Pablo Bays. This necessitates a strategic review of the corridor, and the way passenger service is provided between Sacramento and the Bay Area. As the region faces the impacts of climate change, it's crucial to reassess and adapt the infrastructure to ensure reliable and sustainable rail service. This includes evaluating corridor-hardening improvements, realignment of the tracks and other strategies to best protect the Martinez Subdivision from rising sea levels while maintaining and enhancing the connectivity between these vital regions.

Sacramento and San Joaquin Valleys

The State is already hard at work with its partners to provide enhanced rail service between Sacramento, the Bay Area, and the Central Valley, integrated with high-speed rail. Capital projects that enable increased service frequencies have mostly completed their environmental clearance, with some segments entering construction. New stations are planned in the Central Valley, which will be served by seven new daily round trips. When added to the existing service, most of the corridor will see hourly service split between coordinated regional and intercity rail in the early 2030s. This enhanced rail service will serve over 30% of the disadvantaged communities in California.

By the long-term time horizon, the Sacramento-Stockton-Merced corridor will be electrified and high-speed trains will be able to continue to Sacramento. The service increases in the near- and mid-term build the market and associated ridership and revenue for the large investments required to achieve full electrification to Sacramento.

Major projects in the Central Valley are key to unlocking increased service are anticipated to begin construction in fiscal year 2024/2025. These projects include:

- The Stockton Diamond Grade Separation Project, which will alleviate the most congested rail bottleneck in California. This will be done by grade separating the tracks from the Union Pacific Fresno Subdivision over the tracks from the BNSF Stockton Subdivision, removing the existing at-grade railroad intersection.
- New stations, including stations in the cities of Oakley, Madera, Ceres, and Modesto.
- Track improvements, including additional crossovers and siding tracks to increase capacity of the network.

- Track improvements for new and expanded passenger rail services along both the BNSF and Union Pacific rail lines.

Connections in Merced

Getting the most value out of the Central Valley Segment (CVS) of high-speed rail from Merced to Bakersfield will require convenient and efficient connections to rail services that can expand the reach of the 171 miles of high-speed rail service in the Central Valley. Merced will be the northernmost place where intercity rail and high-speed rail networks interface upon completion of the CVS. This makes Merced the key location to prioritize network improvements to maximize the benefits of high-speed rail. Merced will continue to be a long-term access-point to the statewide rail network for northern Fresno and Madera counties as well as foothill communities. It is also an operationally efficient transfer point between high-speed trains on the Sacramento and Bay Area legs of the statewide high-speed rail system in the long term.

The Merced Intermodal Track Connection (MITC) re-routes the San Joaquins intercity rail service from its current Merced to the new high-speed, intercity, and regional rail station in downtown Merced.[6] This co-located and intuitively designed Merced station will offer cross-platform transfers between high-speed and intercity service, providing connections from the five Central Valley high-speed rail Stations to up to 22 additional intercity-rail stations and five additional regional rail stations throughout the Northern San Joaquin Valley and the Northern California Megaregion. Through improved connections at Merced, regional, intercity, and high-speed services will benefit from increased destinations and increased demand.

In addition to the connectivity between intercity, regional, and high-speed service at Merced, the Madera High-Speed Rail Station Project will also allow for a cross-platform transfer opportunity between these services. The project includes relocating the existing intercity rail station near a primary transit corridor for Madera County and will support transit-oriented development. The project recently received $54 million from the United States Department of Transportation (USDOT) National Infrastructure Project Assistance Program (MEGA).

Southern California

Southern California's rail infrastructure network is undergoing significant upgrades to meet the growing demands for passenger and freight services. Key projects include improvements at LAUS, the introduction of high-speed rail service between Las Vegas and Rancho Cucamonga, major extensions of LA Metro rail service, the expansion of more frequent regional rail services, and crucial freight rail enhancements. These investments reflect a comprehensive vision for a connected, efficient, and high-capacity rail network, ensuring that Southern California remains a central hub for rail travel while improving travel connections to neighboring regions and alleviating congestion on roads and highways.

Los Angeles Union Station Improvements

The LAUS station improvement project, known as LinkUS, will improve rail operations and the passenger experience. Investments include the conversion of most of the station's stub-end tracks to run-through tracks, as well as reconfiguration of BNSF's Malabar Yard to avoid conflict between more frequent passenger and freight operations. The project will improve operational efficiency, allow faster trip times, and enhance passenger experience with increased retail and updates to passenger amenities. The proposed changes are expected to decrease dwell times from 20 minutes to 5 minutes and increase the station's rail service

6 https://sjjpa.com/mitc/

capacity by more than 50%. This project is vital to the future of rail in Southern California.

Phase A of the project, which focuses providing initial through-running service, is expected to be completed in 2033.

LA Metro Improvements

Leveraging successful local ballot measures and state support, LA Metro has continued to deliver ambitious metro and light rail service expansion programs. Major improvements in the near-term will build on LA Metro's success in delivering the Regional Connector in 2023, vastly enhancing regional accessibility by connecting four light rail routes through Downtown LA via a consolidated rail tunnel with three new stations. The projects provide essential connectivity at LAUS and other key rail stations around the region, allowing for reliable, auto-competitive trips to be made to many more destinations in Southern California.

Antelope Valley Investments

Metrolink and LA Metro are overseeing four key capital improvements to the Antelope Valley line, providing 30-minute service from Los Angeles to Santa Clarita and hourly service to Lancaster. These improvements include signaling improvements, double track extension in Los Angeles, a siding extension in Santa Clarita, and improvements to the Lancaster Terminal. This project allows for improved service, frequency and reliability in the corridor, and enables a one-seat ride from the Antelope Valley Line to San Diego on intercity trains.

Las Vegas to Rancho Cucamonga High-Speed Rail Corridor – Brightline West

High-speed rail service between Las Vegas and Rancho Cucamonga represents the first electrified high-speed rail service in Southern California. The train will traverse the Cajon Pass and largely follow Interstate 15, with planned stations in Hesperia and Victor Valley. The Rancho Cucamonga station will be integrated with existing Metrolink service (San Bernardino Line), providing rail connections to LAUS, the Inland Empire, and San Gabriel Valley. Funded with a mix of private investment, private activity bonds, and a $3 billion FSP grant from the FRA, the high-speed rail line expects to begin revenue service in 2028.

In addition to being a significant component of the 2050 vision, the Las Vegas project is a useful example for future projects. Attracting private investment reduces the total amount the State and federal government need to invest to realize their goals. Furthermore, the project takes advantage of existing corridors outside of urban areas, utilizing the median of Interstate 15. This further reduces costs and construction time. The State will take advantage of similar existing infrastructure corridors as it continues to invest in expanding the state rail network.

Burbank to Anaheim Rail Corridor

The Burbank to Anaheim Rail Corridor represents another transformative series of projects for Southern California, as part of the state's broader network. This segment is critical for connecting the state's northern and southern regions through one of the most dense corridors in the state, with future high-speed rail service, as well as significant increases in regional and intercity rail services.

This corridor will require significant upgrades, including new tracks, freight facilities, grade separations, and station improvements along the existing alignment to support existing operations accommodate future high-speed rail service, with significant separation of freight and passenger operations along adjacent tracks within the same corridor. The project will improve travel times and capacity for passenger and freight services.

Redlands Rail

The Redlands Passenger Rail Project (Arrow) is an innovative regional service that extends rail connections from San Bernardino to Redlands, offering direct links to the Metrolink network.

This 9-mile project, which integrates new Diesel Multiple Unit trains with existing Metrolink services, provides faster, more frequent transit options. A new Zero-Emission Multiple Unit train will be introduced in this corridor in 2025, providing regular hydrogen battery-electric rail operations for the first time in North America.

Coachella Valley-San Gorgonio Rail Corridor

The Coachella Valley-San Gorgonio Rail Corridor is a proposed 144-mile regional rail service that will connect Los Angeles to the Coachella Valley, including Palm Springs and other key destinations

along the route. This corridor will provide vital intercity rail service to a fast-growing part of Southern California that currently lacks sufficient public transportation options.

The project has received state and federal support, including funding for planning and environmental studies. Once completed, the Coachella Valley service will provide an alternative to the heavily congested Interstate 10 and offer sustainable transit options to both residents and tourists.

Los Angeles - San Diego Corridor

The Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency JPA operates on one of the busiest intercity rail corridors in the nation. Stretching along the Pacific Coast, it connects key population centers and serves both Amtrak's Pacific Surfliner and Metrolink trains.

Notable projects include track enhancements between San Diego and Los Angeles, safety upgrades, and the stabilization of the tracks along the Del Mar Bluffs to prevent erosion and ensure long-term sustainability.

Recent challenges for the corridor have been severe in the San Clemente area. The coastal bluffs along the route have become increasingly unstable due to ongoing erosion, rising sea levels, and more frequent severe weather events. These conditions have led to extended service disruptions, including temporary suspensions, as the threat of landslides and track instability has grown. These recurring issues highlight the urgent need for a comprehensive solution to secure the future of this essential transportation link. State, federal and local agencies have recently provided full funding for the short-term stabilization projects necessary near San Clemente. A state-led study considering long-term realignment solutions is beginning in 2024, working in close coordination with regional partners.

Southern California Rail Corridor Expansion

The State is also continuing long-term planning for high-speed rail service expansion throughout Southern California with speeds up to 110 mph. These corridor segments will provide frequent, fast service between Los Angeles and the Inland Empire including a multi-state connection to Phoenix. Other high-speed rail connections include Rancho Cucamonga to San Diego and on the High Desert Corridor between Palmdale and Victor Valley to integrate service to Las Vegas. Frequent high-speed service will connect Los Angeles to the Central Valley via Palmdale and Bakersfield.

Pacific Surfliner on layover at Santa Fe Depot in San Diego.

The State's Role

Taken together, these megaprojects are critically important for upgrading the current infrastructure, improving reliability, and expanding rail service to new markets. They are significant investments that require strategic alignment with state policies and funding priorities. Caltrans and CalSTA will continue to collaborate with the rail partners in the state to ensure redundancies are avoided and expertise and resources are utilized efficiently. The State is well-positioned to lead megaproject and megaregional planning that requires coordination between more than one megaproject that often have phasing dependencies that extend across jurisdictional boundaries. The CID Program establishes a partnership and framework with the federal government to further support sustained and coordinated planning between all partners within key corridors and megaregions. The State's leadership, alongside the expertise and partnership from regional stakeholders will allow the projects to be planned together in this larger megaregional context and will ensure an appropriately phased implementation and funding plan that delivers as many interim benefits as possible. By organizing these projects under the State's leadership and completing planning and project development through the CID program, the projects within the northern and southern California megaregions will advance as a coordinated program of projects with close coordination and collaboration between the policy, funding, operating, and regulatory partners.

Statewide Maintenance Facility Coordination

The State and its rail partners have identified key locations in San Luis Obispo and San Diego County for new maintenance facilities to help regional and intercity operations. Additionally, the Stockton Maintenance Facility has expanded its capacity and importance to statewide maintenance needs. As new corridors develop and intensify so will maintenance needs. Caltrans will build off the existing work and coordinate a Statewide Maintenance Facility plan to accommodate expansion and integration of passenger rail services under the Rail Plan. The Statewide Maintenance Facility Plan will evaluate opportunities to develop maintenance facilities for intercity use or co-located facilities with other rail agencies and identify potential efficiencies and distributions of special maintenance and fueling/charging capacities across the state. The Statewide Maintenance Facility Plan will help realize efficiencies related to co-location, equipment purchase, parts pooling, labor, and the location of special maintenance capabilities.

Southwest Multi-State Planning

The Southwest Multi-State Rail Planning Study was a 2014 rail planning effort led by the FRA. The study is part of a national effort to develop high-performance interstate passenger rail networks through a common preliminary technical vision and strategic planning at the multi-state and megaregional level.

The study identifies major corridors and institutional challenges and opportunities in California, and interstate connections between Sacramento and Reno, Los Angeles, Las Vegas and Phoenix. The vision also leverages lessons learned from the study; specifically, incorporating a multimodal perspective and recognizing the importance of federal involvement in multi-state planning.

The State has identified the corridor from Los Angeles to Phoenix as a candidate for investment and the study supports high-speed rail for this corridor, in part, because the distance is in the ideal range for competitive air travel times. Additionally, the travel demand for Phoenix to Southern California travel is very strong.

To support this expansion, Coachella Vally Rail Corridor will provide service along approximately 144 miles from a western terminus at LAUS to an eastern terminus in the City of Coachella.

Coordination for Arizona

The State is committed to extending the integrated network to Arizona and will continue to pursue recommendations from the Southwest Multi-State Rail Planning Study. Specifically, policy

support will continue for a Blue-Ribbon Panel to organize relevant stakeholders in the service planning process for interstate rail service.

2.6. NETWORK IMPLEMENTATION

Near-term

The near-term horizon covers the next four years to 2028 and will encompass continued expansion and integration of existing regional and intercity passenger services with local transit networks and an emerging statewide bus network. The Caltrans priority to implement the vision over the coming decades informs downstream planning by supporting delivery of projects already funded and committed for revenue service by 2028. The near- and mid-term capital program build toward the 2050 goals. This provides technical and resource support to partner agencies to support implementation planning, and to lead long-term strategic planning exercises.

Network Development Highlights

The near-term horizon will see several significant expansions and improvements to the network. Caltrain electrification is complete and has decarbonized and modernized the Peninsula Corridor, while allowing for trip-time improvements on local services and increased frequency. Delivery of Caltrain electrification is also a crucial building block for introduction of high-speed service in the long-term.

In Northern California, further expansion of the Sonoma Marin Area Rail Transit (SMART) service in Sonoma County will connect customers as far north as Healdsburg in the near-term. Service expansion from San Jose to Salinas will provide three round trips and enhanced connectivity to the Central Coast.

Statewide bus connections will be strengthened to provide coordinated access to markets identified for future rail expansion and to rural communities.

In Southern California, regional and intercity service providers Metrolink, LOSSAN, and the North County Transpiration District (NCTD) are working to rationalize schedules and increase service in a post-Covid travel environment where traditional peak-period commuter trips are a smaller share of the market and all-day service is critical to retaining and expanding ridership. In LA County, Metro will continue to deliver segments of the Measure M funded network with new connections to West LA as the D-Line (former Purple Line) is extended to Beverly Hills and LAX is directly connected to the network via the LAX people-mover and K-Line (former Crenshaw Line).

Caltrans will continue to support regional operators Metrolink, LOSSAN, and NCTD in pursuit of integrated service planning to provide regular, all-day, bi-directional service on the region's corridors consistent with strategic planning efforts supported by the State. By coordinating service and ticketing, introducing modernized rolling stock and operational practices, and strategically investing in infrastructure to increase capacity and improve trip times, Southern California will continue to see expansions and improvement to the megaregion's passenger rail network. Increased frequencies in the core of the network, particularly in and around Los Angeles County, and further build-out of local transit networks will increase rail's competitiveness against other modes.

The 2028 Olympics is critical test-case for the rail network's ability to efficiently respond to an influx of demand with efficiency and capacity required to move large numbers of event attendees around the region while maintaining high-quality service for regular passenger rail customers. Caltrans will support local and regional partners in the planning and delivery of passenger service, freight coordination, and other support for the 2028 Olympics.

Finally, new fleet will be brought into revenue service throughout the statewide network, reducing GHG emissions and improving the passenger experience. The full deployment of new single-level intercity equipment will be completed on the San Joaquins service. The nation's first hydrogen powered train will be deployed on the Arrow route, connecting San Bernardino and Redlands, and the first of Caltrans' new 4-car hydrogen trains will be put into service in the Central Valley and demonstrated on corridors throughout the state.

High-Speed Rail Programming Highlights

The Authority has environmentally cleared the Phase-1 system from San Francisco to Los Angeles and completed 100% of the design work for civil infrastructure for the Central Valley Segment.

Caltrans will continue to support implementation of the initial high-speed rail Central Valley Service planned from Bakersfield to Merced. Caltrans supports development of the Merced Intermodal Track Connection as well as transfer facilities in Madera.

Caltrans is committed to supporting regional services in the Sacramento and San Joaquin Valleys, which will be initiated between Ceres and Natomas, while intercity service levels are maintained. Central Valley intercity services will deploy additional round trips to serve connections to Merced from Oakland and Sacramento.

Caltrans will also support broader mobilization activities as the San Joaquin JPA approaches initiation of revenue service that integrates high-speed, intercity and regional operations.

High-speed rail service between Rancho Cucamonga and Las Vegas is expected to begin in 2028. The 218-mile high-speed passenger rail system will connect Las Vegas to Los Angeles's regional and intercity rail system.

Planning Goals

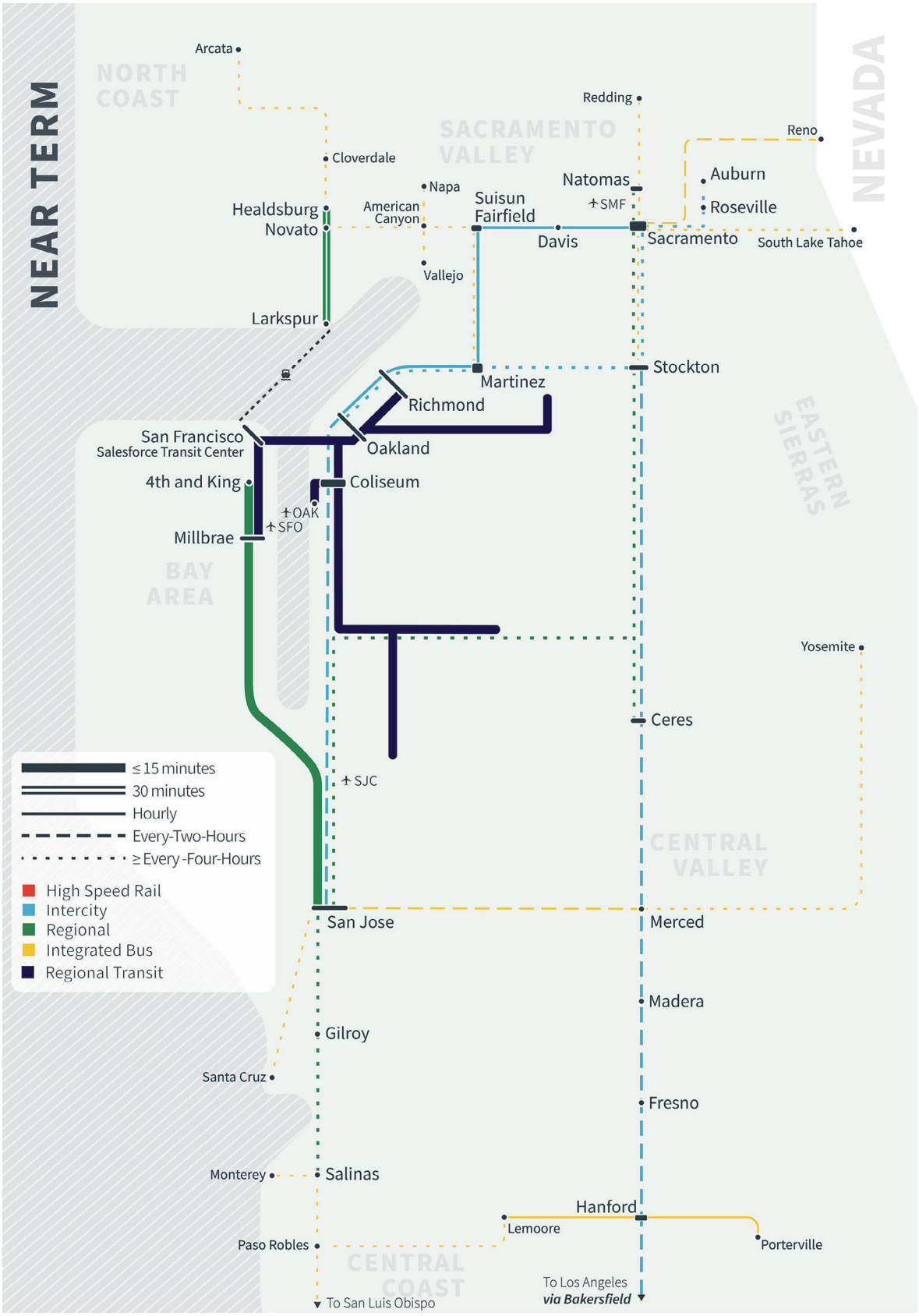
Over the next several years, Caltrans is committed to working with operating agencies across the state to implement Caltrans' Service-Led Strategic Planning Methodology. Caltrans' Division of Rail will take several steps to facilitate this process, including:

- Deploying accessible databases of the current and future infrastructure, current and future operating plans, and travel demand analysis to inform strategic planning with a single-source-of-truth, accessible to partners across the state and regularly updated;
- Providing staff support (coordination, technical analysis, facilitation) and technical resources (software licenses, funding) to support application of the Service-Led Strategic Planning Methodology; and
- Providing staff training in application of the Service-Led Strategic Planning Methodology.

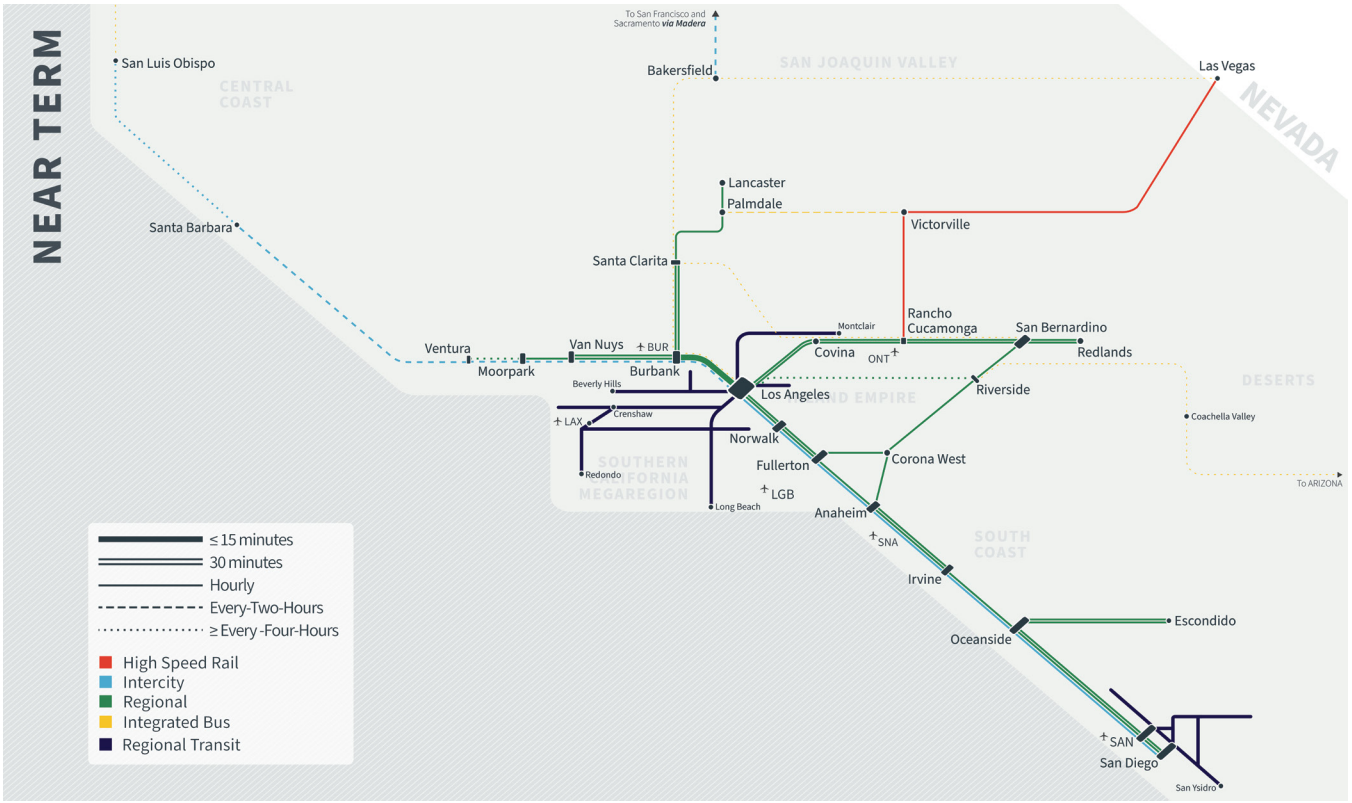
Sea Level Rise

As sea level rise is no longer theoretical, several critical corridors in the State's rail network are under significant threat – and likely to be unusable by mid-century. Most immediately, the Orange Subdivision, connecting the route between Los Angeles and San Diego along the Pacific Coast in San Clemente has become increasingly unreliable as erosion and rising tides have closed the corridor for Metrolink, LOSSAN, and BNSF on several occasions in recent years. This results in a lack of reliability in the rail network which necessitates reduced service and longer trip times, including sporadic bus bridges. In turn, these factors, brought on by low reliability, contribute to reduced ridership. Caltrans will work with local agencies to continue studying resiliency in the corridor. Importantly, Caltrans will coordinate with host freight railroads to identify coordinated resiliency efforts and implement a long-term solution that provides consistent passenger and freight access for the next century and beyond.

Additional corridors, like the Martinez Subdivision by San Pablo Bay, the Coast Subdivision's crossing of the Alviso Wetlands (north of San Jose), Elkhorn Slough, and segments of the Santa Barbara Subdivision are at risk and some will be expected to carry increased passenger service in the future. Caltrans will continue to work with stakeholders to categorize the risk, timelines, and potential solutions for protecting corridors required for future service expansion and the realization of the State's service planning goals.



Near Term Northern California Service Map.



Near Term Southern California Service Map.

Zero-Emissions Implementation

Building from Governor Newsom's leadership in setting ambitious goals for decarbonizing the State's fleet in the next decade, Caltrans has assumed a strategic leadership role working with passenger agencies, freight operators, and equipment manufacturers to transition the State's current equipment fleet and future procurement to zero-emission technology. The San Bernardino County Transportation Authority (SBCTA) and Metrolink expect to take delivery of the nation's first hydrogen powered trainset in the coming years and will expand that fleet to serve regional and intercity markets throughout the state.

Mid-Term

The mid-term horizon covers the ensuing five years to 2034 and includes initiation of high-speed rail service between Bakersfield and Merced with additional enhancements in the northern Central Valley to connect the state network to the high-speed corridor. Caltrans is focusing on supporting project planning and funding strategy for projects expected to be delivered in the early 2030s, implementation planning for future operating concepts, and providing technical or resource support to partner agencies to support long-term strategic planning exercises.

Network Development Highlights

In Northern California, the San Joaquins will connect to high-speed rail in Merced and additional regional service will further enhance high-speed rail connections in the Central Valley. This will connect Merced to Oakland and Sacramento (Natomas). Bus services in the Central Valley and elsewhere will be reoriented to serve as feeder services to intercity rail, making regular timed connections.

Continued build-out of projects on the Peninsula will increase capacity for electrified Caltrain service and prepare for the introduction of high-speed rail, including Caltrain service extension to STC. BART's expansion to San Jose will provide frequent and competitive service for East Bay trips with connectivity to intercity services.

Sacramento, CA. Trains at Sacramento Valley Station at sunset. Editorial Credit: image Allan / Shutterstock.com

SMART will extend to Cloverdale with improved bus connections to the North Coast.

On the Central Coast, service frequency will double between San Jose to Salinas.

In Southern California, a combination of regional and intercity rail services will offer a minimum of hourly all-day coordinated service from Moorpark to Redlands and from Lancaster to San Diego Convention Center. Half-hourly service will be available closer to the urban cores in Southern California. Hourly intercity service will be available between San Diego and Los Angeles, with bi-hourly service north to Santa Barbara, and every-four-hour intercity service to San Luis Obispo.

High-Speed Rail Programming Highlights

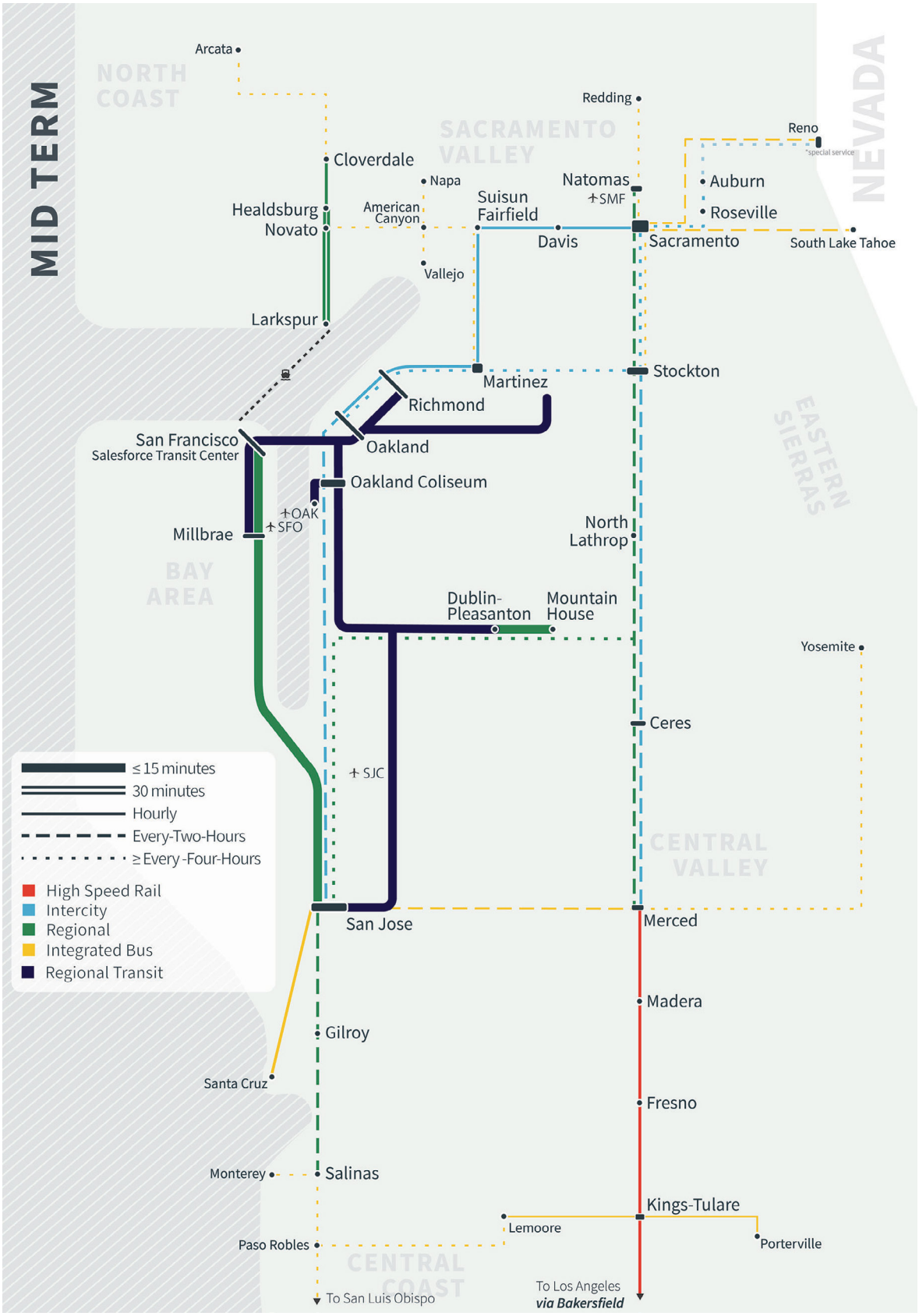
The mid-term will see initial high-speed service begin between Merced and Bakersfield, with regular hourly service connecting both cities and providing integrated connections to regional and intercity trains in Merced.

As this service is mobilized and initiated, the next phase of high-speed rail expansion will be well underway, advancing final design and right-of-way acquisition to complete the corridor to Gilroy and San Francisco, via San Jose, and the corridor between Bakersfield and Anaheim, via Los Angeles.

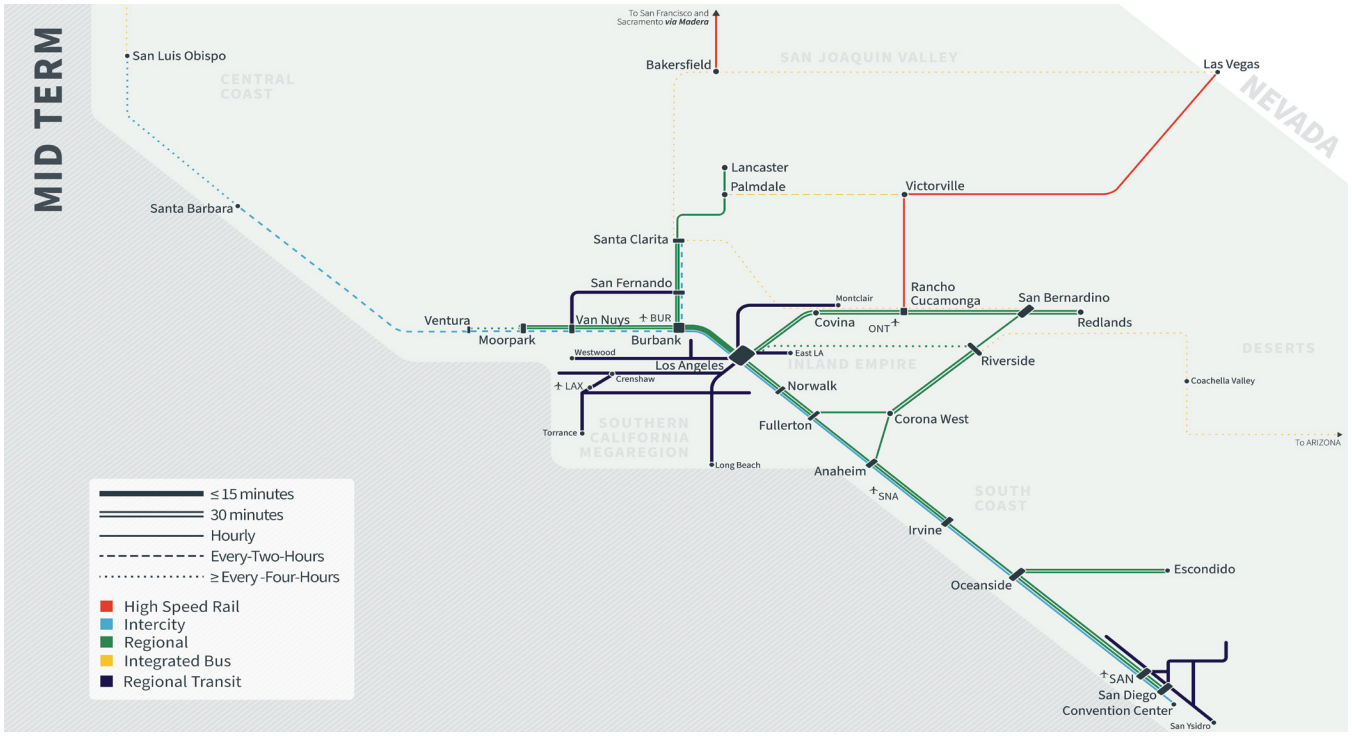
Planning Goals

For the mid-term, Caltrans will be focused on implementation planning for services expected to be operational over the next decade. These include planned service expansions and improvements on the conventional regional and intercity service corridors, and integration between services, including high-speed rail.

Caltrans will coordinate across partners to integrate planning processes and technical analysis with digital tools, accessible databases, and frequent, iterative engagements to define and refine operational, equipment, and infrastructure needs.



Mid Term Northern California Service Map.



Mid Term Southern California Service Map.

Long-Term

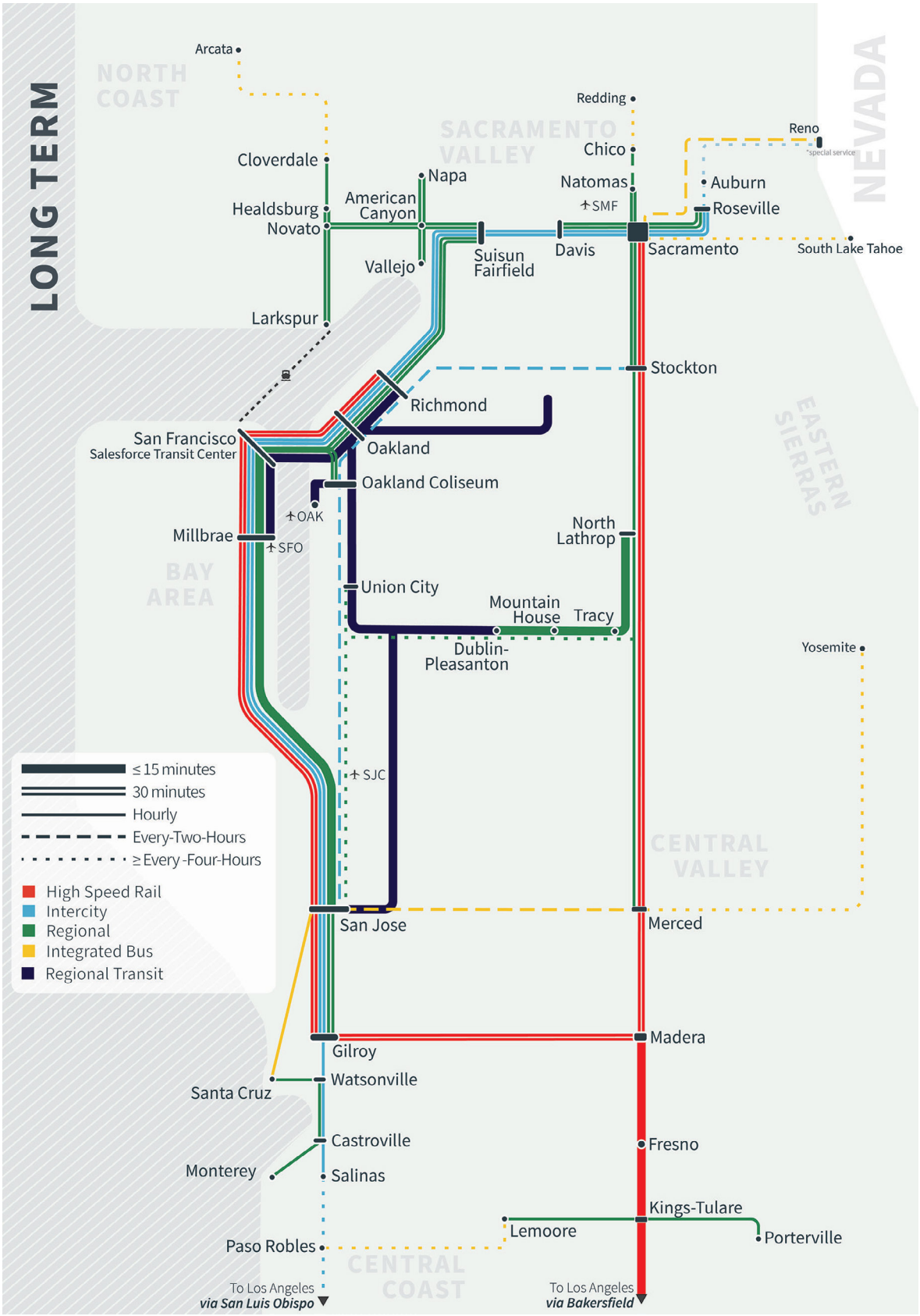
In the long-term, Caltrans' key priorities include the full build out of California's high-speed rail system, as well as new high-speed rail service to Arizona. The resulting high-speed network connecting Sacramento to San Francisco to Fresno to Los Angeles to the Inland Empire and finally to San Diego will be the backbone of a world-class, fully integrated, zero-emission rail network providing access and mobility to all Californians. Active transportation and local transit will connect with regional services and the statewide network. As has been proven throughout the world, modern rail networks are a critical tool in reducing VMT and GHG emissions, improving public safety, and environmental and equity goals. A fully integrated network will create a shift in common travel modes from the state's highway networks to its rail network, reducing the need for future highway expansion.

Network Development Highlights

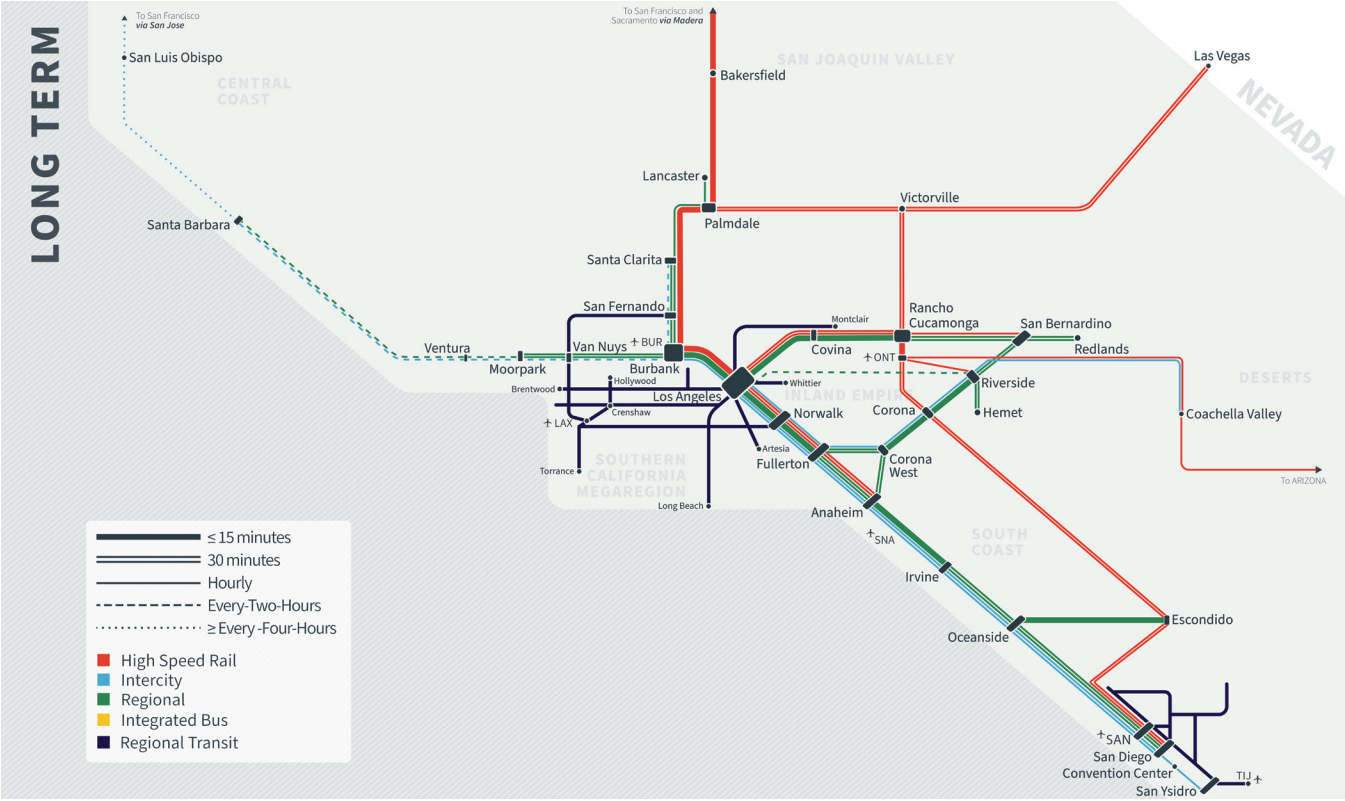
Key priorities in the long-term include delivery of full statewide high-speed rail service.

The build-out of regional service in the Sacramento region will include half-hourly service to Roseville and new service to Chico. A second transbay crossing will allow for through-running trains from Sacramento to San Jose and beyond, via the Peninsula, linking some of the most economically productive markets in the world on a single modern rail corridor.

The Central Coast corridor will extend all-day intercity service between San Jose and San Luis Obispo, via Salinas with connections to a regional rail network connecting Santa Cruz and Monterey. From San Luis Obispo, every-four-hour intercity services will connect to Santa Barbara and combined half-hourly regional and intercity services will run between Santa Barbara and Los Angeles.



Long Term Northern California Service Map.



Long Term Southern California Service Map.

In the Central Valley, new cross-valley rail connections between Lemoore and Porterville will provide regional connectivity to the high-speed rail network at Kings-Tulare Station. Regular high-speed services to the San Francisco Bay Area, Sacramento Valley, Las Vegas, and Southern California will place the Central Valley at the heart of one of the strongest modern rail networks and strongest economies in the world. Increased regional service, building on increased frequencies in the northern Central Valley, will improve regional connectivity integrated bus services.

In Southern California, full build out of the high-speed network will align with regional and intercity improvements to provide an additional layer of high-speed service to modern regional and intercity service corridors connecting San Bernardino and Riverside Counties to both Los Angeles and San Diego. This includes half-hourly regional service from Moorpark to the San Diego Convention Center and to Redlands. All-day half-hourly intercity service will be available from LAUS to the San Diego Convention Center. Interstate connections include Las Vegas and Phoenix that will be connected to the California high-speed rail network, including use of the High Desert Corridor to shorten trip times from San Diego to Northern California, and from the Central Valley to Las Vegas.

Table 1: Service Tables

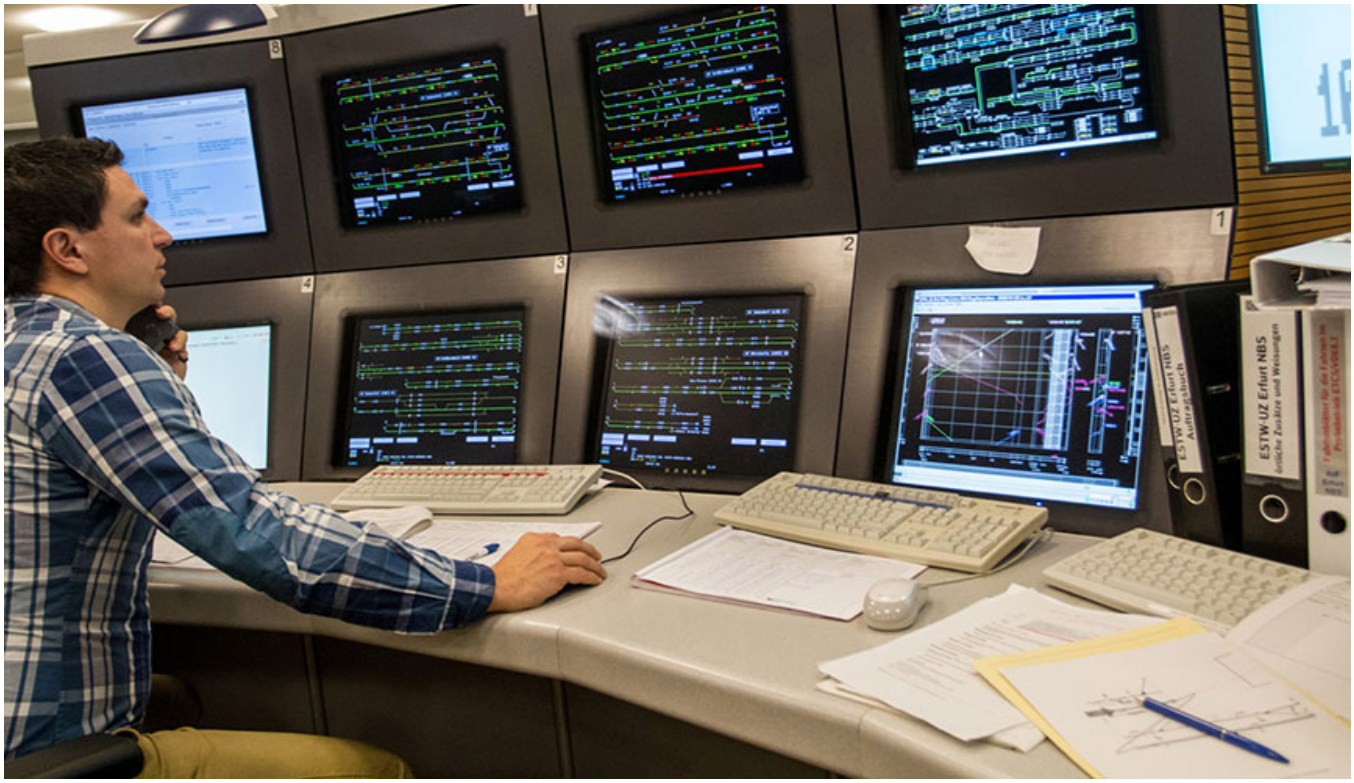
Node	Node	Near-Term	Mid-Term	Long-Term
Arcata	Cloverdale	Integrated bus service between Arcata and Healdsburg, connecting to regional trains in Healdsburg	Integrated bus service between Arcata and Cloverdale, connecting to regional trains in Cloverdale	
Cloverdale	Larkspur	Half-hourly regional service between Healdsburg and Larkspur	Half-hourly regional service between Healdsburg and Larkspur with hourly service extending to Cloverdale	
Marin/Sonoma	Solano / Napa	Integrated bus connections between Marin/Sonoma Counties Napa/Vallejo, connecting to intercity rail at Martinez and Suisun-Fairfield		At least hourly regional service connecting Marin/Sonoma/Napa/Vallejo to intercity service at Suisun-Fairfield
Redding	Sacramento	Integrated bus service between Redding and Sacramento with timed transfers to intercity trains in Sacramento		Every-two-hour regional service between Chico and Sacramento, with integrated bus connections to Redding
Reno, NV	Sacramento	• One daily intercity round trip between Sacramento and Auburn • Integrated bus service between Reno, NV and Sacramento along the I-80 corridor	• Every-four-hour intercity rail service between Roseville and Sacramento with one daily train extending to Auburn • Integrated bus service between Reno, NV and Sacramento along the I-80 corridor	• Hal-hourly intercity rail service between Roseville and Sacramento with one daily train extending to Auburn • Regional half-hourly service between Davis and Roseville Integrated bus service between Reno, NV and Sacramento along the I-80 corridor
South Lake Tahoe	Sacramento	Integrated bus service between South Lake Tahoe and Sacramento		
Sacramento	Oakland	Hourly intercity service between Sacramento and Oakland		Half-hourly intercity rail service between Sacramento and Oakland, continuing to San Jose via San Francisco
Oakland	San Jose	Every two-hour intercity service between Oakland and San Jose (via East Bay)		• Every two-hour intercity service between Oakland and San Jose (via East Bay) • Half hourly regional service between the Peninsula and Oakland Coliseum
San Francisco	San Jose	Highly frequent electrified regional service between San Francisco and San Jose		High-speed, intercity, and regional service between San Francisco and Gilroy via San Jose
San Jose	Gilroy	Limited regional service between San Jose and Gilroy		
Gilroy	San Luis Obispo	• Limited regional/intercity service between San Jose and Salinas, via Gilroy • Integrated bus connections to Santa Cruz, Monterey, and San Luis Obispo		• Hourly intercity service between Gilroy and Salinas, extending as every-four-hour service to/from San Luis Obispo • Hourly regional service to Santa Cruz and Monterey
Stockton	San Jose	Frequency increase of existing ACE commuter sevice as market demand dictates		• Bi-hourly regional service with additional peak overlay between Stockton and San Jose/Union City
North Lathrop	Tri-Valley Hub	NA	Highly frequent regional service between Dublin/Pleasanton and Mountain House.	Highly frequent regional service between Dublin/Pleasanton and North Lathrop
Sacramento	Merced	Frequency increase of existing San Joaquin intercity sevice, continuing to Bakersfield	Coordinated regional and intercity service between Sacramento and Merced resulting in hourly service via Stockton and connecting to high-speed rail at Merced	Half-hourly high-speed rail and hourly regional service between Sacramento and Merced
Oakland	Merced	Five round trips		
Lemoore	Porterville	Integrated bus service between Porterville and Lemoore, continuing to Paso Robles with connection to intercity rail at Hanford.	Integrated bus service between Porterville and Lemoore, continuing to Paso Robles with connection to high-speed rail at Kings-Tulare	• Hourly regional service between Porterville and Lemoore with connection to high-speed rail at Kings-Tulare • Integrated bus connection between Lemoore and Paso Robles

Node	Node	Near-Term	Mid-Term	Long-Term
San Francisco / HSR	Anaheim / HSR	NA	Hourly service between Bakersfield and Merced, connecting to intercity buses and intercity rail connections at Merced and Bakersfield	Full Phase 1 HSR
Las Vegas	Rancho Cucamonga	• Hourly high-speed rail service between Las Vegas and Rancho Cucamonga, via Victorville, connecting to regional service at Rancho Cucamonga • Integrated bus connections between Victorville and Palmdale.		Half-hourly high-speed rail service between Las Vegas and Rancho Cucamonga not to preclude through running to Los Angeles and other destinations
Lancaster	Los Angeles	Hourly regional service between Lancaster and Los Angeles, increasing to half-hourly south of Santa Clarita with a bi-hourly intercity train south of Santa Clarita		
San Luis Obispo	Los Angeles	• Every-four-hour intercity service between San Luis Obispo and Santa Barbara, increasing to bi-hourly intercity service between Santa Barbara and Los Angeles • Limited regional service between Ventura and Van Nuys, increasing to half-hourly between Van Nuys and Los Angeles		• Every-four-hour intercity service between San Luis Obispo and Santa Barbara , increasing to coordinated hourly regional and intercity service between Santa Barbara and Los Angeles • Half-hourly regional services between Van Nuys and Los Angeles
Los Angeles	San Diego	• Hourly intercity service between Los Angeles and San Diego • Half-hourly regional service between San Diego with service on to Escondido		• Half-hourly intercity service between Los Angeles and San Diego • Half-hourly regional service between Los Angeles and Irvine • Half-hourly intercity and regional service between Oceanside and San Diego • Highly frequent regional service between Oceanside and Escondido • Hourly intercity service and highly frequent regional transit service between San Diego and San Ysidro/Tijuana
Los Angeles	Riverside	Bi-hourly regional service between Los Angeles and Riverside	Hourly regional service between Los Angeles and Riverside	Coordinated half-hourly regional and blended high-speed service between Los Angeles and Riverside
High Desert Corridor		NA		Half-hourly high speed service connecting Las Vegas via the California high-speed network
Arizona	Los Angeles	Integrated bus and regional rail services between Coachella Valley and Los Angeles		• Hourly high-speed service between Arizona and Los Angeles, connecting in Rancho Cucamonga • Regional overlay serving the Coachella Valley
San Bernardino	Los Angeles	Half-hourly regional service between San Bernardino and Los Angeles		• Half-hourly high-speed rail service between Los Angeles and Rancho Cucamonga, hourly to San Bernardino • Half-hourly regional service between Los Angeles and San Bernardino
Inland Empire HSR		NA		Half-hourly blended high speed service between Los Angeles, San Bernardino, and Riverside, via Rancho Cucamonga, with through service to Las Vegas, San Diego, and other destinations
San Diego HSR		NA		Half-hourly blended high-speed service between San Diego, Las Vegas and Los Angeles, via Rancho Cucamonga, with connections to San Bernardino, Riverside and other destinations

Chapter 3: California's Freight Network

Freight rail connects industries and markets in California to national and global economies. Since its development in the 19th century, the network has evolved to the changing needs of what is now the United States' largest state economy. Responsible for goods movement and the state's economic competitiveness, the network largely operates on privately owned infrastructure with passenger service sharing the same tracks.

Wind turbine equipment being shipped along a California coastal rail line.



Operations Control Center - computer work station for the ETCS-route. Source: Deutsche Bahn AG / Kai Michael Neuhold.

Ground transportation, shipping, and logistics contribute more than $50 billion dollars a year to California's state economy.[7] Caltrans' strategic goal is to ensure that the state's freight network is efficient, environmentally friendly, and equitable. As in many cases, the most efficient mode to transport freight is rail, and because of this, Caltrans encourages mode shift from over-the-road trucking to the rail system. Shifting freight to rail also frees up additional capacity at airports and on highways, which reduces congestion on those existing facilities and improves the movement of both goods and people. The rail network is well-connected to the state's harbors and can expedite freight away from the harbor to appropriate, efficient sorting locations. Caltrans will support freight projects that work towards achieving this goal because it reduces maintenance costs on state highways and is more environmentally friendly. Since California's ports are surrounded by major population centers, efficiently moving freight to sorting locations can also reduce impacts on communities that have been affected by goods movement. Goods movement, whether by train or truck, can impact the health of communities through accidents, constriction of neighborhood circulation, and pollution from idling diesel engines. In places where rail is the best mode for transporting freight away from harbors, Caltrans will support projects that minimize these community impacts.

On-dock rail projects load containers directly from ships to trains and assemble trains with containers destined for a single location on the dock.[8] This allows more of the cargo from an arriving ship to be immediately exported

7 Bureau of Economic Analysis, US Department of Commerce
8 Description of the on-dock facility under development at the Port of Long Beach: https://polb.com/port-info/projects/#pier-b-on-dock-support-facility

The BNSF Hobart Yard in Commerce, CA

from California by long-distance freight trains without needing to be trucked around the region before it is assembled into a long-distance train. The CalSTA Port Freight Infrastructure Program (PFIP), the California Transportation Commission Trade Corridor Enhancement Program (TCEP) and various federal programs have made significant investments in the Port of Long Beach Pier B On Dock Rail Project, which will triple the volume of on-dock rail the Port can handle.[9]

Near-dock rail projects still involve drayage trucking trips to move cargo from ship to rail, but those trips are much shorter and stay within the greater port industrial area, avoiding impacts on additional communities.[10] Where clean improvements of near dock facilities can be made that increase capacity and mitigate community impacts, these improvements are critical to ensuring a greater rail mode share for goods movement.

While immediately sending trains from the port to far-flung locations like the Chicago area is desirable, containers destined for smaller final destinations create a storage space problem at the ports, where not enough of those containers are available at one time to rapidly assemble a whole two-mile-long train, so the containers must sit near the dock until there are enough to assemble a train.

The Barstow International Gateway is the first facility of its kind to be developed by a Class I railroad. The facility will provide the space to sort the containers that arrive on ships within 130 miles of the port. Instead of requiring many truck trips to move the containers to this location, the containers will be expeditiously loaded onto trains regardless of their final destination. Organization of the containers and their contents will take place at a new facility near the location of the long-time classification yard in the Barstow-area desert.[11]

9 https://polb.com/download/388/pier-b/7526/pier-b-on-dock-rail-support-facility-fact-sheet-07-24.pdf
10 A summary of on-dock and near-dock facilities connected to the Port of Los Angeles: https://www.portoflosangeles.org/business/supply-chain/rail
11 Barstow International Gateway Project Overview: https://bnsfbig.com/

These types of projects require strong partnerships between funding and regulatory agencies, local governments, and private railroads. This type of partnership can meet the needs of freight and passenger rail by developing shared understanding of existing infrastructure, constraints, and future demand.

3.1. FREIGHT RAIL NETWORK GOALS

The private freight rail industry provides public benefits to the state. The State's responsibility is to work with freight railroads to enhance those public benefits, in line with public policy goals, while also supporting private goods movement goals and fostering the attainment of economic, equity, and environmental goals.

Caltrans has recently completed the 2023 California Freight Mobility Plan (CFMP).[12] The CFMP identifies multimodal mobility, economic prosperity, environmental stewardship, healthy communities, safety and resiliency, asset management, connectivity, and accessibility as goals for California's freight network. The freight rail network goals below describe alignment between these two plans.

Economic

The freight rail network is primarily owned by private industry companies and market driven. California's rail infrastructure, especially the transcontinental routes, must effectively serve international ports, industries throughout the state, and markets throughout the country. Freight flows are determined by network reliability and competitiveness against other modes (i.e., highways and trucking).

The competitiveness of California's ports, logistics industry, manufacturers, and agricultural industry depends on rail connections to/from the rest of North America. Caltrans will continue to collaborate with freight railroads and support public/private freight projects to maintain this competitiveness.

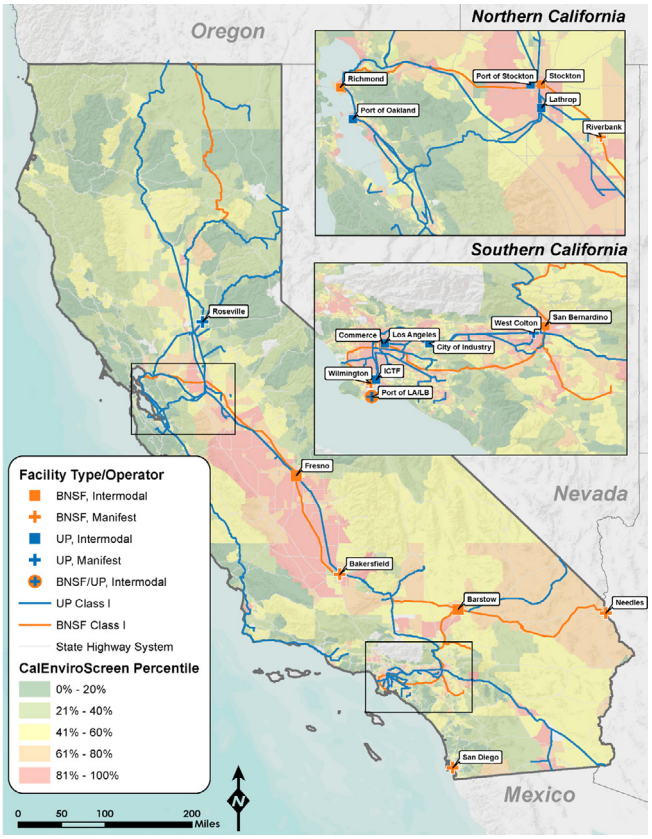


Figure 8: Freight facility locations compared to the prevalence of disadvantaged community indicators: CalEnviroscreen 4.0 -- https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40

Environmental

In the past, railroads have been approximately four times more fuel efficient than trucks. The general rule has been that one gallon of diesel fuel can move one ton of freight an average of 470 miles with 75% fewer GHG emissions. However, the implementation of truck regulations which require trucks to produce less particulate matter (PM2.5) and Nitrogen Oxide (NOx) emissions, have cleaned up freight trucking significantly.

This trend towards hydrogen and battery technologies in trucking will begin to erode rail's competitive advantage.

12 California Freight Mobility Plan, Caltrans

Equity

Caltrans acknowledges that freight rail infrastructure is often co-located with disadvantaged communities and priority populations and burdens these neighborhoods with air quality, noise pollution, physical barriers to circulation, and safety issues. While providing good paying jobs and supporting manufacturing and agricultural industries, the benefits freight rail provides must be balanced against the negative impacts rail operations and rail infrastructure can create in communities.

An increase in freight rail use is an efficient alternative to highway expansion. Without effective rail connections to ports in places like Los Angeles, Long Beach, Oakland, and Richmond, state highway networks would require significant expansion to handle increased truck traffic. California can reduce the need for highway expansion by supporting and improving rail infrastructure to attract freight traffic and growth away from highways, enhancing trade corridors by lowering transportation costs for businesses.

Reductions in locomotive idling, improvements in safety, expanding freight facilities farther away from dense disadvantaged communities will be the outcomes of State Caltrans-supported freight rail projects.

Support for Passenger Services

Lastly, the freight network supports economic, environmental, and equity goals via its support and facilitation of passenger rail services. Regional and intercity rail has and will continue to largely utilize freight railroad owned and dispatched rights-of-way. To deliver on the passenger service goals identified in the long-term vision, Caltrans and host railroads will conduct service planning and pathing studies to identify, plan, and deliver improvements with shared benefits.

TCEP Funding in Action

Stockton Diamond Grade Separation: Stockton, CA

TCEP Award: $100,000,000

Total Project Cost: $397,150,000

Summary: This project grade separates the Union Pacific Railroad and BNSF mainline tracks in Stockton, California. The Stockton Diamond is the busiest at grade railway junction in California.

Benefits: This will allow trains from the two Class I railroads to cross each other without stopping. There will be fewer air quality impacts to this central Stockton neighborhood due to idling diesel locomotives waiting for train congestion to clear. The project also provides capacity benefits to passenger rail and supports new passenger rail service between Sacramento and Merced.

Fourth Track Rail Expansion in Port of Long Beach

TCEP Award: $8,000,000

Total Project Cost: $24,000,000

Summary: Project expands the capacity for trains to leave the Port of Long Beach and connect to the Alameda Corridor by adding a fourth track to the connection, building crossovers, and improving signals.

Benefits: Increases the port's Rail Capacity, reduces train delays, reduces local truck drayage needs, improves air quality by expediting diesel locomotives away from the ports with less idling, and reduces goods movemen impacts on surrounding communities.

PFIP Funding in Action

Port of Long Beach System Wide Investment in Freight Transportation (SWIFT) Project, Long Beach, CA

PFIP Award: $383,000,000

Total Project Cost: $2,168,000,000

Summary: The project constructs a full-service staging facility to support on-dock rail, allowing trains of almost 2 miles in length to be staged within the project footprint (and twice that length using connected support tracks). The project includes zero-emission locomotives, support vehicles, and charging infrastructure. PFIP-funded components of the project are expected to be completed by December 2028.

Benefits: Improve goods movement efficiency, maximize port infrastructure, improve air quality by expanding zero-emission adoption and expediting diesel locomotives away from the port-surrounding neighborhoods.

Merced County Inland Port, Merced, CA

PFIP Award: $49,600,000

Total Project Cost: $115,674,000

Summary: The project develops a pre-shipment processing center, rail expansion to a new staging and container laydown area, and planning & engineering for future expansion at the Castle Commerce Center.

Benefits: The project processes containers from Southern and Northern California Ports without requiring expanded capacity within the ports themselves. This reduces emissions, public health impacts, and other negative impacts to communities surrounding Southern California and Oakland Ports.

3.2. SUPPORTING THE FREIGHT NETWORK

While privately-owned freight railroads continue to make investments in their infrastructure, it is in the state's interest to advocate for ongoing freight focused funding programs. These investments are critical to address supply chain issues, increase the capacity of the freight network to allow for more truckloads to be shifted off the state's highways, and to support the expansion of passenger rail service. Leveraging state funding to secure more funds from federal programs is key to maximizing the State's investment. The significant state and federal freight rail funding programs with opportunities to support components of the freight rail network can be found in Section 4.6. Two freight-focused funding programs that have provided significant benefits to the state rail network include the one-time PFIP program and the on-going TCEP program, which both work to enhance the safety, capacity, and efficiency of the freight network.

SEACANS – Supporting Environmental and Community Advancement and National Security

CalSTA, Caltrans, and the FRA initiated the SEACANS Program in partnership with other regional, state, and federal partners to address funding shortfall for freight projects.[13] Funding needs for freight are described in more detail in Section 3.4.

SEACANS is intended to improve Southern California's multimodal freight network and support a more fluid supply chain beginning at the seaports and extending into the interior of the nation, with an emphasis on optimizing freight rail for inland import/export movements, while also enabling planned passenger rail service expansion. SEACANS allows for collaboration between all stakeholders to scope and develop a consensus-based program of capital projects

13 California Freight Mobility Plan 2023 https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/cfmp/cfmp-july-2023-final-v1-a11y.pdf

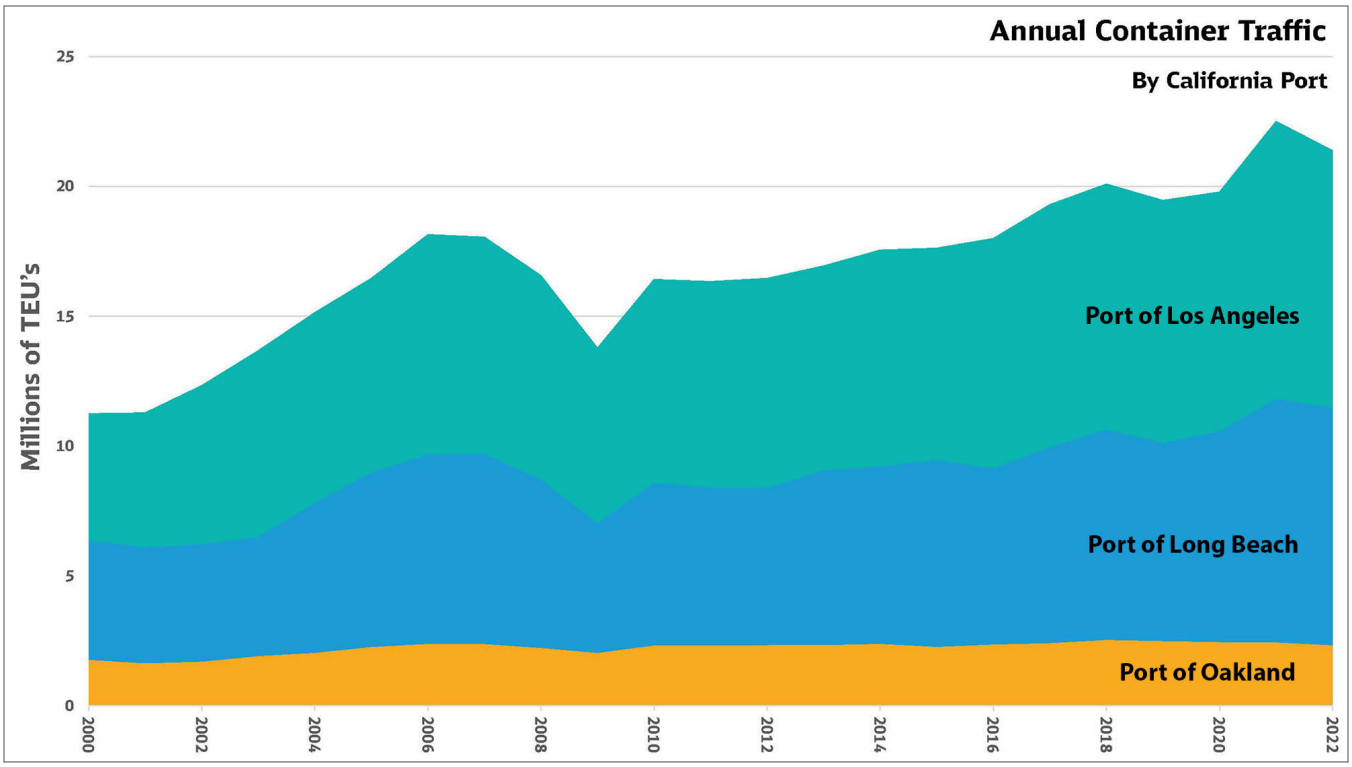


Figure 9: Annual container traffic across California's three largest ports from 2000 through 2022.

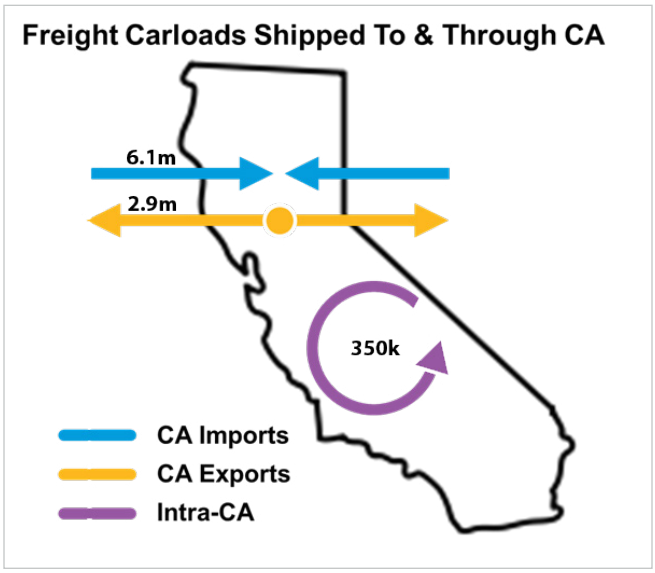


Figure 10: Intra- and inter-state freight carload imports and exports in California.

that will advance the objectives of the group. With technical analysis and regular coordination amongst SEACANS partners expected to resume in 2025 the State will be able to strategically leverage available funding to develop Southern California's freight network growth for the needs of the 21st century.

3.3. FREIGHT TRENDS

Zero-Emission

CARB adopted the In-Use Locomotive Regulation on April 27, 2023.[14] This regulation will achieve a reduction in emissions from diesel-powered locomotives and increase the use of zero-emission equipment. Goals of this regulation include improving public health and air quality through

14 https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california

a reduction in criteria pollutants, air contaminants, and greenhouse gas emissions.

Other freight modes including over-the-road trucking in California are making progress towards zero-emissions.[15] This development is a significant benefit to California's air quality, particularly for disadvantaged communities and priority populations often co-located proximate to industrial sites and ports with high freight traffic. It is also a significant change to the status quo between trucking and freight rail, where rail has been historically more fuel efficient. Without transitioning to zero-emissions technology, the freight rail network risks losing a competitive advantage over trucking, with potential implications for how the public sector prioritizes capital support for freight network capacity projects.

To lead collaborative efforts towards meeting CARB regulations, Caltrans has developed the Rail Fleet Consortium (as discussed in Section 1.4) to share knowledge on fleet related topics and includes a sub-working group that focuses on the transition to zero-emission. Other collaborative efforts with air quality management boards include repurposing Tier 0 diesel switcher locomotives and integrating hydrogen fuel cells or advanced battery technology to reduce greenhouse gas emissions at facilities near urban areas.

3.4. FREIGHT FLOWS

2022 California Freight Flows

California is a major logistics hub for the global economy. California ports handle over 200 million tons of freight a year, and the vast majority of those tons come from Southern California. In aggregate, Los Angeles area[16] and Bay Area[17] ports would represent the 4th and 16th largest ports in the United States by tonnage.[18] The largest share of freight funding will go to Southern California because the region handles so much freight. However, certain projects to decentralize freight handling into other parts of the state to reduce the impact to the communities surrounding the largest harbors may attract funding to other parts of the state. A detailed technical understanding of how freight railroads operate both as transportation networks and as businesses is required to understand how freight gets to and from ports, how California's agricultural and manufacturing industries obtain raw materials and ship to markets, and how the state manages the growth of truck traffic on state highways while planning the transition to zero-emission.

Freight traffic in any year-over-year period is dynamic as it is just one link in a global supply chain connecting factories, farmers, and consumers throughout the world. Economic factors in different markets, trade policy, and even the weather can drive surges or slowdowns in freight shipments. Overall, freight traffic is expected to grow in line with the economy as global trade and population increase over the coming decades.

Supply Chain

Freight railroads are still stressed from the national supply chain crises caused by the COVID-19 pandemic from increased demand in goods available online. As gas prices increase, demand for passenger rail increases as well, creating a greater need to address rail capacity in shared freight/passenger corridors. A large percentage of the state's goods move through Southern California where freight lines are shared with passenger rail.

The State is pursuing funding and overseeing pathing studies to improve Southern California's multimodal freight network and support a more fluid supply chain beginning at the seaports and extending into the interior of the nation, with an emphasis on optimizing freight rail for inland import/export movements.

15 CARB analysis
16 Combined tonnage of Port of LA and Port of Long Beach
17 Combined tonnage of Port of Oakland and Port of Richmond
18 Tonnage of Top 50 U.S. Water ports, Ranked by Total Tons, Bureau of Transportation

3.5. COORDINATION & IMPLEMENTATION

Network Capacity Analyses

Intermodal traffic and international trade are expected to grow along with the economy, beyond the capacity of the existing network. Understanding the capacity of a railroad or a rail network is a complex question that demands technical analysis. While highway planning is for roadways that carry independently operated, low-capacity, individual vehicles and trucks relying on stop-go or static signals, rail systems cannot be operated within line of sight. Railways require outside dispatch, layers of computer safety systems, and signal systems that compensate long stopping distances and dangers associated with the operation of high-capacity vehicles. These are all safety components that create a more controlled network and allow for safe, reliable, and dynamic capacity management. Railroads do not have fixed capacity and can respond to capacity needs by changing schedules, train lengths, and/or operations. Any question of current or future capacity depends on many administrative and technical variables.

Technical Parameters

Several variables determine the 'capacity' of a rail corridor. Those variables break down into three buckets:

1. The specific characteristics of the train(s) that utilize a corridor;
2. The specific characteristics of the infrastructure; and
3. The specific characteristics of how the corridor is operated.

The number and complexity of variables and assumptions demand detailed documentation of assumptions and rigorous technical analysis to effectively understand capacity constraints and future capacity needs.

Priority Freight Project Types

The State supports targeted investments in infrastructure and operations that give freight the capacity needed to support California and the Nation's economy while facilitating efficient passenger rail operations and protecting the health of community members living near freight facilities. Projects with these shared benefits include:

Projects to shorten freight routing and reduce the need for trucking:

- Distribute rail freight staging and processing capacity away from ports and into parts of California with more space and ability to accommodate freight development.
- Projects to reduce or eliminate the need for drayage moves:
    - On-dock ship-to-rail projects
    - Near-dock projects that allow freight to move from ship to rail within the port complex

Projects to reduce choke-points for freight:

- Increase the number of tracks serving ports to expedite the departure of freight loads
- Expanded track capacity to and away from ports and other terminals
- Grade separation projects for rail/rail 'diamond' crossings and rail/highway at-grade crossings
- Expand yard infrastructure so freight trains don't have to wait for space in the yard on a main line track

Projects to reduce emissions:

- Zero-emission locomotive procurements
- Projects that reduce choke points (see above)
- Projects that shorten freight routing and reduce the need for trucking (see above)

Freight and Passenger Coordination

The State has an interest in expanding the rail network to accommodate growth in both freight and passenger movements. Early and on-going coordination is critical between the State and host freight railroads to ensure the right investments are being made at the right time in the right places to maximize the benefits to both systems. This is further discussed in Section 4.6.

Mitigating Capacity Constraints

Since the 2018 State Rail Plan, Caltrans has engaged in several strategic efforts to understand, prioritize, and articulate future capacity needs. These efforts scale Caltrans' ability to understand current capacity constraints, identify the implications of future freight or passenger traffic increases, and effectively prioritize future investments.

There are four components to Caltrans' strategic management of understanding capacity and relevant investments to mitigate constraints:

- **Documentation/Monitoring**: Caltrans is collecting and cataloging actual operations performance data of state-sponsored intercity passenger service.
- **Technical Analysis**: Caltrans is developing and updating digital infrastructure and operations models for current and planned traffic volumes in the long-term vision.
- **Strategic Planning**: Caltrans' analysis is then refined and updated iteratively through implementation planning exercises (utilizing the Service-Led Planning Methodology) to deliver the integrated statewide passenger network detailed in the vision.
- **Prioritized Investments**: Components 1-3 provide a technical foundation for Caltrans to understand which improvements should be prioritized under specific assumptions/conditions for future traffic volumes and operating parameters and the relative utility accruing to passenger services. This understanding is a basis for funding commitments and negotiations over administrative agreements with host railroads.

Caltrans partners with freight railroads to identify shared priorities and investments that will provide benefits to both the freight and passenger rail networks. Continuing to foster these partnerships is critical to deliver the State's freight and passenger network goals.

Multimodal containers along the Los Angeles River in Los Angeles' Arts District. Editorial Credit: Noah Sauve / Shutterstock.com

Chapter 4: Implementation

Delivering the Rail Plan requires coordinated planning and project development to identify a phased implementation strategy. The goal is to eliminate stranded investments and build a network that can serve travelers as soon as possible and grow the service and benefits by 2050. Strategic implementation requires close coordination with many partners to address funding gaps, climate resiliency, and governance.

A diesel multiple unit regional rail train crosses the haystack landing drawbridge in Petaluma.

4.1. NETWORK PHASING

The service and connectivity goals along with corridor-level improvements required to deliver the Rail Plan are described in the capital program which is split into three phases: capital projects identified for the next four years (2028); mid-range needs identified for the next decade (2034); and plans for long-range improvements and investments by 2050.

The capital project list directly supports the delivery of the service goals identified in Chapter 2. The capital program is derived from the service goals which were developed through service-led planning by corridor with close coordination with rail partners.

Future Planning Studies

Ongoing planning studies are important to ensure the right investments are being made in the right markets at the right time. Consistent planning will empower policymakers and regional stakeholders through the iterative process of optimizing current investments and scaling toward an effective and integrated regional and statewide network. Other plans included in policy and planning decision-making include CAPTI and the Interregional Transportation Strategic Plan (ITSP).

Near Term Investments

The near-term capital program carries approximately $18.9 billion of statewide infrastructure investments. Major projects include initial Metrolink capacity-increasing program investments, the expansion of SMART to Healdsburg, the introduction of new services in the Central Valley, and high-speed rail service between Rancho Cucamonga and Las Vegas. These represent major ongoing investments in establishing the statewide passenger network.

In addition to passenger rail projects, the Rail Plan supports several freight-focused projects ranging from grade separations, signal improvements, track work, yard expansions, and staging tracks to facilitate freight movements, to major investments in port capacity and container handling at the Ports of LA and Long Beach, Port of Hueneme, and the Otay Mesa port of entry.

Near-term investments also include a significant ramp-up in the State's zero-emission transition to decarbonize the intercity fleet and increase fleet size to achieve the service goals in the mid-term.

Mid Term Investments

The mid-term capital program already carries approximately $48.5 billion of statewide investments. Major projects include high-speed rail connecting Bakersfield to Merced, the Portal, LAUS initial run-through tracks, and major capacity investments in Los Angeles County rail capacity in preparation of full phase 1 high-speed rail service.

Long Term Investments

The long-term capital program carries over $235 billion of statewide infrastructure investment needs. Major investments include high-speed rail extensions to San Diego, the Inland Empire, High Desert Corridor, and Sacramento as well as a high-speed rail line to Arizona. Concurrently, the Rail Plan supports major projects to develop a second transbay crossing connecting San Francisco, the East Bay and Sacramento, allowing electrified, standard-gauge rail service for regional and intercity trains, major tunnel projects in San Diego County along the coast, and full build-out of regional transit networks and connections to the fully integrated statewide network.

The full capital program, including additional fleet and grade separation investments, is available in Appendix 2.

4.2. ECONOMIC BENEFITS

Economic benefits accruing with implementation of the Rail Plan include employment (measured as person-years of full-time employment), income (wages and salaries) associated with this employment, and firm output (expenditures).

Improvements in California's rail system are investments that will be realized through greater economic activity including new construction and development, more jobs, and increased tax revenues.

Direct fiscal impacts of the capital investments are:

- The $307 billion of direct expenditures identified in the Rail Plan will result in a total output for the economy of over $537 billion by 2050 – a payout of $1.75 for every dollar invested (See Appendix 2: Capital Projects)
- The expenditures will result in a total employment impact across affected industries of over 900,000 full time jobs, and labor income of nearly $55 billion.
- By 2050, state and local tax revenues anticipated from the expenditures will be close to $4 billion, and federal tax revenues will be $10.5 billion. The tax impacts pertain to taxes for which revenues can be directly inferred from economic expenditures, such as sales or income taxes.
- Continued operations and maintenance of the envisioned system is estimated to cost $2.4 billion per year. These activities will permanently expand the workforce supported by the state's rail network.
- Additional positive fiscal impacts will benefit the state due to expanding connections available to each California resident by improving their mobility, or access.[19]
- Improving the speed of travel and the number of statewide destinations available to a person at a given location, expands the number of opportunities they have access to, and this can increase economic activity.
- The Transport Access Manual provides two measures for the benefits associated with improved access.[20] The following are examples of these measures:
    - By reducing a trip time between two locations in California from two hours to one hour, the intercity customer's cost to access the breadth of the new activities and opportunities around them has been reduced by half.
    - Further, the efficiency with which the person can access targeted essential opportunities, goods, or services that used to be located two hours away has doubled because the travel time has been reduced by half.

4.3. COORDINATION

Caltrans has ongoing communication and coordination with host railroads, JPAs, commuter rail agencies and relevant state, regional, and local rail, transit, and planning agencies. Coordination between agencies is critical because implementing the 2050 vision is incumbent upon railroad owners, operators, and many other partners agreeing on investments, priorities, processes, and implementation approaches. It is important to ensure the right investments are being made in the right markets, at the right time, to deliver the vision.

Host Railroad Coordination

In California, most passenger rail service is operated on infrastructure owned by freight railroads (or 'host railroads'). Freight railroads deliver shareholder value by responding to business opportunities. They do this by increasing efficiency and preserving network capacity to accommodate growing freight traffic. Passenger rail service must not negatively impact the core freight business or infringe on future freight operations.

In technical service and operations planning, Caltrans considers the potential impacts of the planned passenger rail service improvements on railroad capacity, and access to yards and customers. Infrastructure investments necessary for increased passenger train volumes will also add capacity and flexibility to freight operations. Caltrans' articulation of future service goals and implementation strategy, paired with increased use of technical planning tools, provides a technical foundation and venue for strategic collaboration in implementation planning.

19 https://humantransit.org/basics-access-or-the-wall-around-your-life
20 https://ses.library.usyd.edu.au/handle/2123/23733

The State's goal is to enable continued, market responsive growth in goods movement by freight rail, while providing for increased passenger capacity. This will be achieved through early and continuous dialogue with the freight railroad partners, and progressive identification of shared opportunities. In some cases, ensuring capacity for passenger and freight rail operations will be realized through development of a shared track infrastructure used by both freight and passenger trains. In other cases, ensuring capacity for freight will involve the development of largely dedicated track for passenger and freight trains in a shared right-of-way while retaining the ability to share track under certain conditions, or the development of separate freight and passenge infrastructure.

Ongoing Coordination

Policymakers and rail partners participate in the State's iterative planning process to optimize investments and to scale project delivery toward an integrated statewide network. For example, California high-speed rail, which will serve as the backbone of the statewide rail transportation system, is planned, managed, and delivered by the Authority; but, the planning assumptions, timelines for completion, and many other components must be integrated into the statewide network design process. In doing so, high-speed rail parameters are considered when designing service goals for the entire state. Supportive statewide investments can be prioritized for completion in alignment with high-speed rail delivery timelines to facilitate timed transfers and other complementary services that will expand the benefits and impact of high-speed rail on day one of revenue operations.

Regular communication with partner agencies is essential. Close coordination ensures planning efforts are aligned with the State-supported service-led planning methodology that allows for a transparent, documented, and shared basis for planning. With a shared planning basis, assumptions and datasets across stakeholder agencies and planning horizons are the same, and it becomes easier for agencies to coordinate. The planning process allows for stakeholder feedback during concept development, and it helps to identify potential conflicts early, which can avoid stranded or redundant capital investments and other inefficiencies.

Utilizing a standard service planning methodology offers a shared language to facilitate coordination with partners. Recently, this was applied to coordinate with a new partner to ensure services and schedules were being planned consistently across the state. Caltrans staff engaged the Las Vegas to Rancho Cucamonga high-speed rail project when early versions of their service plan showed 20-minute headways – a misalignment from the State's hourly pulse schedule system.[21] Through discussion and collaboration with a unified front of state and regional partners, Brightline West, the project sponsor, modified its service plan to better integrate with the state network's frequencies. This will have connectivity and ridership benefits for all systems.

Challenges

The State Rail Plan establishes a statewide vision for integrated passenger rail; but delivering that vision can be challenging when it must happen within a complex governance structure that includes many different public agencies and private companies with differing goals, budgets, and priorities. For example, specifics about project phasing and prioritization can sometimes be at odds with local or regional transportation priorities and plans. While the various planning documents may be overall supportive of the same goals, differences in timelines and policy guidance can create challenges for securing funding and expediting delivery timelines.

21 The service maps and goals show an hourly snapshot of service levels. The hourly pulse is based on quarterly increments so levels of service can increase or decrease to every two hours, or to half hourly, every-15 minutes, and so on.

Additionally, funding programs continue to be constrained. While there has been historic investment from the state over the past decade, in addition to an influx of federal funding in the last few years, there is still insufficient funding to meet all the Rail Plan goals. It can be challenging building a funding plan with so many funding sources that each have different rules and regulations for how and when money can be spent. Finally, the existing rail network already faces significant pressure to respond to climate change – from mudslides and coastal erosion to sea level rise and flooding events. More focus needs to be put on embedding climate mitigation and adaptation components into project planning, so projects deliver proactive solutions for resiliency.

Opportunities

One opportunity to improve coordination with the various planning partners is participation in the Federal CID Program. The program offers a framework for creating SDPs for intercity passenger rail corridors and requires explicit stakeholder coordination during the technical planning process. This facilitates consensus building and utilization of shared methodologies and inputs to help all partners work from a shared understanding and build off that understanding to make sound decisions.

The CID Program also requires a railroad stakeholder engagement plan and an agency coordination plan which will identify involvement activities linked to key milestones in the planning/engineering and alternatives analysis process. A goal of improved host railroad coordination is to streamline the timelines for completing each phase of a project from planning, through project development, and finally construction. By coordinating early, often, and within a standardized framework with the host railroad partners, project costs can be kept lower, and project delivery timelines can be met. Another opportunity to improve host railroad coordination is through the initiation of a capital access fee-based method of delivering new or increased rail services, where passenger rail operators become customers of the host railroads and a new 'customer service' dynamic is applied to on-time performance needs.

4.4. CLIMATE RESILIENCY

Impacts of Climate Change on the Rail Network

California is focused on both decarbonizing the State's rail system by planning and transitioning to zero-emission fleets, as well as preparing for sea level rise and other climate risks by increasing resiliency in the network.

California's coast faces a crucial risk of experiencing sea level rise of up to 1.0 feet by 2030 and 7.6 feet by 2100. Many rail corridors in California are at risk of disruption due to sea level rise; some already experience flooding and erosion every year that lead to costly delays and repairs. Vulnerable coastal zones, host to essential statewide rail infrastructure, include Santa Barbara, Orange, and San Diego counties; as well as San Pablo Bay, Alviso Wetlands, and Elkhorn Slough.

The ownership, jurisdiction, and management of the rail network in California is complex because the infrastructure itself, owned by a collection of public and private entities, crosses land owned by or under the jurisdiction of multiple cities, counties, and state and federal agencies, thus exacerbating the challenges for mitigating against and responding to sea level rise impacts.

Fortifying segments of the rail network in the near-term can help preserve the current function of rail infrastructure from sea level rise, but long-term adaptation planning is also needed to address higher amounts of sea level rise and other climate threats. For example, sea level rise can lead to flooding which can stop trains from running. Flash floods can lead to a washout of tracks and cause derailments, which can cause track segments to be impassable. As sea levels rise, flooding will become more frequent.

Additionally, increased rainfall intensity will further the severity of flooding. California continues to reach record high summer temperatures and successive years are expected to be hotter.

Excessive summer temperatures can warp tracks due to uneven thermal expansion, which can restrict train speeds and cause derailments. These climate risks all represent the potential impacts the rail network faces in the coming years. To mitigate these threats, California must follow the Ocean Protection Council's Sea Level Rise Guidance and other related plans. A changing climate can lead to serious delays on railroads across California which will result in a loss of economic efficiency and safety while moving people, goods, and services.

Sea Level Rise and Coastal Erosion

California's rail network, particularly along its coastlines, is vulnerable to sea level rise and coastal erosion. According to the California Coastal Commission's Sea Level Rise Policy Guidance (2018), sea levels along California's coast are projected to rise between 1.1 to 2.7 feet by 2050, with potential increases of 3.4 to 10.2 feet by 2100 if high GHG emissions continue. This rise is primarily due to the thermal expansion of seawater and melting ice caps. Coastal erosion, exacerbated by these rising sea levels, threatens infrastructure directly adjacent to the coast. The State of California Sea-Level Rise Guidance highlights regions at risk from these processes, indicating that rail lines close to the shore are particularly vulnerable to damage from both chronic inundation and episodic storm events. These regions are primarily those in close proximity to the coast, such as San Clemente and the Del Mar Bluffs, or near bodies of water whose water levels are directly impacted by the ocean, such as San Pablo Bay.

Natural Disasters and Flooding

Natural disasters such as wildfires and floods are becoming more frequent and severe as climate change accelerates. The California Climate Change Assessment (2022), conducted by the California Natural Resources Agency, forecasts an increase in the intensity and frequency of wildfires, which can directly damage rail infrastructure through fires and smoke.

Flooding risks are also heightened. The California Flood Future Report (2013), published by the California Department of Water Resources, provides a comprehensive analysis of flood risks, emphasizing the need for updated infrastructure to cope with increased precipitation and storm intensity. The Federal Emergency Management Agency manages and reports on the areas most susceptible to flooding for any reason, also known as "floodplains." Understanding how floodplains will grow or change in the future allows transportation agencies to make the most targeted and informed decisions about infrastructure construction or relocation. Almost 8,000 critical transportation facilities are exposed within 500-year floodplains (Flood Future Report, 2013). These reports underline the necessity of integrating climate projections into infrastructure planning to mitigate the impacts of these disasters.

Impacts on Freight and Passenger Services

The disruptions caused by climate change impact both freight and passenger rail services. The National Freight Strategic Plan (2021) by the FRA outlines how climate-induced disruptions, such as track damage from floods or delays due to wildfires, can lead to substantial economic costs and operational inefficiencies for freight services. The report supports a two-pronged approach: having a strong crisis response in place, as well as resiliency planning, in order to be flexible in the face of short-term and long-term climate-related disruptions. Because many passenger rail services also operate on freight operator-owned tracks, freight disruptions can also have severe implications for the timely and correct operation of passenger rail services. For passenger rail services, the Climate Adaptation Plan (2014) by USDOT provides methodologies for evaluating climate risks and implementing resilience measures. This guide also stresses the importance of designing adaptable transit systems that can respond effectively to changing environmental conditions.

4.5. PLANNING FOR FUTURE INVESTMENTS

Alignment with State Goals

The California Transportation Plan (CTP) 2050, developed by Caltrans, emphasizes the need for a resilient transportation system. The document articulates long-term goals for maintaining and improving transportation infrastructure. One of its four key infrastructure objectives emphasizes the importance of rail resiliency as it relates to climate change: "increasing infrastructure resiliency to climate change and natural disasters: this objective focuses on the importance of adaptation by understanding a transportation system's risk to exposure and sensitivity to a variety of threats, determining consequences, and prioritizing targeted investments."

Rail is a critical form of transportation facing challenges that demand both short-term stabilization efforts and long-term solutions. The State is committed to addressing immediate climate resiliency issues by coordinating with the FRA, rail and other regional partners to secure funding, streamline project delivery, and facilitate regulatory permitting support. CalSTA will take a greater leadership role and leverage existing planning efforts to create a long-term strategic action plan for rail corridors experiencing resiliency issues.

Caltrans is investing $50 million in the form of Climate Adaptation Grants to support local and regional transportation climate resiliency through project-level adaptation planning. These grants are part of California's commitment to mitigating climate impacts on critical infrastructure. They support projects that enhance rail network resilience, improve natural habitat restoration, and provide additional flood protection for surrounding communities.

Planning studies such as the Sea Level Rise Guidance and the Critical Infrastructure Guidance provide local governments, asset managers and other stakeholders with policies and planning information to help inform sea level adaptation decisions that are consistent with the California Coastal Act. Other plans included in policy and planning decision-making include CAPTI, the ITSP and more.

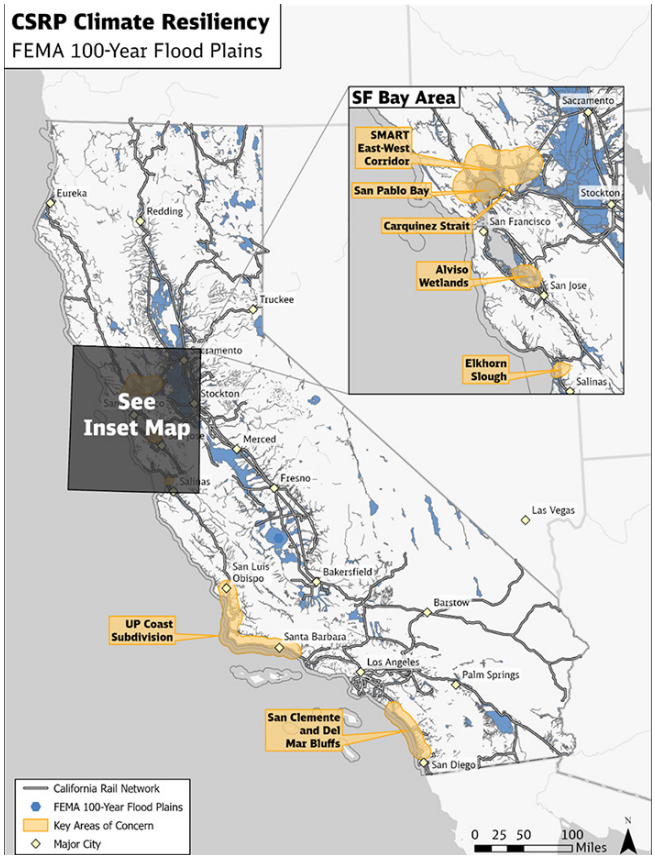


Figure 11: Overlaps between current statewide rail network and 100-year flood plains.

While capital rail improvements and studies across the state are ongoing, Caltrans intends to conduct planning studies with the help of local and regional partners in the rail planning regions. These studies are to be completed in the near-term (2028) time horizon.

Investment Strategies

Investments in rail infrastructure must be carefully planned:

Identifying Impacted Areas:
Currently, climate impact assessments are spearheaded by local and regional agencies. Example climate assessments include OCTA's "Rail Defense Against Climate Change Plan" (2021) and the "California High-Speed Rail 2021 Climate Adaptation Plan" (2021) by the Authority.

Protecting and Relocating Infrastructure:
The "Climate Adaptation Strategies for Transportation Infrastructure" (2023), conducted by Caltrans provides guidance on when and how to adapt infrastructure to mitigate a variety of risks, including changes in precipitation, sea level rise, extreme heat events, drought, wildfires, and landslides. Most of the recommendations suggest construction and maintenance of secondary infrastructure to manage physical effects of such disasters such as drainage systems and intentional landscaping.

Immediate vs. Long-Term Investments:
The CAPTI (2021), prepared by CalSTA, offers a framework for prioritizing investments based on immediate needs and long-term benefits. Action S2.2 in CAPTI calls for identifying a long-term strategic funding pathway across all funding opportunities to realize the State Rail Plan. This involves prioritizing rail investments statewide for major state funding programs and future federal grant opportunities.

Timeframe Considerations:
Because of the time-consuming nature of rail planning through project delivery, it is important for agencies to weigh the time necessary to plan projects with the imminent nature of climate-related risks. The "California Climate Adaptation Strategy" (2021), developed by the California Natural Resources Agency, provides action items, their metrics of success, and importantly, timeframes for implementation and reexamination moving forward.

Coordination with Host Railroads for Resiliency

Because of the collaborative nature of railroad operation between host railroads and other operators, all parties must be in communication and in concurrence with each other about how to approach climate resiliency. In case of a climate-related event that causes damage or other disruptions to a rail segment, trains may need to be re-routed or service altered. Host railroads will need to be in close communication with operators to both safely manage the operations on the new or altered route, as well as manage any potential repair or reinforcement of affected infrastructure.

Coordination is also critical for determining the long-term strategy for a specific corridor – dialogue must be had between the State and a host railroad to identify shared goals and strategies. The State will have to know the freight

A Capitol Corridor train traverses Alviso Wetlands in the South San Francisco Bay Area.

options and alternatives to be able to determine if they align with the passenger goals of the corridor, and if they do not, plan accordingly.

Near-Term Vulnerabilities and Areas of Concern

Several locations on the state rail network are particularly vulnerable to climate change. Figure 11 shows the statewide rail network overlaid with the projected 100-year floodplains, which are the areas in the state that are expected to see heavy flooding and inundation in 100 years. Key areas of concern are highlighted in orange, where the existing or future network lies within one of these floodplains. Understanding the specific risks at each site is crucial for implementing effective resilience strategies.

Suisun to Novato (East-West) Extension

The East-West Corridor is a proposed rail and multi-modal transportation project intended to connect the SMART system with key east-west routes in the San Francisco Bay Area. Its goal is to enhance regional connectivity, improve transit options, and support economic development by linking SMART rail lines to major transportation hubs and destinations across the region. The project is currently still in its planning stages, with three proposed alignments. All three of these alignments traverse the Napa-Sonoma Marshes, low-lying wetlands connected to San Pablo Bay that are subject to regular flooding and sea-level rise.

San Pablo Bay

San Pablo Bay, located north of San Francisco, is critical for rail operations due to its proximity to major rail lines. Railroads provide critical links between the ports found on the bay and inland distribution centers, supporting regional and international trade. The "San Pablo Baylands: Ensuring a Resilient Shoreline" (2022) report, conducted by the State Route 37 – Baylands Group, forecasts the rail around San Pablo Bay and its aging system of berms and pumps to be ill-equipped to handle rising sea levels. This rise increases the risk of flooding and shoreline erosion impacting rail as well as highway infrastructure. Suggested measures include an emphasis on protecting the existing ecosystem to act as a natural buffer against climate-related dangers to the infrastructure.

Carquinez Strait

The Carquinez Strait is a narrow tidal channel in Northern California that connects San Pablo Bay to the Sacramento and San Joaquin Rivers. The Union Pacific-Martinez Subdivision, which sees extensive freight and passenger rail traffic, runs over a flood plain in Yolo County and follows the shorelines of the Carquinez Strait, which makes it particularly susceptible to the adverse effects of climate change and faces significant risks from rising sea levels and extreme weather events.

Elkhorn Slough

Elkhorn Slough is a large tidal salt marsh located on the central coast of California, near Monterey Bay, and serves as an important habitat for diverse wildlife, including birds, fish, and marine mammals. An 8-mile stretch of Highway 1 and nearby rail represents a critical commuting and freight expansion corridor in the area that is at risk due to rising sea levels. The Transportation Agency for Monterey County (TAMC), in partnership with Caltrans, is conducting the Highway 1 Elkhorn Slough Climate Resiliency Project, which addresses the vulnerability of the transportation infrastructure through the Elkhorn Slough, focusing on multimodal and nature-based solutions to climate change impacts. The initiative is backed by Caltrans' funding for preparing a Planning and Environmental Linkages (PEL) study and project documentation.

Alviso Wetlands

The Alviso Wetlands are a vast network of tidal marshes and mudflats sitting at the southern end of the San Francisco Bay, near San Jose. The Alviso Wetlands face several risks due to climate change, including rising sea levels that threaten to inundate and erode the marshes, and increased frequency of extreme weather events such as storms, which can exacerbate flooding and habitat loss for local wildlife. The nearby railroad, which is owned by Union Pacific and operates both freight and passenger rail traffic, runs through a low-lying, environmentally sensitive wetland area that is at significant risk for damage

and destruction due to rising sea levels. CCJPA and Caltrans are continuing critical climate adaptation planning for railroad infrastructure in the Alviso wetland area of San Francisco Bay, producing the "Alviso Wetlands Railroad Adaptation Alternatives Study." Funded by Caltrans' Climate Adaptation Planning Grants, this project focuses on engineering feasibility and stakeholder outreach to benefit transit, the environment, and nearby communities. The adaptation of infrastructure here aims to increase resilience, improve capacity and redundancy, restore natural habitats, and provide flood protection.

Union Pacific Santa Barbara Subdivision from San Luis Obispo to Ventura County

The Union Pacific Santa Barbara Subdivision is a rail line operated by Union Pacific Railroad that runs along California's Central Coast, stretching from San Luis Obispo to Ventura County. This route is part of a broader rail network that supports both freight and passenger services, providing a crucial transportation link between the coastal areas and inland regions.

The line traverses scenic coastal areas and connects with other major rail routes, playing a significant role in regional and intermodal transportation. Due to its coastal location, this subdivision faces risks such as sea level rise and coastal erosion, which could impact the stability and operations of the rail infrastructure. This is especially concerning for passenger rail services, as the region has a sparse rail network to lean on.

San Clemente and Del Mar Bluffs

The rail line around San Clemente and the Del Mar Bluffs in California is a scenic and crucial segment of the coastal rail corridor, connecting the southern Orange County area to San Diego, and facing ongoing challenges related to erosion and environmental concerns. The State views improving resiliency in these areas as absolutely critical, and will continue working closely with regional partners, especially OCTA, NCTD, and the San Diego Association of Governments (SANDAG) to support both temporary and long-term resiliency measures. The State is committed to furthering this support and collaboration, providing additional funding, and working to streamline the delivery of priority projects in this key corridor. CalSTA will take a greater leadership role to study and plan for a long-term vision for the corridor going forward.

In addition to participation in repeated investments in the Del Mar Bluffs (now in the fifth phase), CalSTA and Caltrans have coordinated with stakeholders to immediately shore up the bluffs along the LOSSAN corridor, Caltrans coordinated with stakeholders to implement more than $36 million in emergency repairs to improve bluff stabilization, clear debris from rights-of-way, ensure track safety, and recommission track. Bluff stabilization and rail line protection is a temporary solution however, as extreme weather events and climate change will continue to threaten this corridor's safety. In order to protect the railroad for the next 20-30 years, completing the Del Mar Bluffs stabilization projects and completing the recently fully-funded OCTA Coastal Resiliency Project (over $300 million) are essential, but stakeholders must all seek long-term solutions.

Caltrans and regional stakeholders are proactively identifying, studying, and funding long-term solutions to permanently improve climate resiliency along the Orange County coast by potentially realigning the railroad from the coastline's Del Mar bluffs into inland tunnels. This undertaking requires environmental and equity assessments; engineering studies; coordination between SANDAG and OCTA as regional authorities, Metrolink, NCTD, and the BNSF railroad as owners and operators, and LOSSAN as a state supported passenger service provider; as well as state and federal funding coordination. The Orange County Coastal Rail Resiliency Study, conducted by OCTA, is currently underway and is projected to be published in 2025. A separate study will evaluate potential relocation of the line to an inland alignment to evade coastal erosion already affecting service in the area. Long-term solutions elsewhere on the Orange County coast, including in San Clemente, are also

being assessed to avoid unplanned track outages. The Del Mar realignment and other investments along the Orange County coast will not only protect the railroad from unstable bluff conditions, but also contribute to the State's service goals by increasing double track to allow for higher train frequencies through what is today a congested rail corridor.

4.6. FUNDING OPPORTUNITIES

Funding the Rail Plan Vision

California's rail system is funded by several sources and programs, including state fuel taxes and fees, federal fuel taxes, federal grant programs, state bonds, the Cap-and-Trade program, and local sales tax measures. This Rail Plan positions projects for federal and state funding opportunities, such as SCCP, TCEP, Consolidated Rail Infrastructure and Safety Improvement Program (CRISI), FSP/CIDP, and others.

Currently, the largest sources of funding include the State's Public Transportation Account (PTA) funded by the diesel fuel sales tax and a portion of the vehicle registration fee, Greenhouse Gas Reduction Fund (GGRF) revenue from the Cap-and-Trade program, and federal fixed guideway capital investment grants. Various funding programs cover every aspect of the detailed vision of how the rail system will work, from enhancing active transportation access to stations, to building the appropriate freight infrastructure required to enable higher levels of service. Funding sources not specifically designed for rail can also help deliver portions of rail projects, and further opportunities to incorporate sea level rise mitigation into state funding programs should be explored.

Funding for near-term projects are already secured and programmed with construction underway in most cases, while mid-term projects have most of their funding committed, but may still have funding gaps that are expected to be addressed over the next few years. Long-term projects typically do not have a significant portion of their funding identified, although some may be identified in regional plans or an expectation of inclusion in future local or regional ballot measures. Private investments made by host railroads on their own infrastructure is not known or included, but many passenger rail projects have freight co-benefits and can make a project more competitive for funding and can deliver additional benefits. Public funding sources for shared freight and passenger corridors are included in the Capital Plan. (Appendix 2: Capital Projects). A few of the most significant funding opportunities for delivering the state rail network are described in more detail below. Detailed descriptions of all funding sources and awards are provided in Appendix 5: Rail Funding.

Bipartisan Infrastructure Law

One significant opportunity to efficiently support the delivery of the projects identified in the Rail Plan is through federal partnerships for grant funding. The Bipartisan Infrastructure Law, also known as the Infrastructure Investment and Jobs Act of 2021 (P.L. 117-58) invests $66 billion nationally in advanced appropriations and $36 billion in authorized funding.

As part of those appropriations, significant awards were made to California. Some highlights include:

- $3 billion to the California High-Speed Rail Authority from FSP and $202 million from CRISI.
- Up to $3 billion to Nevada Department of Transportation for Brightline West High-Speed Intercity Passenger Rail from Los Angeles to Las Vegas (FSP).[22]
- $54 million for the Madera High-Speed Rail Station (MEGA).

22 The combined FY22-23 NOFO for the FSP National Program made available $4.566 billion. However, IIJA allows the FRA to make contingent commitments of money through a letter of intent to a grantee announcing its intention to obligate an amount to the grantee's major capital project from future budget authority. California High-Speed Rail and Brightline West received such commitments (alongside a third corridor in North Carolina) totaling $3.638 billion.

- $54 million for the San Dieguito Bridge Replacement Project (INFRA).
- $42 million for the Sacramento to Roseville Third Track Phase I Project (CRISI).
- $100 million to the Orange County Transportation Authority (OCTA) San Clemente Corridor Resiliency Project (CRISI).
- $25 million for The Portal project in San Francisco (CRISI).
- At least $3.8 billion in funds remain solely for projects on the national network (including the Corridor Identification Program) for which all rail corridors in California would qualify.

Further details on the awards and their respective programs are included Appendix 5: Rail Funding.

In addition to funding commitments, IIJA established the following rail development goals:

- Bring world-class passenger rail service to regions across the country,
- Grow a safer, cleaner, more equitable rail system,
- Renew Amtrak's fleet and facilities and deliver high-quality intercity passenger rail service, and
- Build the foundation for a long-term rail program.

Funding programs established or augmented by IIJA include:

- **FSP – Federal-State Partnership for Intercity Passenger Rail Program**
  This program provides funding for capital projects that reduce the state of good repair backlog, improve performance, or expand or establish new intercity passenger rail service.
- **RAISE – Rebuilding American Infrastructure with Sustainability and Equity**
  Helps project sponsors at the state and local levels, including municipalities, Tribal governments, counties, and others complete critical freight and passenger transportation infrastructure projects.
- **INFRA – Nationally Significant Multimodal Freight & Highway Projects Program**
  The purpose of this program is to provide funding for multimodal freight and highway projects of national or regional significance to improve the safety, efficiency, and reliability of the movement of freight and people in and across rural and urban areas.
- **CRISI – Consolidated Rail Infrastructure and Safety Improvement Program**
  This program invests in a wide range of projects within the United States to improve railroad safety, efficiency, and reliability; mitigate congestion at both intercity passenger rail and freight rail chokepoints to support more efficient travel and goods movement; enhance multi-modal connections; and lead to new or substantially improved Intercity Passenger Rail Transportation corridors.
- **MEGA – National Infrastructure Project Assistance Program**
  Supports large, complex projects that are difficult to fund by other means and likely to generate national or regional economic, mobility, or safety benefits.

A majority of funds available to rail projects in California through IIJA have already been authorized and the current funding landscape through IIJA is limited without reauthorization. The State will look for additional and reauthorized federal partnerships to deliver the Rail Plan and will advocate for the continuation of existing programs and even more funding for rail projects.

CID Program – Corridor Identification and Development Program

The CID Program establishes a comprehensive partnership program between the federal government and states that will help guide intercity passenger rail planning and development throughout the country and create a pipeline of projects ready for implementation. The CID Program is intended to become the primary means for directing federal financial support and

technical assistance toward the development of proposals for new or improved intercity passenger rail services throughout the United States. Caltrans envisions that over the coming years the CID Program will become a key mechanism for Caltrans to demonstrate State leadership and deliver a coordinated, service-led planning process for passenger rail service in California.

In December 2023, USDOT announced 69 corridor selections across 44 states through the CID Program that will impact corridor planning for every region nationwide. Nine corridors were awarded in California, including 5 Caltrans-sponsored corridors:

- San Joaquin Valley Corridor (Chico – Merced)
- Capitol Corridor (Reno – Sacramento – San Jose – Salinas with extensions to Novato and San Francisco)
- Central Coast Corridor (San Jose – San Luis Obispo)
- LOSSAN Corridor (San Luis Obispo – US/ Mexico Border)
- Coachella Corridor (Los Angeles – Coachella Valley)

Caltrans is working with the Intercity JPAs, CalSTA and other regional partners to develop corridor SDPs that will efficiently advance each corridor's priority projects through the planning and project development phases.

Other corridors awarded in California include:

- Brightline West High-Speed Corridor (Rancho Cucamonga – Las Vegas, NV)
- California High-Speed Rail Phase 1 Corridor (San Francisco – Los Angeles/Anaheim)
- High Desert Intercity High-Speed Rail Corridor (Victor Valley – Palmdale)
- Sunset Limited Long-Distance Service (Los Angeles – New Orleans, LA)

State Programs

TIRCP – Transit and Intercity Rail Capital Program
TIRCP is a competitive state grant program that receives annual appropriations equivalent to 10% of the state's Cap-and-Trade auction revenues via the GGRF, as well as significant funding from Senate Bill 1 (SB 1).[23] This program is dedicated to transformative transit and rail projects that will have a significant impact on increasing ridership and reducing GHGs. TIRCP will receive an average of $300 million annually from SB 1 and GGRF revenues.

SRA – State Rail Assistance Program
This program is an SB 1 program specifically for intercity and commuter rail which statutorily distributes funding between the three intercity rail JPAs and the five commuter rail agencies in the state. These funds can be utilized for capital projects as well as operating costs.

SCCP – Solutions for Congested Corridors Program
The primary objective of this program is to fund projects designed to reduce congestion in highly traveled and highly congested corridors through performance improvements that balance transportation improvements, community impacts, and that provide environmental benefits.

TCEP – Trade Corridor Enhancement Program
An ongoing program funded through SB 1 the Road Repair and Accountability Act of 2017 to provide funding for infrastructure improvements on federally designated Trade Corridors of National and Regional Significance, on California's portion of the National Highway Freight Network, as identified in California Freight Mobility Plan, and along other corridors that have a high volume of freight movement.

PFIP – Port Freight Infrastructure Program
Executive order 19-21 provided one-time funding in the amount of $1.2B to improve the capacity, safety, efficiency, and resilience of goods movement to, from and through California's maritime ports, while also reducing GHG

23 SB 1 was signed into state law in 2017. For more information, see: https://dot.ca.gov/programs/SB 1.

emissions and harmful impacts to communities adjacent to the corridors and facilities used for goods movement.

Public-Private Partnerships and Private Investment

Private investment can be involved in the planning, design, construction, and/or operations phases of rail projects, and the State will actively explore these opportunities. The private rail company Brightline was awarded, in partnership with Nevada DOT up to $3 billion in FSP funds as well as CID Program funds to continue planning and project development for a high-speed rail segment between Rancho Cucamonga, CA and Las Vegas, NV.

Private investment can also support infill housing development around station areas. Private housing developments can be leveraged to secure funding for public projects that benefit the public. Even though housing developments do not directly improve rail service, housing near transit hubs increases the utilization of rail services.

Private investment may help government agencies avoid infeasible public debt and reduce the cost of construction or risks of the unknown. However, partnership with the private sector can also introduce other risks and escalate the cost of projects if not structured carefully.

Partnership structures with the private sector should be considered when risk can be reduced, while still ensuring enough control to get the output desired to maximize efficiencies and public benefits.

A Caltrans-owned California Car is ready to open doors and board passengers at Bakersfield, CA. Editorial Credit: image Richard Thornton / Shutterstock.com

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