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# California High-Speed Railway Project

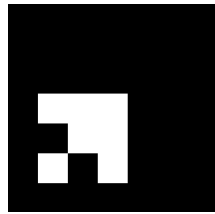
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B113 Project Management



SS0325



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Paper Title

**California High-Speed Railway Project**

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*We confirm that this collaborative report is  
our own work and that we have documented  
all sources and materials used.*

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# **1. Introduction**

The California High-Speed Rail (CHSR) project is an ambitious, publicly funded initiative aimed at developing a high-speed rail system throughout California. Conceived to address the state's growing transportation needs, the project aims to connect major metropolitan areas, alleviate congestion on highways and airports, and contribute to economic development and environmental sustainability.

The primary objective of the California High-Speed Rail (CHSR) system is to provide residents of California with a more rapid, efficient, and environmentally sustainable option for intercity travel. Its goals include alleviating the significant congestion experienced on interstate highways and at commercial airports, addressing future intercity travel demands, maximizing opportunities for intermodal transportation through integration with local transit systems, airports, and highways, and enhancing the overall intercity travel experience by offering comfortable, safe, frequent, and reliable high-speed travel. Furthermore, the system serves as a crucial component of California's strategy to reduce greenhouse gas (GHG) emissions, aiming to eliminate an average of 3,500 tons of emissions annually along its 800-mile corridor.

The project's initial vision encompassed an approximately 800-mile system connecting San Francisco and Sacramento in the north to Los Angeles and San Diego in the south. Due to its immense scale, complexity, and cost, the California High-Speed Rail Authority (CHSRA) divided the system into nine project sections for phased implementation, in line with Proposition 1A, the Safe, Reliable, High-Speed Passenger Train Bond Act of 2008. The current focus is on Phase 1, which aims to connect San Francisco to Anaheim via the Central Valley, with Phase 2 extending to Sacramento and San Diego in the future.

Key stakeholders in this monumental undertaking include the California High-Speed Rail Authority (CHSRA), the Federal Railroad Administration (FRA), the U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS),

National Parks Service (NPS), and the Advisory Council on Historic Preservation. Local governments, freight railroad companies, contractors, small businesses, disabled veteran business enterprises, disadvantaged business enterprises, and the general public (including affected communities and landowners) are also critical stakeholders.

All information in this case study is strictly obtained from the California High-Speed Rail Authority. Individual reports are referenced at the end of this document. For efficiency, direct mentions will be marked with the acronym “CHSRA” instead of the whole phrase.

## **2. Project Scope**

The CHSR project is a statewide infrastructure initiative aimed at establishing the nation’s first high-speed rail system. Its primary goal is to design, construct, and operate an electrified rail line that can exceed speeds of 200 mph, connecting the San Francisco Bay Area and the Los Angeles Basin through the Central Valley. This initiative has two phases: Phase 1 is underway, and Phase 2 involves future extensions to Sacramento and San Diego (CHSRA, 2023).

### **2.1. Deliverables**

The core deliverables include:

- The rail infrastructure (track, tunnels, viaducts, and stations).
- Electrified rolling stock (high-speed trains with Tier III compliance).
- Communication and signaling systems.
- Maintenance facilities and operations control centers.
- Environmental mitigation and community integration measures.

The 2025 Project Update Report states that the authority “will connect the [CHSR]’s Early Operating Service (Merced to Bakersfield),” planned in 2022 (CHSRA, 2022a), “to the newly electrified Caltrain system via Gilroy, creating immediate regional benefits” (CHSRA, 2025). This segment aims to showcase the project’s feasibility, benefits, and

safety before proceeding with further development.

## **2.2. Requirements**

The project utilizes advanced electrically powered, steel-wheel-on-steel-rail technology, capable of reaching speeds of up to 220 mph on grade-separated segments (CHSRA, 2022b). It aims to serve over 100 million annual riders upon completion. Modern safety, signaling, and automated train control systems, including Positive Train Control and Early Earthquake Warning, are required.

Regulatory compliance with federal and state environmental laws mandates Environmental Impact Reports/Statements (EIR/EIS) for all projects. Biennial Project Update Reports and Business Plans must be submitted to the California Legislature, outlining progress, funding, and risks. The system will operate on 100% renewable energy.

## **2.3. Constraints**

The project faces several critical constraints. These include:

- Financial constraints: a limited and uncertain funding pipeline reliant on state bonds, federal grants, and cap-and-trade revenues.
- Geographical challenges: rugged terrain, including the Tehachapi and San Gabriel mountains, that requires tunneling.
- Legal constraints: ongoing litigation from landowners, environmental groups, and political stakeholders.
- Time constraints: pressure on the schedule due to funding deadlines and public expectations.

## **2.4. Assumptions**

- Ongoing political and public support through successive state administrations.
- Consistent access to federal and state funding sources.
- A forecasted increase in California's population and demand for intra-state travel.
- The viability of addressing existing legal and technical challenges without significant

scope reductions

## 2.5. Work Breakdown Structure (WBS)

<b>1. Planning &amp; Design</b>	<ul style="list-style-type: none"><li>• Route &amp; Site Selection</li><li>• Environmental Approvals</li><li>• Engineering &amp; Architectural Design</li></ul>
<b>2. Infrastructure Construction</b>	<ul style="list-style-type: none"><li>• Earthwork &amp; Foundations</li><li>• Track &amp; Structures (Bridges, Tunnels)</li><li>• Stations &amp; Facilities</li></ul>
<b>3. Systems &amp; Rolling Stock</b>	<ul style="list-style-type: none"><li>• Power &amp; Signaling Systems</li><li>• Communications &amp; IT</li><li>• Train Procurement</li></ul>
<b>4. Project Management &amp; Support</b>	<ul style="list-style-type: none"><li>• Project Oversight</li><li>• Land Acquisition</li><li>• Legal &amp; Compliance</li></ul>
<b>5. Testing &amp; Commissioning</b>	<ul style="list-style-type: none"><li>• System Integration Testing</li><li>• Safety Certification</li><li>• Operational Trial Runs</li></ul>
<b>6. Operations &amp; Handover</b>	<ul style="list-style-type: none"><li>• Staffing &amp; Training</li><li>• Service Launch</li><li>• Ongoing Maintenance Readiness</li></ul>

## 3. Schedule and Timeline

The original CHSR timeline, drafted in 2008, proposed an “electrified commuter service as soon as 2020” (CHSRA, 2015). However, cost overruns, environmental lawsuits, and delays in right-of-way land acquisition forced the CHSR authority to push its expected start date to 2030. This had led to public scrutiny and a decline in the public’s interest in the project. Phase 1 now targets the completion of the Merced to Bakersfield segment by 2030 (CHSRA, 2023), with further safety enhancements scheduled for 2040 (CHSRA,



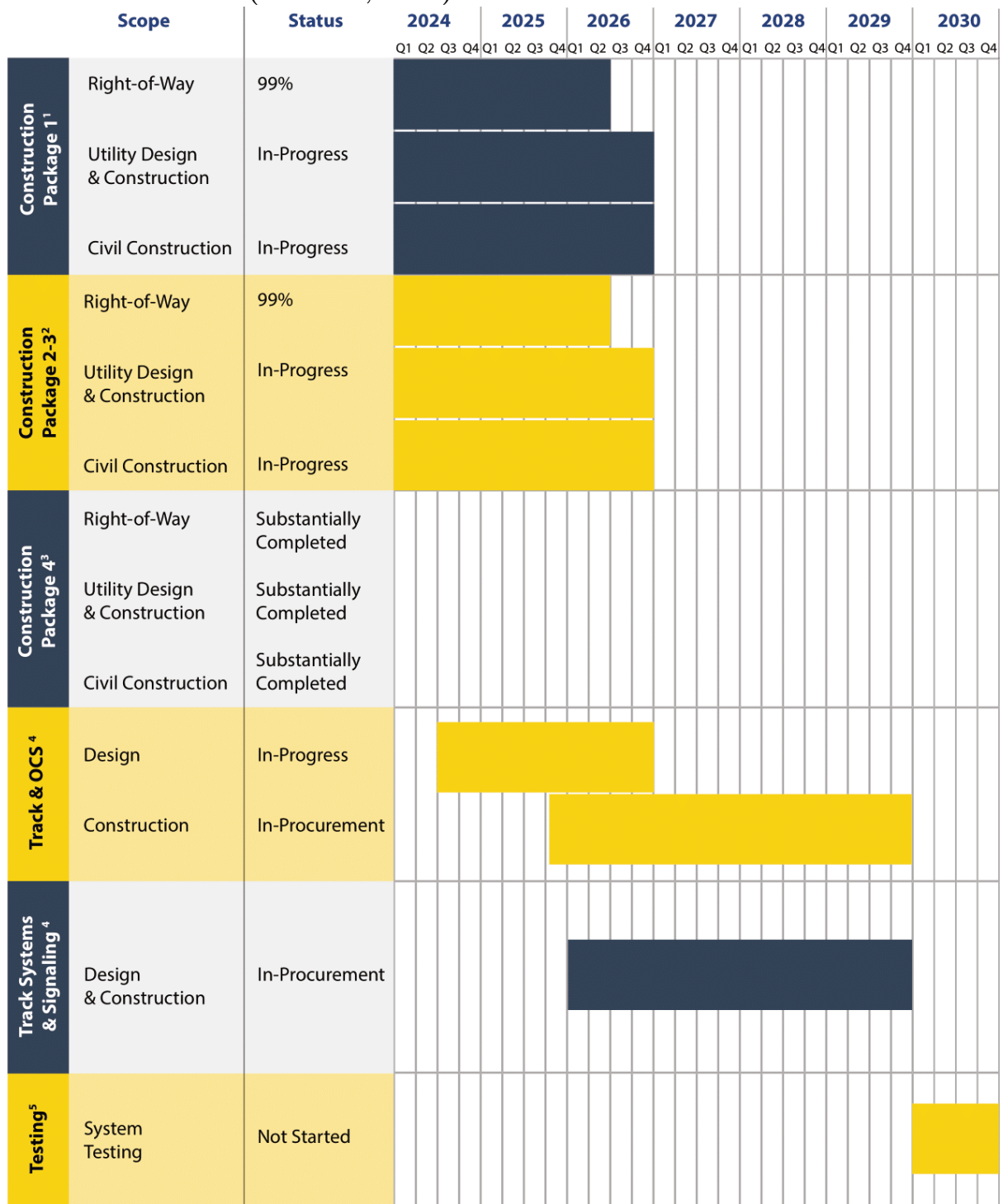
2025).

### **3.1. Schedule Management Challenges**

Various challenges have impacted the CHSR schedule:

- Legal delays due to land disputes and environmental litigation (California Legislative Analyst's Office, 2025).
- Inflation and supply chain disruptions post-COVID-19.
- Slow utility relocation and coordination with local jurisdictions.
- Delays in federal approvals and funding disbursements.

### 3.2. Gantt Chart (CHSRA, 2025)



Notes:

1. Based on latest approved revised baseline schedule
2. Based on latest conditionally approved revised baseline schedule
3. CP 4 is substantially complete
4. Dates align with latest grant agreement

### 3.3. Major Milestones

In 2024, “[Construction Package (CP)] 4 reached substantial completion, highlighting tremendous progress toward civil construction in the Central Valley” (CHSRA, 2025).

Construction packages one, two, and three are expected to be finished in 2026, with the Track Systems, Signaling, and Overhead Contact System (OCS) following closely behind, with completion dates set as late as 2029. Testing is scheduled to begin in 2030, with the project’s launch expected to follow in the same year. These milestones demonstrate a phased delivery model designed to maximize project resilience and flexibility in the face of changing political and economic conditions.

## 4. Budget and Cost Management

Budgeting and cost management have been among the most controversial and scrutinized elements of the CHSR project. Initially estimated at \$33 billion in the 2008 Business Plan for the full Phase 1 system, the project’s costs have ballooned to \$128 billion (CHSRA, 2024a). Fortunately, the 2025 Project Update Report “does not update any of the cost estimates included in the 2024 Business Plan (which were the same as the cost estimates included in the 2023 PUR)” (California Legislative Analyst’s Office, 2025).

### 4.1. Cost Breakdown and Budget Allocation

The budget structure is distributed across various elements, with cost categories including:

- **Civil construction (track, viaducts, tunnels):** \$12 – 13 billion
- **Systems installation (signaling, electrification):** \$3.80 – 3.82 billion
- **Rolling stock:** \$3.84 – 3.85 billion
- **Land acquisition:** \$2.7 – 2.8 billion
- **Environmental mitigation and design:** \$1.04 – 2 billion
- **Program management and contingency:** \$600 – 620 million

The estimated total revenue for the first phase is currently between \$26.7 billion and \$29.7 billion. This estimate is based on annual Cap-and-Trade revenue scenarios of \$750 million and \$1.25 billion per year through 2030, as well as a scenario assuming the current

yearly revenue trend of \$1 billion per year (CHSRA, 2025).

**Figure 4.1: Program Baseline Budget (\$ in Millions) (CHSRA, 2025)**

Scope	Amount	Notes
Central Valley Segment (CVS) Civil Construction: CP 1, CP 2-3, and CP 4	12,455	Civil works for 119 miles from Madera to Poplar Avenue, including SR-99 and SR-46 projects
CVS Track and Systems, Trainset Certification Facility, and Fresno Historic Depot	3,813	Single track and related systems on 119 miles from Madera to Poplar Avenue, high-speed rail trainset certification facility, and Fresno Historic Depot
Project Development and Advance Design	1,043	Phase 1 environmental clearance and advance design
Program Management and Support	2,732	Program management and support for planning and construction activities
Bookend Investments	1,298	Caltrain electrification, San Mateo grade separation, Rosecrans/Marquardt grade separation, Union Station
Program Contingencies and Reserves	618	Unallocated contingency, interim use, project reserve
<b>Subtotal with 2023 PUR Adjustments</b>	<b>21,960</b>	<b>Subtotal Without New Federal Grants Scopes</b>
Federal-State Partnership for Intercity Rail Grant Award Scope	3,842	High-speed rail trainsets, trainset facilities design and construction, Fresno station design and construction, Merced and Bakersfield extensions final design and ROW acquisition, and Bakersfield interim extension civil works and track and systems construction (\$3.074B FY2022 and 20-23 FSP-National grant award)
CRISI Grant Award Scope	292	Six grade separations in the City of Shafter (\$202M FY2022 CRISI grant award)
RAISE Grant for Fresno Historic Depot	0	Depot Renovation and Plaza Activation Project. No net budget change, but reflect new funding (\$20M 2023 RAISE grant award)
Corridor ID Grant	0	For planning associated with a future service development plan. No net budget change, but reflect new funding (\$500K 2023 CIDP grant award)
<b>Total January 2024 Expenditure Authorization</b>	<b>26,094</b>	<b>Total Program Baseline Budget</b>

**Note:** Totals may not sum due to independent rounding

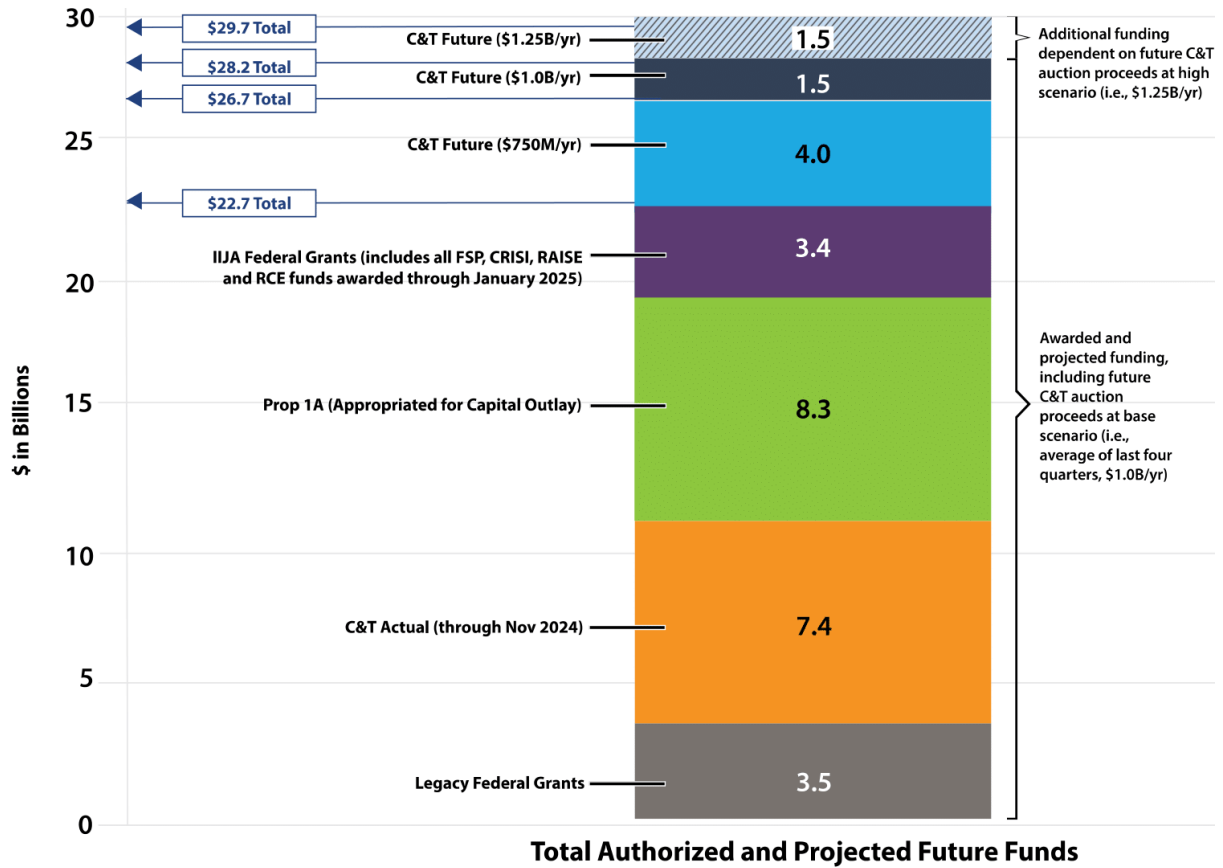
## 4.2. Funding Sources

The project is funded through a combination of state, federal, and private investments. Key funding sources include:

- **Proposition 1A:** A \$9 billion grant for planning, construction, and administration (CHSRA, 2022c)
- Funds from the American Recovery and Reinvestment Act
- Federal-State partnership for Intercity Rail Grant Award

- CRISI Grant Award
- RAISE Grant for the Fresno Historic Depot

**Figure 4.2: Authorized and Projected Future Funding (CHSRA, 2025)**



\*Totals may not sum due to independent rounding

\*\*Portion of future C&T revenues may be used to fund administrative support activities

\*\*\*Prop 1A is net of funds for administrative support activities

## 5. Quality Management

### 5.1. Quality Objectives and Standards

The quality objectives of the CHSR project emphasize three primary outcomes: compliance with federal and state regulatory agencies regarding safety and performance; excellence in design and construction that ensures durability, requires minimal maintenance, and exhibits resilience; and adherence to standards for customer experience, including timeliness, ride comfort, and accessibility. The CHSR authority's Quality Management System (QMS) is based on ISO 9001:2015 (CHSRA, 2024b), which integrates requirements for contractor quality assurance (QA) and quality control (QC).

## **5.2. Quality Assurance and Quality Control Framework**

The authority maintains a comprehensive, multi-level QA/QC framework that includes contractors responsible for initial quality control, such as material testing and inspection; independent quality assurance firms (IQFs) hired to verify contractor results; and supervision by the CHSR authority to ensure compliance with standards throughout the entire project. Quality is monitored at every stage— from design validation and environmental compliance to civil construction and system integration.

## **5.3. Challenges in Quality Management**

Despite its robust architecture, the CHSR has encountered multiple challenges related to quality management:

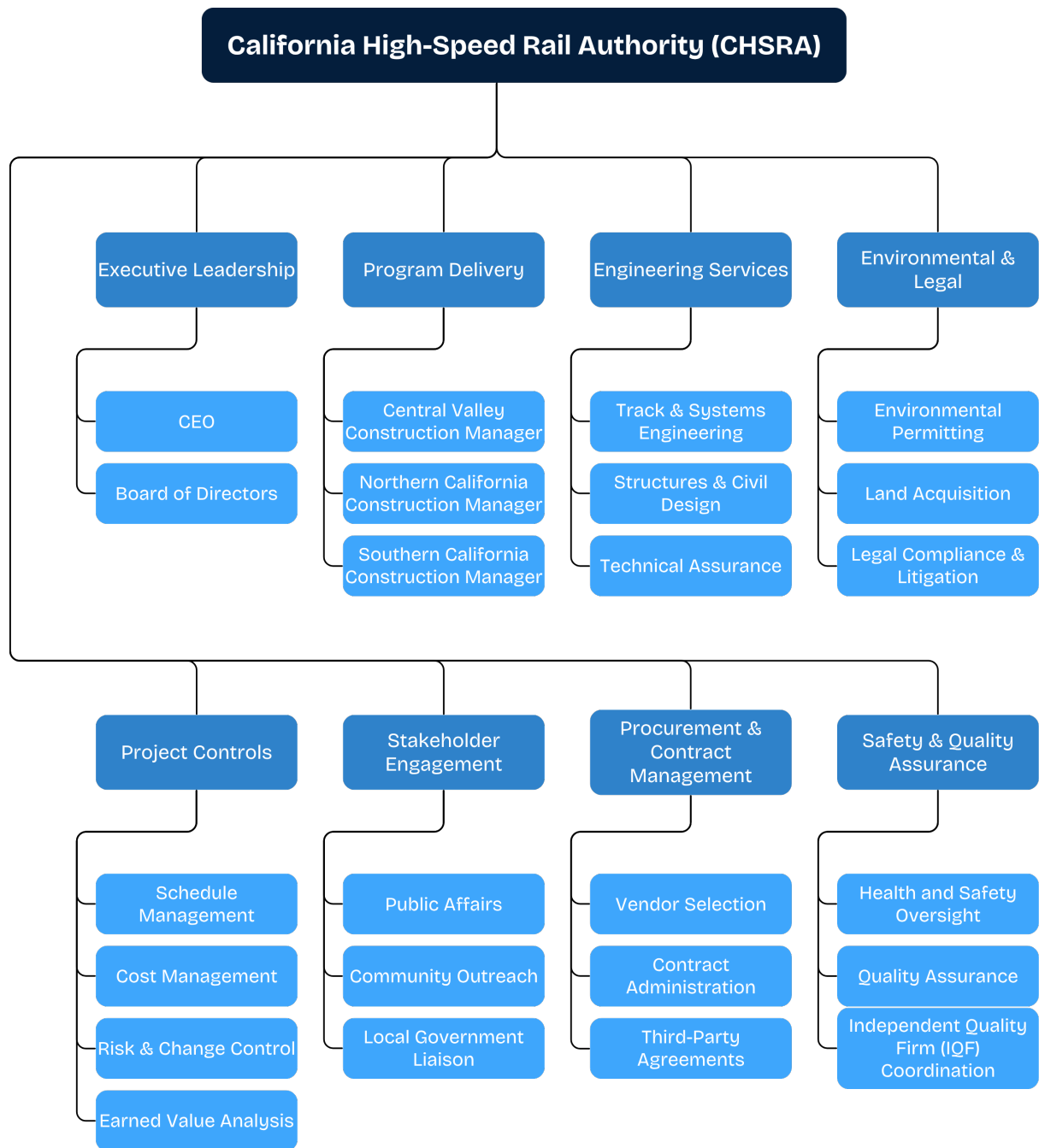
- Design modifications and initial engineering complications, resulting in rework and increased expenses.
- Inconsistent quality among contractors, particularly in subcontracted earthworks and viaduct segments.
- Delays in coordinating with third-party utility providers, adversely affecting inspections and certifications.

These challenges have necessitated the adoption of a more integrated quality governance framework that enhances coordination among IQFs, contractors, and CHSRA engineering teams.

## **6. Resource Management**

The project involves a vast range of professionals, including civil engineers, project managers, environmental specialists, utility coordinators, contractors, and third-party auditors. The CHSR authority’s Organizational Breakdown Structure (OBS) identifies the various functional roles across major delivery areas, including the day-to-day execution of construction packages, design standards, technical oversight, permitting, stakeholder engagement, land acquisition, cost management, scheduling, and risk management.

**Figure 6.1: Organizational Breakdown Structure (OBS)**



## 7. Communications Management

### 7.1. Communication Objectives

The key objectives of the CHSR's communication plan are to:

- Ensure timely dissemination of accurate project information.
- Facilitate coordination between agencies, contractors, and the public.

- Promote transparency and public trust.
- Support regulatory compliance and stakeholder engagement.

## 7.2. Stakeholder Communication Needs

Stakeholder	Communication Needs	Frequency	Format
California High-Speed Rail Authority (CHSRA)	Strategic oversight, performance updates	Bi-Weekly	Dashboards, reports
Federal Railroad Administration	Regulatory compliance, funding justifications	Quarterly	Reports, audits
State Government	Political oversight, budgeting information	Monthly	Briefings, memos
Local Governments	Land use, environmental, and alignment updates	Monthly	Public meetings
Contractors and Consultants	Technical coordination, scope changes, timeline updates	Weekly	Progress reports
Public and Communities	Project impact, noise, land acquisition, employment	Ongoing	Newsletters, website
Media	General updates, milestones, public relations	Ad hoc	Press release

## 7.3. Tools and Channels

To manage communication, the CHSR project utilizes both traditional and digital platforms:

- **Project Website:** Serves as the central platform for public documents, news, and updates.
- **Project Management Software:** Utilizes systems such as Primavera P6 and Microsoft Project for internal communication and scheduling updates.
- **Stakeholder Newsletters:** Distributed monthly to inform local communities and interest groups.
- **Public Hearings and Town Halls:** Conducted during environmental review phases and community outreach efforts.



- **Social Media Platforms:** Employs X, Facebook, and YouTube for public engagement and real-time updates.
- **Document Management System:** Implements SharePoint and cloud-based repositories for formal reports and document control.

#### 7.4. Communications Matrix

Message Type	Sender	Receiver	Method	Frequency
Regular Status Report	Project Managers	CHSRA Executives	Email, Dashboard	Bi-Weekly
Regularly Update	Environmental Team Lead	FRA, EPA	Formal Report	Quarterly
Risk Alerts	Risk Manager	Engineering, Legal Teams	Email + Meeting Notes	Ad hoc
Progress Milestones	Communications Manager	Public + Media	Press Release, Website	As needed

#### 7.5. RACI Matrix

Activity / Task	CHSR Exec	Program Mgmt Office	Eng. Team	Legal Team	Contractors	Local Gov't	Public Affairs	Stakeholder Liaison
Define Project Scope	A	R	C	C	I	C	I	C
Schedule Planning Updates	I	A/R	C	I	C	I	I	I
Budget Approval	A	R	I	C	I	I	I	I
Procurement Bidding	A	R	C	C	C	I	I	I
Environmental Review	I	R	C	A	C	C	I	C

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Risk Identification Mitigation	I	R/A	C	C	C	I	I	C
Quality Assurance Inspections	I	R	A	I	R	I	I	I
Community Engagement Town Halls	I	C	I	I	I	C	A	R
Press Releases and Public Info Sharing	I	C	I	I	I	I	R/A	C
Final Project Acceptance	A	R	C	C	C	I	I	I

## 8. Risk Management

### 8.1. Risk Management Plan

The CHSRA adheres to a formal risk management process that aligns with the ISO 31000 standards. The process involves:

- **Risk Identification:** Conducted through expert workshops, historical data analysis, stakeholder interviews, and scenario simulations.
- **Risk Assessment:** Risks are evaluated in terms of likelihood and impact using a qualitative and quantitative matrix.
- **Risk Response Planning:** Strategies are developed, including mitigation, transfer, acceptance, or avoidance.
- **Risk Monitoring and Control:** Continuous monitoring through regular reviews, updates, and use of Early Warning Systems (EWS).

## 8.2. Risk Management and Mitigation Matrix

Probability		<b>Federal funding withdrawal</b> <ul style="list-style-type: none"> <li>• Maintain bipartisan support</li> <li>• Demonstrate milestones</li> </ul>
	<b>Labor shortages in rural segments</b> <ul style="list-style-type: none"> <li>• Workforce development programs</li> <li>• Local hiring mandates</li> </ul>	<b>Construction delays from land disputes</b> <ul style="list-style-type: none"> <li>• Advance right-of-way acquisition</li> <li>• Legal support teams</li> </ul>
		<b>Public opposition to route alignment</b> <ul style="list-style-type: none"> <li>• Transparent town halls</li> <li>• Route adjustments where possible</li> </ul>
		<b>System integration issues (track &amp; tech)</b> <ul style="list-style-type: none"> <li>• Rigorous testing</li> <li>• Phased commissioning</li> </ul>
	<b>Environmental permit delays</b> <ul style="list-style-type: none"> <li>• Early engagement with EPA &amp; CEQA</li> <li>• Buffer in schedule</li> </ul>	<b>Cost Overruns</b> <ul style="list-style-type: none"> <li>• Escalation clauses in contracts</li> <li>• Regular market review</li> </ul>
Impact		

## 9. Stakeholder Management

### 9.1. Stakeholder Identification

Stakeholders are classified based on their influence, interest, and level of engagement. Principal stakeholder groups encompass internal entities such as the CHSRA Executive Board, the Project Management Office, and the engineering and legal teams. Additionally, external stakeholders include the California State Legislature, the Federal

Railroad Administration, local government authorities, landowners, environmental organizations, contractors, labor unions, community organizations, and the general public.

## 9.2. Stakeholder Engagement Strategies

The CHSRA deploys a tiered engagement plan:

Interest	<b>High Interest, Low Influence</b>	<b>High Interest, High Influence</b>
	Affected communities Local businesses Environmental NGOs Labor unions	California High-Speed Rail Authority Federal Railroad Administration California State Legislature
	Public town halls, newsletters, community liaison offices, interactive website dashboards	Regular briefings, strategic updates, performance dashboards, decision-making involvement
	<b>Low Interest, Low Influence</b>	<b>Low Interest, High Influence</b>
	General public outside affected zones	US Environmental Protection Agency Army Corps of Engineers Federal Transit Authority
	Occasional press releases, general website updates	Ensure compliance updates, maintain strong working relationships, notify on major decisions
Influence		

## 9.3. Stakeholder Communication Methods

Stakeholder communication is a vital part of any project. Guided by the Communications Management Plan, stakeholders can be informed through public engagement, regulatory reports, and community relations. Public engagement includes town halls, information sessions, and feedback surveys. Regulatory reports such as

compliance reports, quarterly performance reviews, and lobbying updates also provide crucial statistics about the project. Community relations ensures that stakeholders are actively informed and kept happy. The CHSR authority established a Stakeholder Liaison Office to manage grassroots engagements, particularly concerning eminent domain and environmental disputes.

#### **9.4. Managing Conflicts and Resistance**

Resistance was expected, especially concerning land acquisition, environmental impact, and budget overruns. The Project Management Office applies conflict resolution strategies, including mediation and compensation mechanisms, along with mitigation techniques such as rerouting in sensitive areas and noise reduction measures. Additionally, targeted benefits are offered to impacted communities, such as employment opportunities. It also utilizes transparency tools, such as public dashboards and financial disclosures, notably the CHSR website, which has been effectively used as the primary source throughout this document.

## **10. Project Closure**

The closure of the project represents the concluding phase of the project lifecycle, encompassing the formal certification of completion, evaluation of outcomes, and verification that deliverables adhere to the mutually agreed-upon standards. Given the intricacy of the CHSR project, the closure process must be executed in a phased and strategic manner to ensure sustainability, compliance, and stakeholder satisfaction.

### **10.1. Closure Criteria**

For each segment, such as the Central Valley IOS, completion is contingent upon the fulfillment of all contractual deliverables (including infrastructure, safety systems, and interoperability), the successful performance testing and commissioning of all systems, and obtaining regulatory approval. A segment shall not be deemed complete unless these three criteria are satisfied. These criteria cannot be prioritized by urgency, as the first pertains to the physical installation of the project, the second concerns safety

and operability, and the third involves securing legal approval from state authorities and ensuring compliance with safety, environmental, and technical standards.

## **10.2. Acceptance Process**

The acceptance process begins with the Project Management Office issuing formal handover reports to the CHSR authority's executive board and operations division, indicating that the project is ready for operational review. At the same time, an Operational Readiness Review is conducted to carefully verify that all key components, including sufficient staffing, robust systems, and detailed maintenance plans, are in place and prepared for deployment. The final crucial step is obtaining stakeholder sign-off, which involves securing approval from key stakeholders, including the State of California, the Federal Railroad Administration, and relevant community representatives, especially those in areas heavily affected by eminent domain or construction activities. This process ensures that all concerns are adequately addressed before the project is officially accepted.

## **10.3. Documentation and Archiving**

Any project requires thorough documentation for future research and growth. Fortunately, the CHSR authority is mandated by the State of California's Legislative Analyst's Office to submit annual project update reports and business plan updates every 2-4 years (or whenever there is a change to the plan). This requirement will simplify archiving, as by the project's end, only minor edits will be needed for the latest business plan and project update report to accurately reflect the project's overall progress. This includes final risk registers, procurement logs, financial records, commissioning records, warranties, legal documents, and stakeholder agreements. Additionally, all documentation must be stored in a centralized digital repository to comply with California's Public Records Act (California Government Code, § 6250 et seq.).

## **10.4. Conclusions and Transitions**

Project reviews shall be conducted to assess schedule compliance, cost deviations, the efficacy of stakeholder engagement strategies, contractor and supplier performance, and the effectiveness of risk management. These insights shall offer a prospective outlook for

CHSR segments and other significant infrastructure endeavors within California. Upon completion, responsibilities will be transferred from the Project Management Office to the Operations and Maintenance Division, which will oversee the daily service operations, ongoing maintenance, and user feedback collection of the CHSR. Staff recruitment, training, and onboarding procedures should commence approximately six months prior to the project's completion to facilitate a seamless transition.

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