California High-Speed Train Project

Request for Proposal for Design-Build Services

RFP No.: HSR 11-16
Book 2, Part C: Scope of Work

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PART C – Scope of Work

This Scope of Work covers the technical aspects of the project. Other requirements are delineated elsewhere in this Procurement Package. Contractor shall refer to General Provisions for a list of general terms and definitions.

1 California High Speed Train Project (CHSTP) Standards and Manuals

The following technical documents are provided to Contractor in order to direct the development of final design drawings, construction drawings, and construction:

- **California High-Speed Train Project (CHSTP) Design Criteria** – Mandatory design guidance and criteria requirements Contractor shall follow and apply in the development of final design and construction documents.
- **Directive Drawings** – Directive Drawings provide mandatory design criteria in a graphical format Contractor shall follow and apply to ensure consistency during design for system-wide elements and features.
- **California High-Speed Train Project (CHSTP) CADD Manual** – Mandatory drawing standards and format Contractor shall follow and apply in the preparation of design, construction, and as-built drawings.
- **California High-Speed Train Project (CHSTP) Plan Preparation Manual** – Mandatory plans format Contractor shall follow and apply in the preparation of design and construction submittals, and as-built drawings.
- **Aesthetic Guidelines for Non-Station Structures** – Mandatory aesthetic guidelines Contractor shall follow and apply to the design of non-station structures.
- **Design Variance Request Process** – Mandatory process Contractor shall follow and apply in the identification, preparation, and submittal of design variance requests, as necessary to achieve approval.
- **Preliminary Ground Motion Data** – Preliminary ground motion data that the Authority has prepared and Contractor shall use in seismic and structural design included in the proposal.
- **Final Ground Motion Data** – Final ground motion data that the Authority will prepare and Contractor shall use in seismic and structural design for preparation of design submittals, construction, and as-built drawings.
- **Basis of Design** – Policy document prepared by the Authority that defines the major components and performance objective of the CHST System. Contractor shall use this document in the preparation of designs to ensure consistency with the components, objectives, processes, requirements, and assumptions governed by Authority policy.

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- **Record of Survey and Control Monument Data** – Survey control data that the Authority has completed to date and Contractor shall use in its topographic survey and mapping for its design.
- **Standard Specifications (for reference)** – Technical specifications for use in Authority construction contracts, and as determined applicable by the Contractor. Standard Specifications are not considered mandatory for this project, except for those sections or portions thereof identified in Attachment 5 "Mandatory Standard Specifications Listing" of this Scope of Work.
- **Standard Drawings (for reference)** – Standard project elements for use in the construction of the California High-Speed Train system, as determined applicable by the Contractor. Standard Drawings are not considered mandatory for this project. However, if Contractor chooses to use a Standard Drawing, the design as shown on that drawing shall be followed.

The Standard Specifications and Standard Drawings indicate a standard of quality to be achieved by the Contractor for the construction of the Project.

The identified technical documents are found in Book 3 and Book 4 of this Procurement Package.

2 Preliminary Engineering Documents

Preliminary design documents have been prepared to support environmental assessment and approval, and demonstrate technical feasibility and constructability.

The following preliminary engineering documents are provided to the Contractor for reference:

a. **Design Plans:**

Excerpts from 15 percent design plans for Construction Package 1A Option 1 (Hybrid Alternative) – Initial design prepared by the Authority with the intent of supporting environmental assessment and approval.

Preliminary design plans for Construction Package 1A, exclusive of the Hybrid Alternative, Construction Package 1B, and Construction Package 1C (Alignment F1) – Proposed preliminary design prepared by the Authority with the intent of demonstrating technical feasibility and constructability.

b. **Preliminary Technical Reports** – Technical reports prepared by the Authority to document data collection efforts completed to date and document the basis of the design for the proposed preliminary design and environmental documents.

- Floodplain Impacts Assessment and Hydraulics and Hydrology Report
- Stormwater Management Report
- Geotechnical Data Report
- Structures Report
- Design Variances

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c. **Special Specifications** – Proposed technical specifications with specific reference to the Preliminary Design Plans for Construction Package 1, and as determined applicable by the Contractor. Special Specifications are not considered mandatory for this project, except for those sections or portions thereof identified in Attachment 6 "Mandatory Special Specifications Listing" of this Scope of Work.

d. **Electronic Files** – Available electronic files used in the preparation of the preliminary design documents.

- Design Files
  - Topographic Mapping
  - Digital Terrain Model (DTM)
  - Alignment Geometry Files
  - Design Cross Sections
  - Sheet DGN Files
- Existing Utility Data
- GIS Files for Environmentally Sensitive Areas
- Geotechnical Electronic Data

The Design Variance Report is found in Book 3 of this Procurement Package. The remaining above-identified Preliminary Engineering documents can be found in Book 4 of this Procurement Package.

The Preliminary Engineering Plans, Reports, and Special Specifications are based on preliminary design efforts and investigations and are provided for reference, unless otherwise specified for specific elements in this Scope of Work. If Contractor chooses to use the proposed preliminary design, Contractor shall review and validate that design meets CHSTP design criteria, directive drawings, local jurisdictional authorities' design criteria, and/or other requirements before advancing design to a baseline level (see Design Services section of this Scope of Work).

3 Project Description and Limits

Construction Package 1 (CP1) is located within the counties of Madera to the north and Fresno to the south, and the City of Fresno in the southern area. It is composed of four segments: Hybrid Alternative of Construction Package 1A, the remaining alignment of Construction Package 1A, Construction Package 1B, and Construction Package 1C.

General Project limits, from north to south, are described below. Refer to Attachment 1 "Limits and Extents of Work Table", Attachment 2 "Limits of Work Map", and Attachment 2a "Caltrans Limits of Work Map" for additional information.

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- Construction Package 1A (CP1A), Hybrid Alternative – South of Avenue 17 to North of Veterans Boulevard (alignment generally along the existing BNSF Railway)
- Construction Package 1A (CP1A), Remaining alignment: North of Veterans Boulevard to north of Stanislaus Street. The limits within this package include a portion of work that is being performed by Caltrans.
- Construction Package 1B (CP1B): North of Stanislaus Street to South of Santa Clara Street
- Construction Package 1C (CP1C), Alignment F1: South of Santa Clara Street to South of East American Avenue

Description and major elements of each segment are described in the following sections.

3.1 CP1A, Hybrid Alternative Segment– South of Avenue 17 to North of Veterans Boulevard (alignment generally along the existing BNSF Railway)

The northern terminus of Hybrid Alternative is near Avenue 17 in Madera County. Traversing southward, the alignment parallels the west side of the BNSF tracks for approximately four miles before turning towards the Union Pacific Railroad (UPRR) south of Madera. The alignment follows the east side of the UPRR and transitions from at-grade to an elevated section to cross over the San Joaquin River. South of the river crossing, the elevated section continues over the UPRR tracks and transitions to an at-grade configuration west of the UPRR near Herndon Avenue. This segment terminates at the north side of Veterans Boulevard and is approximately 14 miles in length.

The majority of the construction will be on embankment approximately 4 to 5 feet high. Major structural elements for consideration are three major bridges at the Fresno River and SR145, Cottonwood Creek, and the San Joaquin River. The work will be subject to seasonal construction constraints as defined in the Final Environmental Documents. In addition, there are nine 2-lane grade separated structures. The San Joaquin River Bridge is approximately 2.3 miles long. Construction includes demolition, site clearing, utility relocations, roadway construction, and compliance with the applicable requirements, mitigation measures identified in the Final Environmental Documents, and master agreements between the Authority and applicable Third Parties.

3.2 CP1A, Remaining Alignment Segment – North of Veterans Boulevard to North of Stanislaus Street

This segment is approximately eight miles in length and runs adjacent to the west side of the UPRR. From Veterans Boulevard to approximately Olive Avenue, the alignment runs nominally at-grade. In the vicinity of Olive Avenue, the alignment begins its descent into a below-grade section, approximately 1.7 miles in length. Between Olive Avenue and Belmont Avenue, the below-grade section is further constrained by Roeding Park to the west, UPRR to the east, and an existing 96-inch storm drain pipe. On the south side of Belmont Avenue, the below-grade section is also constrained by a drainage basin. Continuing south of Belmont Avenue, the below-grade section passes under two active San Joaquin Valley Railroad (SJVR) spurs, Dry

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Creek Canal, and SR-180 before returning to a nominal at-grade section through to the end of CP1A just north of Stanislaus Street. The proposed design to cross under SR-180 is a 2-track box approximately 300 to 400 feet in length.

Additional major construction elements include five grade separated structures, realignment of Golden State Boulevard, demolition, site clearing, and utility relocations, and compliance with the applicable requirements, mitigation measures identified in the Final Environmental Documents, and master agreements between the Authority and applicable Third Parties.

Portion of work to be performed by Caltrans includes, realignment of SR-99 from Station A92+20 to A237+30, including new interchanges at West Clinton Avenue and Ashlan Avenue, on and off ramps to and from Golden State Boulevard, plus the portion of High-Speed Rail infrastructure from Station S10691+50 to S10825+60. Refer to Attachment 2b "Caltrans Scope of Work Map".

3.3 CP1B Segment – North of Stanislaus Street to South of Santa Clara Street

This section is approximately one mile in length and runs nominally at-grade, from the north side of Stanislaus Street to south of Santa Clara Street. It includes the future High-Speed Train Fresno Station and must accommodate the future 4-track and 6-track section(s), which include two storage tracks immediately south of the future Fresno station (one on each side of the station tracks), necessary for operation of the CHST.

Major work elements for this section include necessary civil work for the at-grade track section and four (4) grade separations at Stanislaus Street, Tulare Street, Fresno Street, and Ventura Street, demolition of existing Tuolumne Street overcrossing, reconfiguration of local streets per City of Fresno requirements, as well as demolition, site clearing, and utility relocations, and compliance with the applicable requirements, mitigation measures identified in the Final Environmental Documents, and master agreements between the Authority and applicable Third Parties.

3.4 CP1C, Alignment F1, Segment – South of Santa Clara Street to South of East American Avenue

This segment is approximately five miles in length and runs adjacent to the west side of the UPRR after crossing SR-99, via an aerial structure, and adjacent to the west side of BNSF. From south of Santa Clara Street, the alignment passes under SR-41 and runs nominally at-grade to approximately East Belgravia Avenue. In the vicinity of East Belgravia Avenue, the alignment begins to descend into a shallow cut section, approximately one mile in length, to pass under existing East Jensen Bypass. As it approaches South Orange Avenue, the alignment transitions to a 1.2 mile aerial structure, passes over Golden State Boulevard, SR-99, and South Cedar Avenue, before returning to grade to cross under East Central Avenue and through to the end of CP1C, south of East American Avenue.

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Major construction elements for this segment include civil works for the at-grade track sections and three grade separations. Close coordination with Caltrans will be required on the planned improvements for South Cedar Avenue and impacts of the CHSTP aerial structure to SR-99.

The construction effort will also include demolition, site clearing, utility relocations, and compliance with the applicable requirements, mitigation measures identified in the Final Environmental Documents, and master agreements between the Authority and applicable Third Parties.

3.5 Limits of Work for Enabling Facilities

As described above, Contractor's scope of work includes a number of grade separations, and associated roadway reconstructions, railroad relocations, and utility works owned by Third-Party Entities. These include the following:

- California Department of Transportation (Caltrans)
- City of Fresno
- County of Madera
- County of Fresno
- Union Pacific Railroad (UPRR)
- San Joaquin Valley Railroad (SJVR)
- BNSF Railway
- Utility companies
- Flood Control Districts (Fresno Metropolitan Flood Control District, Fresno Irrigation District, Fresno County Flood Protection Board)
- Other permitting agencies as noted in Book 3 of this Procurement Package

Contractor shall be responsible for coordinating and confirming the limits of work described above to ensure conformance with:

- Final Environmental Documents
- Local jurisdictional entity requirements
- Third-Party Agreements
- Direct coordination with the impacted third parties
- Other works required to support future CHSTP elements through Interface Coordination and Design Integration Workshops with the Authority.

Based on preliminary engineering and Third-Party coordination efforts achieved to date, Contractor shall be aware of the following local conditions that have informed the preliminary

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design included in Book 4 of this Procurement Package. As delineated in this Scope of Work, Contractor shall be responsible for confirming these and all other design and location issues with the impacted Third Parties through the course of final design and construction. These include but are not limited to the following items:

- Maintenance and access provisions as required by the local irrigation and flood control districts.
- Compliance with most recent and published general plans for/by Caltrans and the cities and counties of Madera and Fresno.
- Consider local and state regulations with regard to impacts to sensitive areas, such as campgrounds and schools.
- Veterans Boulevard – do not preclude future Veterans Boulevard work.
- S. Cedar Ave – consider future 2-lane widening and profile raise of 2.5 feet.
- SR99 in South Fresno – do not preclude future Caltrans widening in median or outside shoulders.
- Fresno St. underpass - preserve existing UPRR grade separation to minimize disruption to freight operations.
- Belmont Ave and Olive Ave - offset proposed grade separations to maintain traffic on the existing roadways as long as possible.
- Jensen Ave - identified as Extra Legal Load Network roadway; traffic must be maintained at all times.
- Box under SR180 - extend under entire Caltrans ROW for SR180 to preserve future Caltrans improvements.
- Avoid impacts (temporary and permanent) to Roeding Park.
- Work in the vicinity of the existing Golden State Boulevard ramps will require coordination with the City of Fresno. The City of Fresno is responsible for the demolition of these ramp structures just north of SR41.

4 Project Scope of Work

4.1 General

Contractor's Work is defined as all services, labor, materials, equipment, and other efforts to be provided and performed by the Contractor including the following general categories:

- Scheduling
- Utility protection and relocation
- Demolition
- Permitting

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- Survey
- Mapping
- Geotechnical
- Design
- Environmental mitigation
- Construction
- Quality control and quality assurance for design and construction
- Community relations
- Quality inspection and testing
- Verification and validation
- Construction safety and security
- Preparation of CADD As-Built and Consolidated Services Drawings
- Implementation of Contractor's extended warranty for the Project after construction completion
- Coordination with jurisdictional authorities (governments, public, and private entities), utility companies, railroad companies, and local communities
- Other efforts necessary or appropriate to complete the design and construction of the Project, and to ensure the Project's ultimate readiness for high-speed rail passenger operations

The exceptions to this list include those efforts that the Contract specifies will be performed by the Authority or other Persons.

Contractor shall provide design and construction for CHSTP trackway civil infrastructure, complete in place with the exception of CHSTP trackway from Station S10691+50 to S10825+60 which will be performed by Caltrans. While Caltrans performs the design and construction of this portion of the CHSTP trackway civil infrastructure, Contractor shall be responsible for establishing and controlling the plan and profile of CHSTP alignment in Caltrans portion of the work. Contractor shall identify, design, install, and maintain a temporary protective layer over the trackway subgrade to protect the subgrade from degradation through the warranty service period. Degradation refers not only to erosion of fill/existing soils as a result of rainfall and wind, but also to potential damage caused by animal burrowing, vandalism, and other environmental factors (such as flooding) not evident at the time of construction.

Contractor shall design and install structural embedments such as anchor bolts, embeds, grounding, and bonding, foundations, etc., as needed, in structures, walls and subsurface infrastructure to accommodate future CHSTP systems components not in the Project scope.

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Contractor shall design and construct enabling works, such as grade separations and intrusion protection, complete in place. The enabling work shall be coordinated, designed, and constructed in accordance with the Third-Party Entity's requirements (i.e., City of Fresno, County of Fresno, California Department of Transportation, railroads, etc.). If the enabling work such as grade separations and intrusion protection are located above or below or immediately adjacent to the CHSTP alignment, in no case shall the enabling work be constructed to standards less stringent than the CHSTP Design Criteria if their failure would have the potential for damaging or otherwise interrupting HST service.

The Scope of Work does not include construction of the portion of CHSTP trackway performed by Caltrans as stated above; trackwork itself; passenger stations; buildings; right-of-way engineering, negotiations, and acquisition; soundwalls; and systems work (i.e., Overhead Contact System poles, foundations, and wires; Traction Power Facilities; Automatic Train Control; etc.). The Scope of Work excludes civil/site works for said future CHSTP systems facilities and ancillary sites, unless noted otherwise (i.e., civil preparatory works are generally limited to the improvements required for the CHSTP trackway only). However, while these elements are not included in the Scope, Contractor shall coordinate interfaces with the portion of work performed by Caltrans and ensure accommodation and integration of future CHSTP work elements via the Interface Coordination and Design Integration Workshops with the Authority.

Contractor is further responsible for the following:

- Design and construction of the civil infrastructure elements as generally described above and identified in further detail in Attachment 3 "Scoping Typical Sections" and Attachment 4 "Scope Elements Matrix". The Work shall be performed and completed in accordance with the documents as defined in Sections 1 and 2 of this Scope of Work, as well as Master Agreements, design criteria, standards, and permits by Third Parties for facilities within their jurisdictions. Contractor shall refer to the Project Elements section of this Scope of Work.
- Contractor's design and construction shall be completed such as to ensure the ultimate operation of the CHSTP system to operate at speeds of at least 220 miles per hour. Note that design speed shall be 250 miles per hour (see 4.2.1.1 in this Scope of Work).
- Accommodation of future CHSTP elements and facilities to be designed and constructed by others that affect the civil infrastructure as identified in this Scope of Work and through the Interface Coordination and Design Integration Workshops, including the following:
  - Trackwork
  - Traction Power Facilities
  - Overhead Contact System
  - Automatic Train Controls Facilities
  - Communications

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  - Rolling Stock
  - Operations
  - Maintenance Access/Emergency Access/Egress from Trackway (Ladders and Stairs)
- Preparation of design and construction submittals in accordance with this Scope of Work.
- Preparation of Construction Specifications in accordance with this Scope of Work.
- Coordination with Third-Party Entities, including the following:
  - Local, Regional, State, and Federal Agencies
  - Railroads
  - Utility Companies
  - Other Permitting and Regulatory Agencies

4.2 Design Services

4.2.1 Review of Design Criteria, Drawings, Reports and Specifications

Contractor is responsible for review of the CHSTP Design Criteria, Preliminary Engineering Drawings and Reports, Standard Drawings, Directive Drawings, Standard Specifications, and Special Specifications for completion of design and construction of the Project.

4.2.1.1 CHSTP Design Criteria

Design Criteria has been prepared to direct the development of Contractor's final design and construction drawings for the Project. Contractor shall develop the alignment to ensure an initial operating speed of at least 220 miles per hour and future operation at 250 miles per hour.

Contractor shall document the applicability assessment in the Requirements Verification Traceability Matrix (RVTM), including identification of each criterion that is determined by the Contractor to not be applicable to the Project. RVTM is described in more details in Verification, Validation and Self-Certification in Book 3.

Contractor shall review the CHSTP Design Criteria and determine applicability of each criterion.

Contractor shall refer to the Authority's Design Variance Guidelines and CHSTP Design Criteria in Book 3 of this Procurement Package for definition on design variance process and criteria thresholds, respectively. Design Variance Requests are location-specific. Design Variance Requests are subject to Configuration Management and Change Control. Contractor shall not assume that additional Design Variance Requests, beyond those included in the Preliminary Design Variance Report provided in Book 3 of this Procurement Package, will be approved. Refer to Design Variances (Section 4.14) in this Scope of Work.

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4.2.1.2 Preliminary Engineering Documents: Drawings and Reports

The 15% Design and Preliminary Engineering Drawings are at various design levels and are provided for Contractor's reference.

Contractor shall review the Preliminary Engineering Design Drawings and Technical Reports and confirm technical feasibility and constructability within the requirements of the approved Final Environmental Documents and the applicable CHSTP Design Criteria and Directive Drawings as described in this Scope of Work.

Contractor shall substantiate the technical feasibility and constructability of the design in the Baseline Design Report. This report will serve as a baseline document for configuration management, and will be subject to change control.

Contractor shall be responsible for the preparation of Construction Drawings and Reports.

4.2.1.3 Specifications

Contractor shall be responsible for the preparation of Construction Specifications.

CHSTP Standard Specifications were developed to support design and construction and are provided for Contractor's reference. Standard Specifications are not considered mandatory for this project, except for those sections or portions thereof as identified in Attachment 5 "Mandatory Standard Specifications Listing" of this Scope of Work.

Contractor shall review CHSTP Standard Specifications and Special Specifications, and determine applicability of each specification section to Contractor's final design and construction methods, and determine what additional specifications are required.

Where Contractor has confirmed applicability of CHSTP Standard and Special Specifications sections, with or without modification, Contractor shall incorporate each into its Draft Construction Specifications in track change format, as needed, in accordance with the format of CHSTP Standard Specifications, which are based on Construction Specifications Institute (CSI) MasterFormat™ 2011 edition and SectionFormat™ 2009 edition. For Contractor-added specifications not included as part of the CHSTP Standard and/or Special Specifications, shall include "NEW" in bold capital letters in the top margin of the new Contractor-developed Construction Specifications.

4.2.1.4 Fresno Street Construction Plans and Specifications by Caltrans

Caltrans has prepared construction plans and specifications for the Fresno Street roadway undercrossing. These plans have been included in Book 4 for Contractor's reference. Contractor shall be responsible for achieving an integrated design and construction, inclusive of the Fresno Street improvements, the high-speed rail infrastructure, and securing concurrence, permits, and approvals. Contractor may choose to use the reference plans prepared by Caltrans at its sole discretion, and shall not rely on them without completing due diligence per Contractor's design-build responsibilities.

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4.2.2 Review of Environmental Documents

Before completing its technical and engineering reports and construction drawings, Contractor shall conduct a review of and ensure compliance with all environmental documents. Contactor shall be responsible for obtaining required permits for construction of the project, as indicated in Approach for Obtaining ICS Environmental Approvals/Permits.

4.3 Additional Data

Contractor shall be responsible for obtaining additional data, including:

- Final identification, confirmation, and potholing for existing utilities.
- Survey and topographic mapping for final design, including site surveys as required. Available photogrammetric data used for preliminary design is provided for Contractor's reference.
- Collecting additional geotechnical information to complete the Project, support the finalization of ground motions work and fault rupture data, and prepare technical reports, construction drawings, and construction specifications. Contractor shall store, maintain, and make available its acquired geotechnical core samples until final acceptance and close out of contract.

4.4 Design and Code Analysis

Contractor shall review and analyze current design, industry and regulatory design and construction codes, including those referenced in the Final Environmental Document, and third parties' requirements for applicability to its design and construction of the project.

Contractor shall identify applicable design, industry, and regulatory construction codes by resource from the EIR/EIS and by affected Third-Party Entities in a Design and Code Analysis Report.

4.5 Safety and Security Certification Program

Contractor shall be responsible for safety and security certification activities during the Final Design and Construction phases of the Project. Contractor shall develop a Safety and Security Certification Plan that describes in detail how they will identify, mitigate, verify/validate, and certify safety and security requirements. The Safety and Security Certification Plan requirements are described in detail in the CHSTP Safety and Security Management Plan in Book 3 of this Procurement Package.

4.6 Interface Coordination and Design Integration

Contractor shall be responsible for coordinating the interfaces and performing design integration with adjacent contracts, third parties, and the Authority, as specified in the General Provisions.

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4.7 Verification and Validation and Self Certification

Contractor shall develop and implement a verification and validation (V&V) process to confirm to the Authority that by examination and provision of objective evidence the technical contract requirements and the particular requirements for specific intended use have been fulfilled. With every submittal to the Authority, Contractor shall provide a V&V submittal self-certifying compliance with the Contract requirements and fitness for purpose. Every submittal shall be fully checked and certified by an Independent Checking Engineer (ICE) and Independent Site Engineer (ISE) before they are submitted to the Authority.

Refer to Book 3 for V&V and Self-Certification requirements.

4.8 Value Engineering

Contractor shall initiate, conduct, complete, and implement a value engineering task upon approval of its Design Baseline Report. Value engineering shall comply with methodologies and procedures adopted by Caltrans and shall be performed in coordination with the Authority. Contractor shall refer to value engineering process requirements specified in the General Provisions of this Procurement Package.

Further contractor-initiated value engineering opportunities can be initiated, conducted, and implemented through final design and construction efforts.

4.9 Design Reports

4.9.1 Design Baseline Report

Contractor shall prepare a Design Baseline Report that defines the major design elements to be progressed to design and construction, and confirms technical feasibility, constructability, and compliance with the approved Final Environmental Documents, including the following:

- **Final Track Alignment and Limits of Construction Activities**
  - Plan and profile for the CHSTP track alignment for the entire limits of the Project, including the portion of the work within Caltrans Scope of Work and location of all special trackwork. The limits of track alignment shall extend beyond Contractor's construction limits to the nearest point of tangency in plan and profile to ensure consistency, interface, and integration requirements with future work and in full support of High-Speed Train operations.
  - Typical sections for CHSTP trackway for at-grade, grade separated structures, and trenches, third-party facilities, as well as facilities constructed by others that affect Contractor's design. Typical sections shall identify and address future traction power, overhead contact system, communications, train controls, operations, and maintenance equipment. CHSTP facilities by others shall be confirmed during the Interface Coordination and Design Integration Workshops. CHSTP facilities by others shall be identified as "NIC" (Not in Contract) on the drawings.

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- **Clearances at Structures and Restricted Locations** – Proper clearances in conformance with CHSTP Design Criteria at all grade separations and future CHSTP facilities by others that affect the design, including substation locations, radio antenna sites, special trackwork, signal houses, access and egress, and location of the system's undertrack ductbank and manholes.
- **Geotechnical Conditions** – See Geotechnical Reports requirements elsewhere in this Scope of Work.
- **Structure Plans, Elevations, and Typical Sections** – For grade separated structures, trenches, tunnels, and retaining walls. Drawings shall include nominal dimensions of the structures subject to final design calculations.
- **Railroads** - For relocation of, or modification to, existing railroad trackways and other facilities per Master Agreements with such entities.
- **Utilities** – Relocation of utilities within Authority's and state and local jurisdictions' right-of-way in accordance with applicable state and federal regulations.
- **Geometric Approval Drawings** – For relocation of, or modification to, state highway facilities and local roadways, as agreed with the affected third-party agency.
- **Storm Water Pollution and Protection Plan (SWPPP) and Best Management Practices (BMP)**
- **Consistency with Final Environmental Documen**ts – describing whether and to what extent the Baseline Design remains consistent with the project described in the Final EIR/S and the environmental analysis provided therein.
- **Aesthetic Design and Review for Non-Station Structures** – See Aesthetic Design and Review for Non-Station Structures Report requirements as delineated elsewhere in this Scope of Work.
- **Other information that establishes the baseline for the project**

Contractor shall prepare Design Baseline Report, submit for review, coordinate comment resolution, and ensure approval by Authority within 180 days of NTP. Authority's nominal review period for the design baseline report is twenty business days.

Drawings shall include dimensions that demonstrate the intent and boundaries of the design to be advanced into final design. Design assumptions for elements identified as future CHSTP facilities by others will be provided by the Authority for incorporation into the Design Baseline Report documents, and reviewed with Contractor during the Interface Coordination and Design Integration Workshops.

Upon receipt of approval, the Design Baseline Report will be subject to the Authority's configuration management and change control process.

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4.9.2 Hydrology and Hydraulics Reports

Contractor shall prepare Hydrology and Hydraulics reports to support the drainage design of the full build-out of CHSTP trackway as well as temporary drainage system for the interim condition.

Contractor shall contact and coordinate with State and local jurisdictions to obtain necessary information for preparation of its reports.

4.9.3 Geotechnical Reports

Contractor shall prepare a Geotechnical Data Report and Geotechnical Engineering Design Reports to support its design calculations and requirements for design and construction of the full build-out of trackway and trackwork, embankment, excavation, soundwalls, retaining walls, trenches, tunnel structures, grade separation, roadways, and all other facilities constructed by Contractor or to be constructed by others per the requirements of the Design Criteria as well as the requirements of State and local jurisdictions. These Geotechnical Reports shall include and address additional geotechnical explorations performed by the Contractor through its design and construction phases.

Contractor shall contact and coordinate with State and local jurisdictions to obtain all necessary information for preparation of its reports.

4.9.4 Structures Reports

Contractor shall prepare Structures Reports providing the basis for its selection of structure for the retaining walls, U-Walls, cut-and-cover boxes, jacked boxes, bridges, and aerial structures. The report shall provide all necessary information such as General Plan, Typical Sections, foundation type, member sizes, and seismic and other geotechnical information to support Contractor's design.

Structure Reports for other jurisdictional authorities such as Caltrans, cities, counties, and railroads shall comply with requirements of that jurisdiction. Contractor shall coordinate with these jurisdictional authorities to obtain their approval prior to the design and construction of these structures.

4.9.5 Aesthetic Design and Review for Non-Station Structures Report

As the project takes form, a consistent system-wide image for the California High Speed Train Project is expected through the introduction of common elements associated with selected bridges and overpasses. Curvilinear forms can be effective for the following reasons:

- Image: Recognizable, consistent bridge and overpass forms can contribute toward establishing an aesthetic image for the CHSTP.
- Structural Precedents: Curvilinear forms such as arches and trusses have been successfully implemented for medium-span high-speed rail bridges internationally.

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- Materials: Either concrete or steel would be appropriate materials. Designers have the latitude to propose materials, details, connections, abutments, etc.

Interfaces between major bridges, overpasses, and adjacent aerial structures shall be carefully and systemically coordinated to ensure smooth and appropriate transitions in accordance with the aesthetic design guidance (Aesthetic Guidelines for Non-Station Structures included in Book 3 of the Procurement Package), as well as the aesthetics mitigation measures in the Final EIR/EIS and the Mitigation Monitoring and Reporting Program.

Contractor shall follow such aesthetic design guidance to implement aesthetic design and visual resource mitigations and enhancements to structures. The Aesthetic Design and Review Report shall describe Contractor's approach to implementing the guidelines.

Structures and other elements included in CP1 for aesthetic design and review preliminarily include the items below (subject to confirmation by the Contractor in its coordination as required herein).

- Aerial structures – approximately 3.7 miles in length
- Bridges, such as the one spanning across the San Joaquin River
- Overpasses, such as the ones crossing Highway 99, approximately 315 feet in length, and Golden State Boulevard, approximately 420 feet in length
- Retaining walls
- Trenches
- Local street lighting
- Access control fence
- Intrusion protection barrier

4.9.6 Certifiable Elements and Hazards Log

Contractor shall update and expand the Certifiable Elements and Hazards Log during the Design and Construction phases. Hazards associated with each certifiable element that can reasonably be expected to occur within Contractor's scope of work shall be identified on the Certifiable Elements and Hazards Log as defined in the CHSTP Safety and Security Management Plan found in Book 3.

4.9.7 Safety and Security Certification Package

Contractor shall compile a Safety and Security Certification Package when all Certifiable Items Lists for a particular element or infrastructure component are completed for applicable milestone payment. The Safety and Security Certification Plan shall consist of a signed Certificate of Conformance for the project element, all completed Certifiable Items Lists, a

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completed Certifiable Elements and Hazards Log (see Section 4.9.6), and all supporting documentation such as hazard analysis, drawings, and design element descriptions.

4.9.8 Final Design Report

Contractor shall prepare a Final Design Report that includes all changes and revisions made to the Design Baseline Report, including the portion of the work within Caltrans Scope of Work. This report shall be supported by all variances and design exceptions granted by the Authority or other third parties that support the changes to the Design Baseline Report. The Final Design Report shall represent a conformed configuration of the design.

4.10 Preparing Construction Drawings and Construction Specifications for CHSTP Facilities Third-Party Entities

Contractor shall be responsible for preparation of the complete design and certification that construction drawings, construction specifications, reports, and calculations meet the requirements of Authority, and Third-Party Entities.

The Project includes modification of facilities owned by Third-Party Entities, and construction in and around facilities owned by Third-Party Entities as shown in Section 3.5.

Contractor shall identify the design and construction requirements and codes of affected Third-Party Entities; and document the requirements and codes in the Design and Code Analysis Report. Contractor shall perform this assessment taking into account signed agreements, permits, or MOUs between the Authority and the Third-Party Entities, or draft agreement, permit, or MOU language in process, as provided by the Authority.

Agreements, Permits, and MOUs are included in Book 3 of this Procurement Package.

4.11 CHSTP Design Submittals

Contractor shall provide Design Submittals to the Authority as specified in this Scope of Work, the CHSTP Design Criteria and other mandatory documents included in the Procurement Package.

Design Submittals require issuance of a SONO or SONO with incorporation of comments to meet the requirements of this Procurement Package.

Contractor shall include in the schedule each Design Submittal and Authority review period, including breakdown by Construction Package Segment and/or structure.

Contractor shall include hard copies and an electronic file posted in accordance with the CHSTP Document Control Manual.

At minimum, submittals shall identify the following:

- Location including Construction Package Segment (CP1A, CP1B, CP1C)
- Preparer and date

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- Checker and date
- Signed and sealed by Engineer of Record, in accordance with State regulation
- Issue date and revision number
- Main point of contact, phone number, and company contact details

Contractor shall provide the following submittals to the Authority:

- Design Reports
  - Design Baseline Report (subject to Authority approval as noted in Section 4.9.1)
  - Design and Code Analysis Report
  - Aesthetic Design and Review for Non-Station Structure Report (as part of Design Baseline Report)
  - Value Engineering Report
  - Hydrology and Hydraulics Report
  - Geotechnical Reports
  - Structures Reports
  - Certifiable Elements and Hazards Log (included in Safety and Security Certification Package)
  - Final Design Reports
  - Certificate of Conformance Package
- Construction Drawings
  - Nominal 60 percent design, all sheets represented
  - Nominal 90 percent design, all sheets included

  Civil and Structure Construction Drawings may be submitted in segments or by structure and shall include identification of future facilities by others for reference as determined in the Interface Coordination and Design Integration Workshops. These include facilities for traction power, overhead contact system, communications, train controls, location of special trackwork, and CHSTP facilities by others, and shall be identified as "NIC".

- Construction Specifications
  - Nominal 60 percent: an outline of construction specifications shall be submitted
  - Nominal 90 percent: all applicable construction specifications shall be submitted
- Ready for Construction (RFC) Submittals (subject to Authority approval as noted in Section 4.13)

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- Electronic Submittal Files (certified as representing the designs in the Construction Packages). Drawing Submittals shall be in accordance with the CHSTP CADD and Plan Preparation Manuals. All other electronic design files shall be in PDF.
- Engineering Calculations (certified as representing the designs in the Construction Packages)
- Survey Reports (signed and sealed) as defined in CHSTP Design Criteria and Standard Specifications.

4.12 Third-Party Entity Design Submittals

Contractor shall provide Third-Party Submittals to respective Third-Party Entity and a copy to the Authority unless otherwise noted. Contractor shall be responsible for determining and providing submittal quantities required by Third-Party Entities.

Submittals shall identify the following information:

- Location including Construction Package Segment (CP1A, CP1B, CP1C)
- Preparer and date
- Checker and date
- Signed and sealed by Engineer of Record, in accordance with State regulation
- Issue date and revision number
- Main point of contact, phone number, and company contact details

Contractor shall include in the schedule each Third–Party Entity Submittal and review period.

4.13 Ready for Construction (RFC) Submittals

Contractor shall provide Ready for Construction Submittals to the Authority. These shall be submitted to the Authority for approval. Authority's nominal review period for RFC submittals is twenty business days. Contractor's attention is directed to Section 61.2 of the General Provisions.

Submittals shall include hard copies and an electronic file posted in accordance with the CHSTP CADD Manual.

Submittals shall identify the following information:

- Construction Package Segment (CP1A, CP1B, CP1C)
- Preparer and date
- Checker and date
- Engineer of Record (signed and sealed for Construction Packages)
- Issue date and revision number

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- Main point of contact, phone number, and company contact details

Contractor shall provide the following submittals to the Authority:

- Civil and Structure Construction Drawings
- Engineering Calculations (certified as representing the designs in the Construction Packages)
- Testing and Commissioning Plans
- Certificate of Conformance Package
- Maintenance Manuals and Training
- Maintainability Demonstration Plan and Procedures
- Maintainability Demonstration Report

Contractor shall include in its schedule each Submittal, including breakdown by section or structure.

4.14 Design Variances

Design variances have been preliminarily approved for specific conditions and locations based on preliminary engineering studies, and are identified in the Preliminary Design Variance Report(s) included in Book 3 of this Procurement Package. Final approval of these Preliminary Design Variances will occur upon Contractor's Design Variance Request submittal(s) during final design, if still applicable.

Contractor shall review the Preliminary Design Variance Report and determine if design modifications can be incorporated into the Design Baseline Report to achieve the design criteria and not require a design variance. Regardless of previous approvals during preliminary engineering studies, Contractor shall submit a request for each preliminary and/or new design variance needed to support design and construction. Contractor shall obtain final approval of Design Variances prior to incorporation of a design variance into a Construction Package. Design Variance Requests are subject to the Authority's change control process. Contractor shall not assume that additional Design Variance Requests will be approved beyond those included in the Design Variance Report provided in Book 3 of this Procurement Package.

Contractor shall refer to the Authority's Design Variance Guidelines and CHSTP Design Criteria in Book 3 of this Procurement Package for definition on design variance process and criteria thresholds, respectively.

4.15 Construction Services

Contractor shall provide Construction Services including but not limited to those described below.

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4.15.1 Safety and Security

Contractor shall be responsible for all work-site safety and security activities. Contractor shall submit a Site-Specific Health and Safety Plan and Site-Specific Security Plan as described in the CHSTP Safety and Security Management Plan in Book 3 of this Procurement Package.

4.15.2 Hazardous Material Handling

Contractor shall remove all Hazardous Material in accordance with previously completed Phase I and II work. Prior to performing the hazardous material removal work, Contractor shall submit a Hazardous Materials Remediation Plan per the requirements of the regulatory agency having jurisdiction over the site, as well as other requirements delineated in this Procurement Package.

4.15.3 Utility Work and Coordination with Utility Companies

Contractor shall be responsible for utility work as delineated in the General and Special Provisions in this Procurement Package. Coordination with utility companies shall be conducted as described in the CHSTP Design Criteria, Master Agreements, and other requirements specified in the Special and General Provisions.

4.15.4 Shop Drawings

Contractor shall prepare and submit construction and material shop drawings in accordance with mandatory CHSTP Standard Specifications, or portions thereof, as noted in Attachment 5 of this Scope of Work and in accordance with Contractor's construction specifications.

4.15.5 As-Builts

Contractor shall prepare and submit as-built drawings, signed and sealed, in accordance with CHSTP CADD and Plan Preparation Manuals. As-built drawings shall fully reflect the final, completed, as-built condition, inclusive of works completed by others in support of the Project and verified by the Contractor. As-built plans shall include Consolidated Service Drawings that fully address utility services designed and constructed by Contractor and/or others in support of the Project. Contractor shall survey the installed utilities to verify the actual placement.

4.15.6 Environmental Mitigations

Contractor shall be responsible for the review, coordination, permitting, design, construction, and monitoring of the applicable mitigations and commitments consistent with the limits and scope of work for CP1. Contractor is expected to review the mitigations and commitments included in the Environmental Documents, verify against Scope of Work, and submit a list of mitigation measures to allow the Authority to verify completeness and concurrence in the list. Contractor's attention is further referred to other requirements as specified in the General/Special Provisions and the Mitigation Monitoring and Reporting Program.

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5 Project Work Elements

The following is a summary of major work elements of the Project. For a more comprehensive list of Work Elements refer to Attachment 3 "Scoping Typical Sections" and Attachment 4 "Scope Elements Matrix" of this Scope of Work.

5.1 Demolition, Clearing, and Grubbing of the Construction Site

Existing buildings and structures within the limits of the construction shall be removed, and the site shall be cleared and grubbed to ensure the successful installation of the Project per the applicable requirements of regulatory and jurisdictional authorities. The construction site shall include the entire Authority right-of-way and construction areas required for the construction of grade separations and the relocation of waterways and utilities. Contractor shall prepare and submit a demolition plan prior to its demolition activities. For recycling requirements, refer to Sustainability Requirements in the General Provisions.

Removal, relocation, and/or purchase of existing billboards will be completed by others through the ROW Appraisal/Acquisition process (not-in-scope for CP01 Contractor). However, Contractor shall remove the billboard foundations, as required.

5.2 Railroad Relocation and Reconstruction

The Authority is working with the railroads to draft and execute design, construction, and maintenance agreement(s) with the railroads. These agreements will establish roles, scope, and responsibilities of the parties during each phase of project development such as railroad's review and approval of contractor's design, the railroad's review period, permitting, inspection, safety, insurance requirements, and flagging.

If the agreements with the railroads assign the scope of design and construction of railroad relocation to the Authority, the Contractor shall design and/or construct railroad relocation to accommodate the CHSTP per the requirements of the agreements. Contractor shall coordinate its railroad design and construction activities with railroads directly and comply with railroad requirements when working within or adjacent to railroad right-of-way.

If the railroads perform the design and/or construction of their relocation to accommodate the CHSTP, Contractor shall coordinate with the railroads directly to ensure railroad activities accommodate Contractor's Work and schedule. Contractor shall comply with railroad requirements when working within or adjacent to railroad right-of-way.

5.3 Roadway Construction

Work within or affecting the State Highway System (SHS) or within the SHS right-of-way shall be coordinated with and performed per Caltrans requirements.

Work within or affecting local jurisdictions shall be coordinated with and performed per the requirements of the jurisdictional authorities.

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Contractor shall design, construct, and maintain temporary access roads for its needs and those that may be required by local jurisdictions and emergency response authorities. Contractor shall also design, construct, and maintain permanent CHSR access roads required by the project per the requirements of the CHSTP Design Criteria and Directive Drawings. Contractor shall coordinate with the Authority Representative and local jurisdictions for the location of permanent access roads. Permanent access roads are required as indicated in the Design Criteria Manual and shall coincide with the location of future CHSR wayside systems/operations facilities as shown on the Preliminary Design Plans. Additional permanent access roads may be required by emergency response authorities. Contractor shall coordinate the design of access roads through Interface Coordination and Design Integration Workshops with the Authority.

Lighting and landscaping of roadway facilities that are within Caltrans and other jurisdictional authorities shall be coordinated with and performed per the requirements of the jurisdictional authorities.

Work in the vicinity of the existing Golden State Boulevard ramps will require coordination with the City of Fresno. The City of Fresno is responsible for the demolition of these ramp structures just north of SR-41.

5.4 Trackway

Final horizontal and vertical alignments for the trackway shall be designed by Contractor for the entire Project limits, including the portion of the work within Caltrans Scope of Work and location of all special trackwork. The limits of track alignment shall extend beyond Contractor's construction limits to the nearest point of tangency in plan and profile to ensure consistency, interface, and integration requirements with future work and in full support of ultimate CHSR operations.

Contractor's design of the trackbed shall not preclude the eventual design and installation of either a ballasted or non-ballasted track section, unless local conditions warrant a more specific determination. In this case, Contractor shall submit its analysis and results to the Authority for review. Specifically, at-grade sections and shorter aerial structures (less than 1,000FT) shall be designed to accommodate either track section, including the more stringent structural loading requirements. Contractor shall assume the eventual design and construction of a non-ballasted track section for longer aerial structures (greater than 1,000FT) and below-grade structure. Contractor shall consider the long-term settlement criteria of the constructed trackway in the design and shall monitor the settlement of the constructed trackway to ensure conformity with the most stringent CHSTP Design Criteria to accommodate either track section. Contractor shall coordinate and implement track section homogeneity as well as operations and maintenance considerations through the Interface Coordination and Design Integration workshops with the Authority.

Trackway shall include the cut and fill, temporary protective layer, and the surface and underground drainage, with the exception of the underdrain system along the trackbed. The

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installation of underdrain system along the trackbed will be performed by the follow-on contractor(s).

5.5 Retaining Walls

Contractor shall design and construct retaining walls necessary for the CHSTP trackway, State Highway System, and local roadways. Design and construction of retaining walls shall include the drainage system for the walls.

5.6 Concrete Barriers

Intrusion protection barriers shall be designed and constructed by Contractor where required to protect the High-Speed Train Operating Infrastructure from intrusion by automotive vehicles and/or railroad locomotives and cars per CHSTP Design Criteria, railroad, and Caltrans requirements. Contractor shall reference Proposed Preliminary Design plans for intrusion protection barrier preliminary locations between High-Speed Train Operating Infrastructure and existing railroads. Final locations of intrusion protection barriers between High-Speed Train Operating Infrastructure and existing railroads will be based on preliminary risk assessment and hazard analysis prepared by the Authority.

At locations where the CHSTP will be located adjacent to an existing railroad and/or highway facility and an intrusion protection barrier is required, said barrier shall be located as close as possible to the right-of-way line that delineates the bounds between both entities. The intrusion protection barrier shall be designed and constructed to ensure maintenance and constructability from within Authority's right-of-way.

For concrete barriers on grade separated structures over CHSTP trackway, Contractor shall design the barriers to accommodate future protective screen with solid plate.

5.7 Cut Sections and Walls (Trench Structures)

In areas where CHSTP trackway alignment is below grade, Contractor shall design and construct cut or cut wall sections to accommodate CHSTP trackway. Trenches are defined as below grade structures with a concrete retaining structure on both sides. When the bottom of a trench is below the water table or flood plains, the retaining structures shall be joined by a common reinforced concrete foundation (known as U-Wall).

Other cut walls that can be used when the CHSTP trackway alignment is above the existing ground water table (or flood plains), including but not limited to soil nail walls, cantilever soldier-pile walls, slurry walls, secant pile/tangent pile walls, and ground anchored walls (other than nail walls), depending on local site conditions. Space for access/egress shall be designed and constructed within the depressed alignment sections at nominal 2,500-foot intervals. Staircases shall be designed by Contractor as future accommodation and will be installed by others. Future installation of staircases shall not be precluded by Contractor's design and/or construction.

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5.8 Tunnels

In areas where CHSTP trackway alignment is sufficiently below final grade and/or the local conditions require third-party crossings over the depressed CHSTP trackway, Contractor may design and construct a short tunnel (or other tunnel type) to accommodate CHSTP trackway. Tunnels shall be waterproofed and be independent of temporary excavation support. CHSTP structures shall be designed and constructed independent of third-party facilities. Fire/Life/Safety codes (NFPA 130) and CHSTP Design Criteria requirements shall be followed.

5.9 Bridges/Aerial Structures

Contractor shall design and construct grade separated structures such as bridges, aerial structures, and grade separations that are required for the Project in accordance with CHSTP Design Criteria requirements.

Grade separated structures owned by Third-Party Entities to be built as part of the CHSTP project shall be designed and constructed in conformity with the requirements of said Third-Party Entities. In the event of conflicting requirements between the CHSTP Design Criteria and other standards and codes of practice, the more stringent requirements shall take precedence. Grade separated structures that span high-speed train trackways and have the capability to influence operability of high-speed trains in the event of failure, shall be designed per provisions in the CHSTP Design Criteria.

Contractor shall design the CHSTP grade separated structures, including the parapet walls, to accommodate the future installation of soundwalls (by others).

Contractor shall make an independent interpretation of the geotechnical information from previous site investigations, and shall carry out such additional geotechnical and subsurface investigations and surveys as are necessary to design and construct the grade separated structures or other elements of the Project, in conformity with the Contract requirements.

The Authority will review the seismic analysis and design to ensure the successful application of said criteria, as specified in the CHSTP Design Criteria. This effort shall be coordinated through the Interface Coordination and Design Integration Workshops with the Authority.

5.10 Drainage

Contractor is responsible for the design to accommodate the full build-out of CHSTP trackway and facilities. However, in lieu of constructing CHSTP trackbed underdrains (closed drainage system) and the drainage system inside the CHSTP trench or tunnel sections, Contractor shall design and construct a temporary drainage system for CHSTP trackbed and trench or tunnel sections to accommodate the drainage of these facilities until the follow-on Contractor installs the final drainage system. Contractor shall design and construct all other permanent drainage systems, such as drainage laterals, to ensure the successful drainage of the Project in the interim and final conditions, complete in place.

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Contractor is responsible for the design and construction of permanent drainage systems for Third-Party facilities being impacted by the Project.

At locations where the CHSTP will be located adjacent to an existing railroad and/or highway facility, a separate drainage system shall be designed and constructed to capture the runoff from each facility independently. The drainage system for each entity (Authority or Third-Party) shall be located within its right-of-way. Contractor shall also reference intrusion protection barrier location requirements as noted elsewhere in this Scope of Work.

In addition to the requirements of the Construction General Permit, the Project is subject but not limited to FMFCD Ordinance 96-1, "Urban Storm Water Quality Management and Discharge Control". Compliance with Ordinance 96-1 requires that Contractor implement the measures included in the FMFCD's "Fresno-Clovis Storm Water Quality Management Program Construction Site Storm Water Quality Management Guidelines".

5.10.1 Reliability of the Drainage Subsystem

Each pump station site shall be dimensioned to accommodate a redundant set of pumps and control equipment in the full build-out condition.

5.11 Utilities

Contractor shall ensure that existing and planned future utilities are not in conflict with CHSTP, State, and local improvements. Contractor shall relocate and/or protect the existing utilities in accordance with the requirements specified in the Special and General Provisions, CHSTP Design Criteria, and the requirements of utility owners and local jurisdictions. Contractor shall coordinate with local jurisdictions and the utility owners throughout the Project and shall design and construct the relocation of utilities in conflict with the Project, including future CHSTP facilities to be designed and constructed by others (i.e., relocation of existing overhead utilities that will conflict with future design and installation of CHSTP overhead contact system). Contractor is responsible for protection of utilities to remain in place during and after the performance of the Work.

Agreements executed to date between the Authority and utility owners are included in Book 3 of this Procurement Package. Contractor shall support the Authority for utility relocation agreements that may need to be finalized and/or executed for the project.

Contractor is responsible for providing temporary utilities required for the performance of its work.

5.12 Grounding and Bonding

Contractor is responsible for design, installation, and testing, which includes providing the testing procedures for acceptance of all grounding and bonding for the facilities it is constructing, and shall install provisions for grounding and bonding of facilities constructed by third party or future contractors, per the requirements of Attachment 3 "Scoping Typical

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Sections," Attachment 4 "Scope Elements Matrix," CHSTP Design Criteria, and Directive Drawings.

5.13 Access Control

Contractor shall design, construct, and maintain permanent access control including fences, gates, walls, and doorways.

5.14 Low Voltage Systems, Underground and Undertrack Ductbank, and Manholes

Contractor shall refer to and coordinate between CHSTP Design Criteria, Preliminary Design Plans, and Directive Drawings to locate, design, and install underground undertrack ductbanks and supporting manholes for future CHSTP Systems facilities along the Authority right-of-way, as delineated in Attachment 4 "Scope Elements Matrix" and shown on the Preliminary Engineering Plans. Final locations and designs for the underground and undertrack conduit ductbanks shall be coordinated with Contractor at the Interface Coordination and Design Integration Workshops with the Authority.

5.15 25 kV Traction Power Underground Ductbank and Manholes

Contractor shall refer to and coordinate between the CHSTP Design Criteria, Preliminary Design Plans, and Directive Drawings to locate, design, and install underground undertrack ductbanks and supporting manholes for future CHSTP Traction Power Facilities that are located away from the Authority right-of-way (e.g., when the relocated Golden State Boulevard separates the Authority right-of-way from a future Traction Power facility site). Final locations and designs for the underground and undertrack conduit ductbanks shall be coordinated with through the Interface Coordination and Design Integration Workshops with the Authority.

5.16 Temporary Lighting and Pumps

Contractor shall be responsible for design and installation of temporary lighting and pump facilities for the Project. Contractor shall leave the temporary lighting and pump facilities for trenches and tunnels in place after completion of the contract.

5.17 Reliability, Availability and Maintainability (RAM)

5.17.1 General

The Contractor shall design, build, and document the Project to achieve the required reliability, availability, maintainability (RAM) and accessibility of the Work, so that no aspect of Work causes a failure or condition which can affect passenger service or make the Work unavailable during the hours of operation, and so that no aspect of the Work precludes the future operating railroad system from achieving the requirement of no service-affecting failures caused by the Work.

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RAM shall be ensured through application of federal, state, and city codes and the best practices per the Design Criteria, directive drawings, other contract documents, and quality control and assurance processes.

Accessibility for inspection and maintenance activities of the Work shall be ensured per Design Criteria, directive drawings, other contract documents, and quality control and assurance processes.

The contractor shall assure and demonstrate the RAM requirements per the Contractor's RAM Program Plan required by the CHSTP RAM Program Plan (RAMPP). Refer to Book 3 for the CHSTP RAMPP.

5.17.2 Reliability

Reliability criteria for the Work include design life, and codes and standards to be applied. Reliability criteria include seismic design standards; flood level considerations; and maintainability features to achieve the required service life of the equipment and structures per the Design Criteria, directive drawings, other contract documents, and quality control and assurance processes.

5.17.3 Availability

Contractor shall design, build, and document the Project so that the availability of Work during the hours of operation of the railroad for the duration of its design life is 100%, and so that any planned unavailability of the Work for inspection and maintenance can be performed outside the hours of operation in one or more consecutive days. For the hours of operation of the CHST System and the available maintenance window during non-operating hours, refer to Book 3: Basis of Design.

This requirement excludes unavailability of the Work caused by natural disasters which cause climatic or seismic conditions in excess of the limits defined by this Procurement package, or caused by the third parties.

The Contractor shall identify the influences on the availability of the Work and shall demonstrate that these influences have been mitigated.

5.17.4 Maintainability

The Contractor shall provide the Work to minimize preventive and corrective maintenance requirements. The Contractor shall ensure that all required maintenance can be performed during the maintenance window outside the operating hours of the CHST System.

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The following additional maintainability requirements shall be ensured in the design and construction:

- **Design Life and Maintainability –** Components which have a shorter design/service life than the whole structure or system, for example bridge bearings and expansion joints, shall be replaceable or maintainable within the maintenance window of non-operating hours. The contractor shall conduct all necessary analysis and submit reports per the RAM Program Plan requirements, identifying all such elements which are part of the Work. Contractor shall assure and demonstrate these requirements as per the Maintainability Demonstration Plan and Procedures and demonstrate verification through the Maintainability Demonstration Report.
- **Accessibility –** Accessibility provisions include inspection points, hatches, doors, swing out racks, quick release covers and similar features aimed at providing rapid access to equipment and structural elements which requires routine maintenance inspection, cleaning or replacement (such as gratings and filters), without the need for special tools or equipment. Contractor shall ensure ease of access for inspection and for replacement of components.
  - Other accessibility requirements include physical access into confined spaces; access that does not require dismantling of components and structures; access that minimizes a need for isolation of the OCS; and maximizing access and repair activities that can be completed within the non-operating maintenance window, including set-up of equipment, scaffolding and lifting platforms needed for inspections and work, and final inspections and tests to allow the return of the works to operational status.
  - Special attention shall be given to minimizing the need to access the underside of bridges and viaducts above the tracks, given the proximity of the future high voltage OCS, including feeder and static wires and the supporting poles, portals, and headspans. Inspection access shall avoid to the maximum extent possible the need for special equipment, the isolation of OCS, and the occupation of the tracks themselves.
  - Access shall not require the removal and/or deconstruction of any part of the works in order to inspect bearings, expansion joints and other sensitive elements of the structures that require inspection as part of the regular preventive maintenance program.
  - Necessity for isolation of the OCS and/or tracks for passenger and work train operations to perform maintenance activities shall be minimized.
  - Visible fault indicators shall be provided to assist in the physical monitoring or repair of structural elements and equipment.

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- Handling provisions shall be provided, including lifting lugs for removal/replacement of heavy items or assemblies, fork-lift compatibility, and lifting limitations for manual handling.

- **Adjustment and Alignment –** Provisions shall allow for adjustment or alignment of equipment without isolation or occupation of the future operating tracks.

The contractor shall assure and demonstrate these requirements as per the Contractor's RAM Program Plan and Contractor's Maintainability Demonstration Plan and Procedures and demonstrate verification through the Contractor's Maintainability Demonstration Report as outlined in the CHSTP RAMPP.

5.18 Durability

Contractor shall prepare design and Construction Specifications to meet the Design Life and Durability goals of various elements of the project as stated in CHSTP Design Criteria. Contractor shall submit documentation indicating how design meets the requirements of the Design Life and Durability of various elements of the work to the Contracting Officer for concurrence. Documentation shall include analysis, engineering data or research, and test reports, as applicable. Documentation shall include citing which Construction Specifications requirements and which design details address specific Design Life and Durability issues. Documentation shall explain design and Construction Specifications provisions that address Design Life and Durability for typical elements in specific locations and those design and Construction Specifications provisions, which address Design Life and Durability.

As an example, the following aspects for concrete design are among those that shall be addressed to achieve the required service life:

- Design shall develop concrete mixes with cement contents, cement type and water/cement ratios that are compatible with achieving the required chemical resistance as well as producing a workable concrete.
- Admixtures that enhance the durability shall be used.
- Contractor shall identify methodology for assessing the characteristics of the environment, the properties of the concrete required to resist the environment, and the requirements for trials to demonstrate that the concrete being produced is of a suitable standard and has the necessary properties.
- Contractor shall assess the environment and determine what the appropriate value (or values) of permeability would be to achieve the service life.
- Contractor shall develop crack control criteria in accordance with the Design Criteria, AASHTO Bridges and ACI standards and guidelines.

6. Attachments

- Attachment 1 – Limits and Extents of Work Table

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- Attachment 2 – Limits of Work Map
- Attachment 2a – Caltrans Limits of Work Plan
- Attachment 2b – Caltrans Scope of Work Map
- Attachment 3 – Scoping Typical Sections
- Attachment 4 – Scope Elements Matrix
- Attachment 5 – Mandatory Standard Specifications Listing
- Attachment 6 – Mandatory Special Specifications Listing

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