California High-Speed Rail Program

TECHNICAL MEMORANDUM

Basis of Design for Blended Operation in the Los Angeles to Anaheim Corridor TM 0.3.1

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Note: Signatures apply for the latest technical memorandum revision as noted above.

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for the California High-Speed Rail Authority

System Level Technical and Integration Reviews

The purpose of the review is to ensure:

- Technical consistency and appropriateness
- Check for integration issues and conflicts

System level reviews are required for all technical memoranda. Technical Leads for each subsystem are responsible for completing the reviews in a timely manner and identifying appropriate senior staff to perform the review. Exemption to the system level technical and integration review by any subsystem must be approved by the Engineering Manager.

System Level Technical Reviews by Subsystem:

Systems:	*Signature on file* Bradley Banks, PE	Date
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Operations and Maintenance:	*Signature on file* Joseph Metzler	Date
System Integration:	*Signature on file* Oliver Hoehne	Date
Regulatory Approvals:	*Signature on file* John Cockle	Date
Rolling Stock:	*Signature on file* Frank Banko	Date
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Note: Signatures apply for the technical memorandum revision corresponding to revision number in header and as noted on cover.

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ABSTRACT

The California High-Speed Rail System is proposed as a high-speed, steel-wheel-on-steel-rail train operation that will provide service throughout the state of California with terminals in Sacramento, San Francisco, Los Angeles, Anaheim, and San Diego.

System requirements, technical memoranda, and design criteria developed to date are based on high-speed trains operating on dedicated high-speed rail facilities as defined in the *Technical Memorandum 0.3, Basis of Design Policy* report. In its 2012 Business Plan, the California High-Speed Rail Authority (Authority) adopted a strategy to 'blend' high speed with existing rail systems on shared infrastructure to accelerate and broaden benefits, improve efficiency, minimize community impacts and reduce construction cost. This strategy was reaffirmed in the Authority's 2014 Business Plan.

This *Basis of Design for Blended Operation* defines the major policy considerations, system elements, and performance objectives that are envisioned by the Authority for the Los Angeles to Anaheim section, which will share tracks with other rail services. This document summarizes the vision for the corridor and will serve as the basis for establishing the technical requirements necessary to allow joint operation of high-speed rail, conventional passenger rail, and freight rail within the blended system corridor between Union Station in Los Angeles and the Anaheim Regional Transportation Intermodal Center in Anaheim.

This document supplements *Technical Memorandum 0.3, Basis of Design Policy* report and addresses the primary elements that differ between the blended operation and the dedicated high-speed operation in the prior document. It specifically focuses on objectives, processes, requirements, and assumptions that are governed by Authority policy.

1.0 INTRODUCTION

1.1 PURPOSE OF BASIS OF DESIGN POLICY FOR SHARED TRACK

This *Basis of Design for* Blended Operation technical memoranda defines the major policy considerations, system elements, and performance objectives that are envisioned by the California High-Speed Rail Authority (Authority) for the Los Angeles to Anaheim project section.

System requirements and design criteria developed to date are based on high-speed trains operating on dedicated high-speed rail facilities. The Authority is intending to develop design requirements to allow operation of high-speed trains at lower speeds on tracks shared with other rail operators within specific limits of the Los Angeles to Anaheim section.

This document supplements *Technical Memorandum 0.3, Basis of Design Policy* report and addresses the basis of design elements that differ between blended operation and the dedicated high-speed operation defined in the prior document. It specifically focuses on objectives, processes, requirements, and assumptions that support the blended operation.

This document is considered a living document and will be updated as the California High-Speed Rail Program CHSRP is further developed and defined.

The policies determining processes, standards, and subsystems of the California High-Speed Rail System (CHSRS) are generally organized in this document by the following:

- Program Implementation
- Performance Requirements
- Infrastructure
- Rolling Stock
- Maintenance
- Systems (Electrification, Train Control, Communications)
- Operations
- Safety, Security
- Reliability

1.2 BACKGROUND

In its 2012 Business Plan, the California High-Speed Rail Authority (Authority) adopted a strategy to 'blend' high speed with existing rail systems on shared infrastructure to accelerate and broaden benefits, improve efficiency, minimize community impacts and reduce construction cost. This strategy was reaffirmed in the Authority's 2014 Business Plan.

Existing rail systems currently serve intercity, commuter, and regional trips throughout California. A blended system will leverage these systems by tying these together with a high-speed rail backbone through the Central Valley and connecting major metropolitan areas. Improvements to the regional and commuter rail systems are intended to improve connections and facilitate integration with the high-speed rail system. Regional or local improvements to the existing systems, such as elimination of at-grade crossings and the addition of passing tracks, have independent utility that will benefit regional and commuter passenger prior to connection to the high-speed rail system.

The blended system will allow rail operators to take advantage of new and improved infrastructure to enhance existing services, and deliver benefits sooner. The system will evolve over time as infrastructure is developed and utilization will progress from the existing rail services to blended operation with a goal to maximize and accelerate the benefits of investments in a cost-effective manner.

A summary description of the blended system, as defined in the Authority's 2012 and 2014 Business Plans is included in Appendix A.

1.3 PROJECT DESCRIPTION

The CHSRS is envisioned as a state-of-the-art, electric powered, high-speed, steel-wheel-on-steel-rail trainset technology, including infrastructure, signaling and train-control systems.

The CHSRS will operate in corridors shared with other passenger rail and freight operations in the Peninsula Corridor in the San Francisco Bay area and the LOSSAN Corridor between Los Angeles and Anaheim. The route may be constructed at-grade, in trenches, in tunnels, or on elevated guideway depending on terrain and physical constraints. Portions of the system may lie within, or adjacent to, existing rail or highway rights-of-way to reduce impacts, minimize land acquisition and enhance interfaces with commercial airports, transit facilities, and the state highway network.

As the CHSRP is developed and refined, ridership data will be updated to confirm system capacity, service levels and frequency of service, and operating plans.

1.3.1 Los Angeles to Anaheim Corridor Operations

The operation requirements for the Los Angeles to Anaheim section will be based primarily on the FRA guidelines for mixed fleet operations that are anticipated to serve as a basis for future federal regulations. The FRA Tier Structure for Passenger Systems is defined in Appendix B.

The following railroads will operate in the corridor between Los Angeles and Anaheim.

- Amtrak
- Burlington Northern Santa Fe (BNSF) Railway*
- Southern California Regional Rail Authority (SCRRA, governing body for Metrolink commuter rail)
- Union Pacific Railroad (UPRR)
- California High-Speed Rail Authority (Authority)

* The Riverside County Transportation Commission (RCTC) owns track rights on the BNSF tracks in this section.

There are various operating plans that could be implemented within the corridor. Studies will be required to determine service levels and infrastructure needs of the respective operators. Where high-speed rail operates on existing track infrastructure, the Authority is assumed to be a tenant railroad and the requirements for the Los Angeles to Anaheim Corridor will generally be based on the host railroad standards.

The Authority has or will establish memoranda of understanding (MOUs) and agreements with the owners and operators within the corridor for implementation of the high-speed system.

1.4 POLICY CONSIDERATIONS

Conditions introduced for the operation of high-speed trains in the blended system corridor will require the establishment of new policies and/or revisions to the Authority policies that were established for dedicated high-speed operation.

Table 1-1 presents a summary of the policies that require revision and identifies new policies that may be required to support blended operation within the corridor. The table is organized by geographic subsection and includes a listing of the “Involved Party or Parties” that the Authority may have to coordinate with in establishing the policy and/or an agreement.

Table 1-1 Policies for Blended Operation

Sub Section	Policy Description	Involved Parties	Revision/New
LAUS to Redondo Junction	Right-of-Way Ownership	Metro	New
	Track Rights	Metro, BNSF, Authority	New
	Dispatching	Metrolink, Authority	TBD
	Train Control	Metrolink, Amtrak, BNSF, Authority	New
	Intrusion Protection	Metrolink, Authority	Revision
	Utilities within ROW	Metrolink, BNSF, Authority	Revision
	Passenger Comfort	Authority	Revision
	Station Capacity	Metro, Authority	Revision
	Maintenance Access	Metrolink, BNSF, Authority	New
	Maintenance	Metrolink, Authority, Metro	New
	Access Control	Metro, Authority	Revision
	Grade Separations	Fully grade separated	New
	Fare Control	Metrolink, Amtrak, Authority	TBD
	Security	Metro, Authority	Revision
	Accommodate Freight Operation	Metro, BNSF, Authority	New
Redondo Junction to Fullerton	Right-of-Way Ownership	BNSF	New
	Track Rights	BNSF, RCTC, Metrolink, Authority, UPRR	New
	Dispatching	BNSF	New
	Train Control	BNSF	New
	Intrusion Protection	Metrolink, BNSF, Authority	Revision
	Utilities within ROW	Metrolink, BNSF, Authority	Revision
	Passenger Comfort	Authority	Revision
	Station Capacity	N/A	Revision
	Maintenance Access	Metrolink, BNSF, Authority	New
	Maintenance	Metrolink, Authority	New
	Access Control	Metrolink, BNSF, Authority	Revision
	Grade Separations	Metro, OCTA, Authority	New
	Fare Control	Metrolink, Amtrak, Authority	TBD
	Security	BNSF, Authority	Revision
	Accommodate Freight Operation	BNSF, Authority	New

Table 1-2 Policies for Blended Operation (cont.)

Sub Section	Policy Description	Involved Parties	Revision/New
Fullerton to Anaheim	Right-of-Way Ownership	OCTA	New
	Track Rights	BNSF, UPRR, Metrolink	New
	Dispatching	Metrolink, BNSF, UPRR, Authority	TBD
	Train Control	Metrolink, Amtrak, BNSF, UPRR, Authority	New
	Intrusion Protection	OCTA, Authority	Revision
	Utilities within ROW	BNSF, OCTA, Authority	Revision
	Passenger Comfort	Authority	Revision
	Station Capacity	N/A	Revision
	Maintenance Access	Metrolink, BNSF, UPRR, OCTA, Authority	New
	Maintenance	Metrolink, OCTA, Authority	New
	Access Control	Metrolink, OCTA, Authority	Revision
	Grade Separations	OCTA, Authority, City of Anaheim	New
	Fare Control	Metrolink, Amtrak, Authority	TBD
	Security	OCTA, Authority	Revision
	Accommodate Freight Operation	BNSF, UPRR, Authority	New

1.5 GENERAL INFORMATION

1.5.1 Definition of Terms

Shared Track — A track designated in the operating rules for the operation of both the high-speed trains and other passenger or freight trains. Also referred to as Shared Use Track.

FRA regulations govern this type of operation, in which temporal separation (no simultaneous operation) may be required.

Shared Right-of-Way — Railroad vehicles operate on separate tracks with track centers less than 25 feet (i.e., separation between the centerline of the freight track and the centerline of the passenger track is less than 25 feet).

Shared Rail Corridor — A Shared Corridor in which the other transportation systems are other railroads that may include passengers and freight.

Shared Minor Facilities — These include rail/highway crossings where transit line and railroad system share crossing protection; level crossings between transit tracks and railroad system tracks; and shared bridges.

Acronyms

Authority	California High-Speed Rail Authority
BNSF	Burlington Northern Santa Fe Railway
Caltrans	California Department of Transportation
CFR	Code of Federal Regulations
CHSRP	California High-Speed Rail Program
CHSRS	California High-Speed Rail System
CPUC	California Public Utilities Commission
FRA	Federal Railroad Administration
g	Standard gravity (9.81m/sec^2 / 32 ft./sec^2)
HSR	High-Speed Rail
LEED	Leadership in Energy and Environmental Design
LOSSAN	Los Angeles - San Diego - San Luis Obispo Rail Corridor
MOU	Memorandum of Understanding
MOI	Maintenance of Infrastructure
mph	Miles per hour
NEPA	National Environmental Protection Act
OCS	Overhead Contact System
OCTA	Orange County Transportation Authority
PTC	Positive Train Control
RAMS	Reliability, Availability, Maintainability, and Safety
RCTC	Riverside County Transportation Commission
ROW	Right-of-Way
SCRRA	Southern California Regional Rail Authority
tph	Trains per hour
TPSS	Traction Power Supply System
TOD	Transit Oriented Development
UPRR	Union Pacific Railroad

1.5.2 Units

The California High-Speed Rail Program is based on U.S. Customary Units consistent with guidelines prepared by the California Department of Transportation (Caltrans) and defined by the National Institute of Standards and Technology (NIST). U.S. Customary Units are officially used in the U.S. and are also known in the U.S. as “English” or “Imperial” units. In order to avoid any confusion, all formal references to units of measure should be made in terms of U.S. Customary Units.

2.0 PROGRAM IMPLEMENTATION

2.1 GOVERNING LEGISLATION AND ENVIRONMENTAL DOCUMENTATION

Governing legislation and other legal documentation dictate performance characteristics of the California High-Speed Rail Program. Proposition 1A was passed by the voters of the state of California on November 4, 2008. The following language establishes the Phase 1 corridor of the California High-Speed Rail Program and outlines the requirements from the proposition which have since been added as Chapter 20 to Division 3 of the State Streets and Highways Code:

> *2704.04. (b) (2) As adopted by the authority in May 2007, Phase 1 of the high-speed train project is the corridor of the high-speed train system between San Francisco Transbay Terminal and Los Angeles Union Station and Anaheim.*
>
> *2704.09. The high-speed train system to be constructed pursuant to this chapter shall have the following characteristics:*
>
> *(a) Electric trains that are capable of sustained maximum revenue operating speeds of no less than 200 miles per hour.*
>
> *(b) Maximum nonstop service travel times for each corridor that shall not exceed the following:*
>
> *(1) San Francisco-Los Angeles Union Station: two hours, 40 minutes.*
> *(2) Oakland-Los Angeles Union Station: two hours, 40 minutes.*
> *(3) San Francisco-San Jose: 30 minutes.*
> *(4) San Jose-Los Angeles: two hours, 10 minutes.*
> *(5) San Diego-Los Angeles: one hour, 20 minutes.*
> *(6) Inland Empire-Los Angeles: 30 minutes.*
> *(7) Sacramento-Los Angeles: two hours, 20 minutes.*
>
> *(c) Achievable operating headway (time between successive trains) shall be five minutes or less.*
>
> *(d) The total number of stations to be served by high-speed trains for all of the corridors described in subdivision (b) of Section 2704.04 shall not exceed 24. There shall be no station between the Gilroy station and the Merced station.*
>
> *(e) Trains shall have the capability to transition intermediate stations, or to bypass those stations, at mainline operating speed.*
>
> *(f) For each corridor described in subdivision (b), passengers shall have the capability of traveling from any station on that corridor to any other station on that corridor without being required to change trains.*
>
> *(g) In order to reduce impacts on communities and the environment, the alignment for the high-speed train system shall follow existing transportation or utility corridors to the extent feasible and shall be financially viable, as determined by the authority.*
>
> *(h) Stations shall be located in areas with good access to local mass transit or other modes of transportation.*
>
> *(i) The high-speed train system shall be planned and constructed in a manner that minimizes urban sprawl and impacts on the natural environment.*
>
> *(j) Preserving wildlife corridors and mitigating impacts to wildlife movement, where feasible as determined by the authority, in order to limit the extent to which the system may present an additional barrier to wildlife's natural movement.*

Although the Los Angeles to Anaheim Corridor is not exempt from requirements, it is anticipated that the following of these legislative requirements will not be met due to corridor constraints:

- Achievable operating headway (time between successive trains) shall be five minutes or less.
- Trains shall have the capability to transition intermediate stations, or to bypass those stations, at mainline operating speed.

2.2 DEVELOPMENT OF TECHNICAL REQUIREMENTS

2.2.1 State and Federal Regulating Agencies

Development of high-speed rail in California will address applicable regulatory safety and security requirements including but not limited to:

- Federal Railroad Administration (FRA) 49 CFR Part 200-299
- California Public Utilities Commission (CPUC) General Orders
- Transportation Security Administration (TSA) 49 CFR Part 1580
- California Office of the State Fire Marshal (OSFM) NFPA 130

In order to commence operation and address applicable regulations, the Authority is required to certify to FRA that applicable regulatory requirements have been met and that the system is safe and secure prior to the start of revenue operations. The Authority may be required to develop new General Orders or seek waivers from applicable General Orders.

2.2.2 System Design Approach

The Los Angeles – Anaheim shared track corridor will be FRA Tier I (IB) or Emerging HSR facilities. Dedicated corridors will be classified as FRA tier III (V) or HST Express facilities. Tier III passenger equipment shall be operational in three environments:

1. On shared track in conventional passenger/freight railroad ROW
2. On dedicated high-speed tracks in shared passenger/freight ROW
3. On dedicated high-speed tracks in dedicated high-speed ROW

High-speed equipment shall be operationally compatible with rail equipment operating as Tier I service.

2.2.3 Reliability, Availability, Maintainability, and Safety

Reliability, availability, and maintainability are achieved by the application of proven technical standards commensurate with the specified level of performance. The technical standards must reflect a comprehensive set of proven principles and system requirements to ensure that all aspects of a high-speed rail network are addressed and integrated. A Reliability, Availability, Maintainability, and Safety (RAMS) plan will be developed consistent with best practices for international high-speed rail and *EN 50126, Railway applications - The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)*.

Safety and security are achieved through the application of a risk-based hazard and vulnerability management program that identifies hazards and vulnerabilities, assesses associated risks, and certifies the application of mitigation measures that reduce the residual risk to a level acceptable to the Authority. Hazards and vulnerabilities are managed for the system, analyzing the risks both initially and in aggregate. Site-specific hazard and vulnerability analysis is applied where local conditions are unique or fall outside the parameters of the programmatic hazard and vulnerability analysis. The Authority's Safety and Security Management Plan describes the policies, responsibilities, and procedures necessary to achieve an acceptable level of safety and security.

2.2.4 Interoperability

Interoperability is required between the passenger and freight railroads that operate in the LA-A corridor. The railroad operators are:

- Authority
- Amtrak
- Union Pacific Railroad
- Metrolink
- BNSF Railway

Interoperability will be achieved by systematically identifying the interfaces between operations and maintenance, systems, rolling stock, infrastructure, stations, track, etc. and proactively managing the

interfaces between the various CHSRS elements. Interface requirements, design and implementation will be documented and agreed upon between affected parties following a Systems Integration approach.

2.3 COST ESTIMATING

Cost estimates will be updated based on information from the project's environmental and preliminary engineering studies. Capital cost estimates will include estimated values for environmental mitigation, program implementation, and contingency. Where required, unit prices will be escalated using construction industry estimating practices. Cost estimate updates may be released by the Authority with the issuance of Business Plans or other formal reports.

3.0 PERFORMANCE REQUIREMENTS

The Authority has established performance requirements to guide the development of the high-speed rail system in blended corridors based on the FRA Tier Structure for Passenger systems described in the "High-Speed Passenger Rail Safety Strategy (2009)."

3.1 SAFETY AND SECURITY

Trains, infrastructure, facilities, systems and operational processes must be designed, constructed, and implemented in a manner that promotes the safety and security of persons and property. The design, construction, testing, and start-up of the CHSRP will comply with applicable safety and security laws, regulations, requirements and railroad industry practices. The Authority will maintain or improve upon the public transit and railroad industry standards for safety and security. Through the Reliability, Availability, Maintainability, and Safety (RAMS) program and the application of system safety and security, a standard of safety and security will be established to ensure a level of safety and security to confirm the system is as safe as or safer than conventional U.S. railroad operations. The design, construction, testing, and start-up of the CHSRP will be accomplished in compliance with this standard.

3.2 SYSTEM CAPACITY AND RIDERSHIP

The CHSR system will be developed to accommodate the level of passengers anticipated in the year 2040 consistent with the demand forecast model and a feasible fare structure approved by the Authority.

Computer-based simulation modeling will be used to develop a ridership demand model that considers future population and employment distribution, income growth, transportation networks, travel conditions and patterns, and the speed, frequency and cost of available transportation modes.

The ridership and travel time projections will be updated and refined as the high-speed rail route sections are developed during project-level environmental and engineering studies. Operational modeling efforts will be advanced concurrent with the preliminary engineering studies and will be the primary tool to confirm performance levels of the System.

For the Los Angeles to Anaheim section, combined Authority, BNSF, Metrolink and Amtrak ridership and travel time will be taken into consideration for assessing overall corridor capacity.

3.3 DESIGN/OPERATING SPEEDS

The speed criteria for the Los Angeles to Anaheim Corridor are as follows:

- **Design Speed:** will be 90 mph
- **Operating Speed:** The design will provide for a maximum operating speed of 90 mph

3.4 TRIP TRAVEL TIMES

Trip travel time for Los Angeles to Anaheim is not mandated by Chapter 20, Division 3 of the State Streets and Highways Code.

3.5 PERFORMANCE REQUIREMENTS SUMMARY

The CHSRS will meet the following performance requirements in the Los Angeles to Anaheim section:

General

- Electrified steel-wheel-on-steel-rail high-speed system
- Capable of safe, comfortable, and efficient operation at speeds not exceeding 110 mph
- Passenger comfort (smoothness of ride) with a lateral acceleration equal to or less than 0.05 g.

Infrastructure

- At-grade roadway-rail crossings may be permitted for trains operating at FRA class 6 speed (operation up to 110 mph) applying risk-based mitigations.
- Full access-control where practical. Where full access control is not practical, intrusion protection and/or intrusion monitoring will be employed with mitigations as required to promote safe and reliable operation.
- Stopping for CHSR stations may occur along station stopping tracks or on mainline tracks at locations where station tracks are not practical. A dual-track mainline with separate station tracks is not practical at the Fullerton Station.
- Train loadings and structure gauge will be defined for the high-speed, conventional passenger and freight trains that will operate in the Los Angeles to Anaheim corridor.
- Infrastructure to accommodate diesel-powered rolling stock
- Clearances for the overhead contact system
- System infrastructure to be compliant with applicable National Fire Protection Agency codes

Traction Power

- Electric traction system – 2 x 25kV, 60 Hz for high-speed trains
- Capable of accommodating 3 HSR and 3-5 conventional trainsets per hour per direction

Train Controls and Communications

- Dependent upon host/tenant arrangements and interoperability considerations
- Train Control and Communication systems will be interoperable with train traffic and dispatch system
- Equipped with high-capacity and redundant communications systems capable of supporting fully automatic train operations
- Shared track users will utilize positive train control (PTC) or automatic train control (ATC). PTC and ATC systems must be fail-safe and perimeter protection will be implemented to keep unauthorized movements by trains or unsecured rolling stock off of the railroad.
- ATC systems from dedicated high-speed rail sections will be maintained in the shared track segments allowing for full high-speed rail interoperability. In order for the CHSR system to operate under shared use with other passenger traffic, CHSR trainsets and train control system will be developed in consultation with the FRA.

Rolling Stock

- Electric Multiple Unit (EMU) trainsets, approximately 660 feet in length capable of coupling to provide nominal 1350-foot long double traction trainsets during peak operating hours and as required by ridership demand.
- Approximately 450 to 500 passengers per single trainset (900 to 1000 passengers for double traction trainsets).
- Double traction trainset up to approximately 1350-foot in length are not to be precluded by existing or proposed infrastructure.
- Support an open competitive procurement and not preclude Asian or European manufacturers
- Both FRA compliant and alternatively compliant rolling stock operate on shared tracks. FRA will issue a Notice of Proposed Rule Making (NPRM) for Tier III rulemaking for trainsets operating within a shared right-of-way at speeds not exceeding 125 mph.

Operations

- All-weather/all-season operation
- Capable of accommodating normal maintenance activities without disruption to daily operations
- Capable of operating on shared-use tracks
- Where tracks are shared with freight carriers, passenger traffic may interoperate with freight traffic. This applies to an area between Fullerton and Anaheim, where the existing right-of-way width can only accommodate the two existing tracks. This segment of the corridor is owned by OCTA and BNSF has operating rights.
- Dispatch and service of the different users on a shared track segment will be governed by an agreement between operators in the segment. Dispatch and service will be performed by the shared control facility operating the shared track segment.

3.6 DESIGN LIFE

The design life for new system infrastructure elements will be established based on industry best practices. Determination of design life will take into account technology, maintenance, capital, operating and maintenance costs, and other life-cycle factors.

A study will be conducted that assesses service life, maintenance history, load ratings, rail and vehicle clearances, seismic rating, constructability, right-of-way requirements, high-speed rail operating requirements, etc., of the existing infrastructure (bridges, tunnels, embankments, retaining walls, etc.) within the corridor that supports or is affected by high-speed rail operation.

4.0 INFRASTRUCTURE

4.1.1 Track Alignment

CHSR alignments are generally established adjacent to existing railroad, highways, and roadway corridors, where possible, instead of creating new transportation corridors. Dedicated HSR alignments will be grade-separated at rail, highway, and roadway crossings. For blended corridors, alignments will generally be designed following FRA rules for the class of service operating in the corridor. The LA-A corridor is planned to operate as a class 5 service (speeds up to 90 mph) with at-grade roadway crossings. FRA guidance promotes closure of crossings or implementing grade separation where practical.

High-speed rail technology requires a dual-track mainline system to support the ridership volumes, frequency of service, scheduling flexibility, and delay recovery required for the proposed system. A dual-track mainline will be maintained through station areas to allow for run-through or express service. Off-line stopping tracks are provided at HSR intermediate stations unless it is determined that inclusion of separate, station stopping tracks is not feasible.

The track structure may be ballasted track and/or non-ballasted track forms. Selection of the track form will depend on the alignment, supporting infrastructure, maintenance accessibility, and cost.

4.1.2 Intrusion Protection

Conventional trains and highway vehicles sharing corridors with or operating adjacent to tracks carrying high-speed trains may be restrained from potentially intruding into high-speed rail operating infrastructure by lateral separation or by a physical barrier where adequate separation is not practical. Determination of the need for a physical barrier will be based on hazard assessment. The need for a barrier depends on, but is not limited to: track alignments, distance and height separating adjacent railroad tracks, highway-rail distance, operating speed of the adjacent freight/passenger equipment, requirements of the adjacent transportation owner, etc.

Intrusion detection will be considered at locations where it is appropriate to mitigate an intrusion hazard.

4.1.3 Tunnels

Alignments will assess the use of lower grades and longer tunnel lengths versus steeper grades and shorter tunnels. Alternate tunnel configurations (including single or twin tunnels) and types of construction (including bored, cut-and-cover, and mined tunnels) will be evaluated. Factors including maintenance, emergency access/egress, fire and life safety, aerodynamics, passenger comfort/health, travel time, power usage, costs, construction feasibility, and train operations will be considered in the assessment.

4.1.4 Aerial Structures

Structures carrying high-speed trains will be designed to achieve the performance, functionality, safety, serviceability, economic, and aesthetic requirements defined by the project. Development and implementation of standard, simply-supported structures may be considered to reduce costs and risk as these may improve constructability, quality control, ease of maintenance, and system integration.

Access control and use of space under aerial structures is restricted by Authority policy. Evaluation is required for activities or use under aerial structures.

4.1.5 Grade Separation

Consistent with FRA preliminary guidance, there will be no at-grade vehicular crossings permitted on the where operating speeds exceed 125 mph. At-grade crossings may be considered consistent with FRA guidance for track Class 6 operations.

Grade separations will be a high priority, particularly grade separations that improve existing and planned rail and road facilities. Early implementation of the grade separation projects may improve local safety, circulation, and reduce air pollution and noise impacts.

4.1.6 Seismic Design Reliability

The primary structural seismic performances goals are to safeguard against catastrophic failures, loss of life, and prolonged interruption of operations due to structural damage. To address reliability for structures supporting high-speed trains, the seismic design criteria will be based on a hybrid probabilistic-deterministic approach using industry best practices.

4.2 STATIONS

It is the Authority's objective to select multi-modal transportation hubs as potential CHST stations. These locations will promote access and connectivity and facilitate transit oriented development (TOD). Stations

will be coordinated with local and regional plans that support rail systems and TOD, offering opportunities for increased land use efficiency and intermodal connectivity with local and regional transit, airports, and highways.

Station configurations will accommodate train and passenger volumes and frequency required to serve the forecasted demand. Overall station size will consider access facilities, parking facilities, and passenger facilities.

Stations and station areas will be designed to reflect the surrounding natural and manmade landscape and include some CHSRP standardized elements, including signage and graphics, fare collection and train boarding process, ticket sales office location and configuration, safety and security design, and communications systems, in order to provide a consistent image for the system.

Stations and maintenance facility buildings will target sustainable designs in accordance with guidelines established for Leadership in Energy and Environmental Design (LEED) “Silver” or better.

4.2.1 Terminal Stations / Intermediate Stations

Terminal stations are located at the “end points” of the HST system and where all trains are planned to stop upon arrival and perhaps lay-over during non-peak periods. Los Angeles Union Station is both a terminal (some trains originate and end a revenue service trip and all trains stop upon arrival) and a run-through intermediate station (some trains will run through to Anaheim or San Diego).

The following stations in the corridor are designated as terminal stations:

- Los Angeles Union Station (both terminal and intermediate)
- ARTIC Station in Anaheim*

* The Authority has not precluded the potential for a future extension to Irvine.

The following stations are designated as possible intermediate stations:

- Norwalk or Fullerton

4.2.2 Passenger Facilities

The configuration of stations and passenger facilities will depend upon location, ridership, intermodal connections (where available), trip purposes served, land use, building codes, and other variables. The development of passenger facilities will consider the need for waiting areas, concourses, ticketing, restrooms, safety and security, and other support services.

Passenger tickets may be purchased at stations potentially with staffed ticketing booths, at ticket vending machines at the station, or by phone or internet. Ticketing procedures will encourage use of pre-purchased tickets and automated ticket vending machines to reduce the need for staffed ticketing.

CHSRP will not have formal baggage handling. Luggage storage facilities shall be considered at stations for passenger convenience.

Basic concessionary spaces will be included as appropriate in pre-procurement designs.

4.2.3 Station Security

Station security will be commensurate with station security on other rail networks in the USA based on assessed risk to the system. Unless otherwise exempted, the CHSR system will conform to Federal requirements regarding transportation security as developed and implemented by the FRA and TSA.

4.2.4 Track and Platform Configuration

Station passenger platforms are planned for a length of approximately 1410 feet to accommodate a range of existing high-speed trainsets. Intermediate station platform configurations must ensure customer safety as trains may operate through or in proximity to the station platform without stopping. Platform

layout and station operations will mitigate potential hazards and vulnerabilities and noise from trains running through the station at high-speeds. Turnouts to station tracks will be designed to maintain headways and allow efficient train operations by not slowing or stopping following trains. Because of this, intermediate station passenger platforms will:

- Provide off-line HSR passenger platforms allowing for pass-through express services on the dual-track mainline, except at Fullerton Station.
- Provide HSR side platforms with center running tracks as the desirable configuration for operational considerations.

Terminal stations may have center or side platforms based on the specific station. Center platforms have two platform 'faces' with a track on each side to allow boarding and alighting from either of the two tracks. Because all HSR trains will stop at terminal stations, there is no need to mitigate issues created by fast-moving through trains.

4.2.5 Station Areas

4.2.5.1 Intermodal Connectivity

Station area amenities will be designed with a focus on convenience and ease of transfer to and from the CHSR system and other modes of transportation.

Development of station areas requires a hierarchy between modes of access and egress: Pedestrians will have the highest priority, followed by public transit, bicycles, pick-up and drop-off, and park-and-ride. Modes will be integrated in order to make the station site an active place.

Facilities for other transportation operators including parking, offices, crew/layover space, etc. will be established through agreement between the Authority and other operators.

4.2.5.2 Parking

The Authority will oversee conceptual design and environmental clearance for parking facilities at stations. Parking facilities will be constructed and operated by others with parking offered at market rates.

4.3 UTILITIES

Utilities within Authority owned right-of-way will be limited to those related directly to the design, construction, and operation of the CHSR system. Construction of high-speed rail facilities will not be used by utility agencies/owners for betterments to existing facilities unless approved by the Authority.

4.3.1 Right-of-Way Encroachment

An encroachment is defined as a structure or object that is within the high-speed rail right-of-way and is not a CHSR system facility. CHSRP policy is to exclude public and private utilities from within the access controlled right-of-way. Existing longitudinal utilities located within the proposed right-of-way shall be relocated to the outside of the CHSRP right-of-way, unless otherwise determined by the Authority.

New utility installations, and adjustments or relocation of existing utilities, will be permitted to transversely cross the Authority right-of-way, subject to review and confirmation that there are no adverse effects on the safety and reliability of the high-speed rail system.

5.0 SYSTEMS

5.1 ELECTRIFICATION / TRACTION POWER SYSTEM

The traction power supply system (TPSS) will be a 2 x 25kV autotransformer system with center-feed and/or single-end feed segments, with substations, switching stations with autotransformers, and paralleling stations with autotransformers. Substations will be connected to 115kV or 230kV utility supply

circuits at approximately 30 mile spacing. The TPSS will be able to support the ultimate level of service (LOS) proposed without degradation when a single power supply system component is out of service.

The TPSS will be developed using a system-wide, computer-simulated traction power model based on the ridership demand forecast and supporting train timetable for the CHSR System. The model will identify the electrification requirements for confirming the size and location of supply stations, switching stations, and paralleling stations.

An auto-tensioned Overhead Contact System (OCS) will distribute electric power to rolling stock. The OCS may be a simple two-wire system supported by cantilevers and attached to track-side poles, and/or gantries or headspans.

Traction power return system will return traction power supply current to the center tap of the autotransformers at supply, switching, and paralleling stations.

5.2 TRAIN CONTROL SYSTEM

The train control system will safely support the ultimate level of service proposed for the System:

- Train operating speed in the corridor up to 90 mph
- Safe braking criteria that considers other railroads' trainset technologies on shared-use tracks
- Compatibility with shared-use track train control equipment specifications, compatibility with other railroads' train control technologies on shared-use tracks.
- System operations plan requirements
- A blended operations, system headway and capacity analysis, which takes into account an LA-A blended operations plan (to be provided in a later stage), shall be conducted to determine minimum design headway requirements, necessary signal system upgrades and PTC system performance requirements to support required headways.
- Consideration of temporal separation for freight operation and track crossings via use of crossovers and bi-directional signaling

The train control system will adopt a collision avoidance approach by employing Positive Train Control (PTC) to reduce the risk of collisions between trains and maximize overall system safety by focusing on the key train control and signaling functional requirements. The train control system will include but not be limited to; the elements of precise train location, safe train separation, worker protection, and automatic train stop enforcement in the event of overspeed, system failure, or other incident.

Technical development and implementation of the train control system will be coordinated with the FRA.

5.3 COMMUNICATIONS

Communications systems deployed will be dependent upon host/tenant arrangements in the corridor and interoperability considerations. The Communication system will be interoperable with the trains' systems and the dispatcher systems. Radio system will be required to support voice and data traffic from host and tenant radio systems.

The California High-Speed Rail System will have a central Operational Control Center (OCC) for supervisory monitoring and control and monitoring of the system operations. The OCC may be established as needed to support operation control and provide system back-up.

6.0 ROLLING STOCK

CHSR vehicles will be electric, multiple unit (EMU) trainsets capable of integrating into existing conventional rail lines where shared-use is expected to occur in the LOSSAN corridor. Performance objectives for the trainsets include the following:

- Capable of revenue service operating speed of 220 mph

- 900 to 1000 passengers per double traction trainset capacity
- Sealed trainsets to mitigate aerodynamic changes and maintain passenger comfort and safety
- Level boarding at stations in compliance with U.S. Americans with Disability Act
- Compliant with FRA/RSAC Engineering Task Force (ETF) Tier III requirements

To reduce costs, promote competition, and take advantage of service proven global technology, the Authority is seeking to utilize available high-speed train technology. Until selection of the trainset technology, the CHSRP will design infrastructure elements such as alignment, track design, stations, and electrification in a manner that will accommodate high-speed trainsets from different manufacturers.

6.1 CONVENTIONAL ROLLING STOCK

High-speed rail vehicles will share tracks with conventional passenger trains. Freight trains may be able to cross over passenger tracks in order to access customers. Passenger trains that share tracks with high-speed train equipment will typically be diesel, locomotive-hauled passenger equipment in a push-pull configuration.

Table 6.1-1 summarizes the passenger car and locomotives currently utilized within the LA-A corridor.

Table: 6.1-1: Conventional Passenger Equipment Summary

Agency	Passenger Car Types	Locomotive Types
Metrolink	Bombardier Bi-Level Hyundai-Rotem Bi-level	MP 36PH EMD F59PH EMD F40PH
Amtrak	California Bi-Level Amfleet/Horizon Superliner	EMD F59PH GE Genesis

7.0 STORAGE AND MAINTENANCE FACILITIES

7.1 VEHICLE STORAGE AND MAINTENANCE

Under current operating assumption, fleet storage, cleaning, servicing, inspection, maintenance, and repair requirements will be supported at:

- Terminal Storage and Maintenance Facility (Level 1) that provides in-service inspection, cleaning and maintenance with a location in proximity to Los Angeles Union Station
- Storage tracks for overnight layup at Los Angeles Union Station and ARTIC Station in Anaheim.

7.2 MAINTENANCE OF INFRASTRUCTURE

Facilities will be provided for storage of maintenance-of-infrastructure (MOI) equipment at appropriately-spaced intervals. MOI facilities include areas for the storage of extra parts and inventories associated with the track way and systems, and areas for associated MOI personnel facilities. MOI facilities may be combined with vehicle maintenance facilities and/or stations where appropriate.

8.0 OPERATIONS

8.1 SERVICE DESCRIPTION

The CHSR System will be developed in a manner capable of accommodating a wide range of service types, from express services between northern and southern California to localized regional trips. The types of services in the operating pattern for both Phase 1 and Full Build Service Plans include:

- **Express service:** Serves San Francisco to Los Angeles/Anaheim only. Skips intermediate stations, offers the fastest trip time between San Francisco and Los Angeles, generally limited to morning and afternoon peaks. Express trains may include a single stop in San Jose.
- **Limited-stop service:** Skips selected stops along a route, offers some of the trip time benefits of express-style service to intermediate stations as well as the terminal stations.
- **All-stop service:** "Local" trains that make all stops along a particular route section, ensures direct service to and from all stations on the network.

The CHSR System will operate seven days a week. The hours of operation are assumed to be from 5:00 am to midnight (revenue service begins at 6:00 am).

8.2 MODELING

Operations will be confirmed using computer-based modeling including simulated intercity travel times and operating speeds. Optimal theoretical trip time targets will be developed using a computer-based train performance calculator (TPC), providing speed profiles depicting performance of single trains between specific locations on the system, including stations. Train performance calculations will use published train set performance specifications for the assumed trainset and alignment attributes as included in the environmental assessment. Unique geometric parameters, infrastructure configurations and identified operating restrictions will be applied.

Conceptual service plans will be developed and updated as required for both the Phase 1 Blended System and the Full Build System based on ridership demand forecasts. Infrastructure design and construction, rolling stock acquisition, and operating plans will take into account a range of interim and future operating scenarios and conditions.

8.3 SHARED USE TRACKS, ROW, AND FACILITIES

8.3.1 Adjacent Rail Operations

8.3.1.1 Definition

Adjacent Rail Operation is defined as a railroad that operates in the vicinity of and/or parallel with the high-speed rail alignment within a common corridor. Operational requirements for the LA-A corridor will be defined consistent with the FRA definitions. The FRA primarily refers to these corridor definitions with respect to transit rail adjacent to freight rail operations. These definitions are applicable to high-speed rail as well, specifically the Shared Track. In the Los Angeles to Anaheim corridor, the Authority will operate in a Shared Right-of-Way Corridor and may have shared minor facilities where freight trains may cross over passenger tracks in order to make deliveries to their customers.

8.3.1.2 Shared Track

The preference is that freight rail vehicles are not allowed to operate simultaneously on the same tracks with high-speed rail train operations. Where practical, separate track(s) will be provided for freight and high-speed rail operations. Where providing separate tracks for operations like local freight may not be practical, a site-specific hazard analysis should be performed to determine the risk associated with mixed traffic operations.

8.3.1.3 Shared Right-of-Way (ROW)

Shared ROW occurs where the passenger high-speed trains operate on tracks located in right-of-way with adjacent freight or passenger rail operations. In most cases, the right-of-way is owned by the freight railroad (i.e., BNSF) or a passenger rail agency with operating rights granted to other railroads including freight. Passenger and freight operations occur simultaneously throughout the day on parallel alignments. The primary consideration in shared ROW operations is to maintain the safety and security of passengers, employees, emergency responders and the general public. The second consideration in shared ROW is to maintain operation of the railroad. While adjacent operations may be affected during the construction of the high-speed rail alignment, the final alignment should provide operations that are at least equal to operations prior to introduction of high-speed rail service. Existing and future operations, including speeds, track arrangements; number of trains, train types and train control systems should be carefully assessed during design. Track separation and intrusion protection, as determined through risk-based analysis, shall be provided as appropriate.

8.3.1.4 Shared Minor Facilities

As with shared track, Authority direction is to keep these tracks utilizing diamond crossings separated and to grade separate such crossings. At other crossing locations utilizing turnouts where the hazard risk analysis does not justify the grade separation and the cost of this grade separation is not justified with respect with the amount of traffic on the adjacent crossing line (i.e., a freight industry branch line that sees only one or two short trains a day or several times a week), temporal separation shall be considered provided that it meets all FRA regulations and approval. The cost of integrating the signal control system of the crossing line with the CHSR. The at-grade crossing of transit operations (i.e., LRT) and CHSR tracks shall not be permitted.

At specific locations within the corridor, freight trains may be able to operate on passenger rail tracks to deliver to their customers by crossing tracks using interlocking devices. Signals along the route will be modified to allow this operation.

8.4 FREIGHT OPERATIONS

Los Angeles – Anaheim Section

The corridor between Los Angeles and Anaheim that is proposed to be used for operation of the high-speed trains is currently owned by Los Angeles County Metropolitan Transportation Authority (Metro) between LAUS and Redondo Junction, BNSF Railway in Los Angeles County between Redondo Junction and Fullerton Junction and OCTA in Orange County and dispatched by the BNSF and Metrolink. Operators in this section include Metrolink commuter rail service, passenger rail service by Amtrak, and freight service by BNSF Railroad and Union Pacific Railroad (UPRR). Freight and passenger service typically operate on separate tracks.

9.0 SHARED TRACK FOR THE LA-ANAHEIM CORRIDOR

California High-Speed Rail Program will utilize the current revised Tier Structure for Passenger Systems from the FRA's *High Speed Passenger Rail Safety Strategy* to define performance requirements of the Los Angeles – Anaheim shared track corridor. The Los Angeles – Anaheim Shared track corridor will be FRA Tier I (IB) or Emerging HSR facilities. Dedicated corridors will be classified as FRA tier III (V) or HST Express facilities. The differences between the types of facilities are summarized in Table 9-1.

Table 9-1 Potential Tier Structure for Passenger Systems Proposed by FRA

Element	Dedicated CHSR Tracks	CHSR on Shared Tracks Los Angeles Anaheim
FRA Tier	III (V)	I (IB)
FRA Description	HST Express	Emerging HSR
Speed Range	Over 220 mph	80 – 110 mph
Other traffic on same track	None	Mixed passenger and freight with temporal separation
Track Class	Class 9	Class 5/6
Signals and Train Control	Positive Train Control; vital and perimeter protection; ROW safety strategy integrated	Positive Train Control; vital and perimeter protection where speeds are above 90 mph
Public Highway-Rail Grade Crossings	None	Sealed corridor; evaluate need for presence detection and PTC feedback
ROW Safety Plan	SSP/CHA and specific approval process for new service similar to 236.361	System Safety Program/Collision Hazard Analysis (SSP/CHA)
MOW Safety Management Plan	Separate plan approval; integrate with SSP/CHA	Address within SSP; no separate approval required
Equipment	Definition of Tier III equipment is under development by a FRA Engineering Task Force (ETF)	Present Tier I plus Cab End Frame Strength, or equivalent safety (including option for alternative to buff strength)
Occupied Forward Car	Prohibited [1]	OK
System Safety Programs	Required; Authority review and approval of acceptability of residual risk; Safety and security certification; FRA reviews management decisions and may disapprove	Required; Authority review and approval of acceptability of residual risk; Safety and security certification; FRA reviews management decisions and may disapprove

[1] Passenger seating is permitted in the leading and trailing units of a Tier III trainset, provided that safety issues associated with passengers occupying the leading unit are addressed and mitigated through a comprehensive system safety analysis.

APPENDIX A – BUSINESS PLAN SUMMARY

The California High-Speed Rail Authority's 2012 and 2014 Business Plans serve as the Authority's foundation document for implementing the state's high-speed rail system. It laid out a roadmap for how the Authority plans to build the 520-mile (Phase 1) system connecting the San Francisco Bay Area to the Los Angeles Basin through a series of phases – starting with construction of the system's backbone in the Central Valley. The 2012 Business Plan created the foundation for a statewide rail modernization program with high-speed rail at its core, and with parallel investments in urban, commuter and intercity rail systems that together will significantly improve mobility and connectivity throughout the state.

For Phase 1, as described in Proposition 1A, the blended system means building the "Bay-to-Basin" system, with new, dedicated high-speed rail infrastructure connecting San Jose and the San Fernando Valley, and then to Los Angeles' Union Station. Improvements will be made to the existing Amtrak/Metrolink rail corridor between Union Station and Anaheim to improve safety, reliability, capacity, and travel times in that corridor. In the San Francisco Bay Area, the existing Caltrain corridor will be upgraded through grade separations, electrification, and passing tracks (to be studied) to provide the connection north from San Jose to the new Transbay Transit Center in Downtown San Francisco. This blended system will allow a one-seat ride (meaning passengers will not have to change trains) between San Francisco and Los Angeles and provide greater connectivity with existing regional and local transit systems. These benefits will be the foundation for implementation of a high-speed program in phases, as follows:

(1) Early investments/statewide benefits - First construction of the IOS, improvements to existing regional/commuter systems, new Northern California unified passenger service, and an accelerated closure of the rail service gap between Northern and Southern California

(2) Initial high-speed rail operation - Completion of the IOS and operation of the first high-speed rail revenue service in the United States

(3) The Bay-to-Basin system - Linking the state's major metropolitan areas with high-speed rail service while incorporating improved regional service

(4) The Phase 1 system - Connecting San Francisco, the Central Valley, and Los Angeles/Anaheim through a combination of dedicated high-speed rail infrastructure blended with existing urban systems

(5) Phase 2 expansion - Bringing high-speed rail to Sacramento, San Diego, and the Inland Empire. Through the blended approach to Phase 1, these areas will see improvements in rail service and access to high-speed rail service far earlier than previously planned

The California High-Speed Rail Authority's 2014 Business Plan, substantiates the adoption of the phased and blended implementation strategy that was laid out in the 2012 Business Plan does not in any way change the end goals for the system; it was designed to fulfill all of the commitments made to the citizens of California through the passage of Proposition 1A in 2008. The system is being designed so that when the Phase 1 system – between San Francisco and Los Angeles/Anaheim – is complete, it will be capable of achieving the maximum nonstop travel times spelled out for each specific corridor, including a run time between the Transbay Transit Terminal and Los Angeles Union Station of two hours, forty minutes. The trainsets to be procured will be capable of sustained revenue operating speeds of at least 200 miles per hour where conditions permit those speeds.

APPENDIX B - FRA TIER STRUCTURE FOR PASSENGER EQUIPMENT

FRA 49 CFR defines requirements for operation of Tier I and Tier II passenger equipment only. Tier I safety standards defined for equipment with maximum operating speed of 125 mph (201 km/h). Tier II safety standards defined for equipment with maximum operating speed exceeding 125 mph (201 km/h) but not exceeding 150 mph (241 km/h).

In 2009, FRA introduced High-Speed Passenger Rail Safety Strategy. In that document and further in subsequent update issued in 2011 by Railroad Safety Advisory Committee (RSAC) Task Force, FRA introduced plans for establishing safety standards for Tier III passenger equipment classification, which would represent the FRA's requirements for operation of high speed equipment at speeds up to 220 mph (354 km/h). In addition Tier III passenger equipment will be compatible with rail equipment operating in Tier 1 (shared corridor) environment at speeds not to exceed 125 mph.

The following characteristics describe current two tiers of equipment specified in 49 CFR 238:

Tier I equipment:

- Maximum operating speed up to 125 mph (201 km/h);
- Intermixing with FRA CFR compliant freight, commuter and intercity rail passenger operations;
- Grade crossings allowed, with specified grade crossing protection, when operating up to 125 mph (201 km/h).

Tier II equipment:

- Maximum operating speed exceeding 125 mph (201 km/h) but not exceeding 150 mph (241 km/h)
- Intermixing with FRA CFR compliant freight, commuter and intercity rail passenger operations;
- Grade crossings not allowed, when operating speed is above 125 mph (201 km/h).

The FRA defines Tier III equipment as follows:

- Maximum operational speed above 125 mph (201 km/h);
- Exclusive right–of-way required above 125 mph (201 km/h);
- No intermixing with freight or non-Tier III passenger operation (i.e. Tier I or Tier II operations) at speeds above 125 mph (201 km/h);
- No grade crossings when operating above 125 mph (201 km/h);
- Operationally compatible with Tier I and Tier II equipment at speeds below 125 mph (201 km/h);
- Can operate in a Tier I environment at appropriate Tier I speeds.

The critical attribute of the Tier III classification is the allowance for Tier III HSR trainsets to operate in a Tier I environment. The Tier III classification closely resembles the anticipated operating environment for the California High-Speed Rail Program.

The FRA believes that the Tier III designation is more consistent with the need to support Operational Compatibility with Tier I service, and that High-Speed Rail Equipment must be Operationally Compatible with Tier I Service.

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April 9, 2015

PMT-CHSRA-04981

Mr. Jeff Morales
Chief Executive Officer
California High-Speed Rail Authority
770 L Street, Suite 800
Sacramento, CA 95814

Attn: Mr. Frank Vacca, Chief Program Manager

Re: Request for Authority review and concurrence of TM 0.3.1 - Basis of Design for Blended Operation in the Los Angeles to Anaheim Corridor

Dear Mr. Morales:

TM 0.3.1 - *Basis of Design for Blended Operation in the Los Angeles to Anaheim Corridor, R0* is enclosed for your review and concurrence. This document summarizes the vision for the corridor and will serve as the basis for establishing the technical requirements necessary to allow joint operation of high-speed rail and conventional rail within the blended system corridor between Los Angeles and Anaheim.

The system requirements, technical memoranda, and design criteria developed to date are based on high-speed trains operating on dedicated high-speed rail facilities as defined in the *Technical Memorandum 0.3, Basis of Design Policy* report. This document supplements Technical Memorandum 0.3 and addresses the primary elements that differ between blended operation corridors and the dedicated high-speed operations in the prior document. It also defines the major policy considerations, performance objectives, and system elements that are envisioned for the Los Angeles to Anaheim section.

If this meets with your requirements, please sign below acknowledging your concurrence for adoption and use on the program.

Sincerely,

Gary E. Griggs
Program Director
Program Management Team
California High-Speed Rail Program

Attachments: TM 0.3.1 - Basis of Design for Blended Operation in the Los Angeles to Anaheim Corridor

California High-Speed Rail Authority Concurrence

Frank Vacca

Frank Vacca, Chief Program Manager

Date: 4/17/15