Independent Financial Advisor Report
To California High-Speed Rail Authority Regarding:

Peninsula Corridor Funding Plan

Project Finance Advisory Ltd. (PFAL)
December 6, 2016

PFAL Project Finance Advisory Ltd.


PFAL

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Key Terms and Definitions

AB 1889: Assembly Bill No. 1889, Stats. 2016, ch. 774

Authority: California High Speed Rail Authority

CalMod: Caltrain Modernization Program

CBOSS: Communications Based Overlay Signal System

DB: Design Build

EMU: Electric Multiple Units

FFGA: Full-Funding Grant Agreement between FTA and JPB

FTA: Federal Transit Administration

Funding Plan: San Francisco-San Jose Peninsula Corridor Funding Plan dated December 5, 2016

High-Speed Train Operation: Authority high-speed train service as envisioned in the 2016 Business Plan and Ridership and Revenue Forecasting Technical Supporting Document to the 2016 Business Plan.

HSR: High-Speed Rail

JPB or Caltrain: Peninsula Corridor Joint Powers Board, the legal entity responsible for passenger rail service referred to as Caltrain

OHLE: Overhead Line Equipment

PCEP: Peninsula Corridor Electrification Project

Peninsula Corridor: Railroad and facilities comprising the rail corridor between San Jose and San Francisco also referred to as the Caltrain Corridor

Phase 1: California High-Speed Rail Program Phase 1 as defined in 2016 Business Plan

PMFA: Project Management and Funding Agreement

PMP: Program Management Plan

Prop 1A: Proposition 1A, the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century, (added by Stats. 2008, ch. 267 (AB 3034)), codified at Streets and Highways Code 2704, et seq..

Report: Independent report pursuant to California Streets and Highways Code 2704.08(d)(2)

SB 1029: Senate Bill No. 1029 Budget Act of 2012

SB 557: Senate Bill No. 557 (added by Stats. 2013, ch. 216) codified at Streets and Highways Code section 2704.76, 2704.77).

2013 MOU: 2013 Memorandum of Understanding entered into by the Authority and JPB

7-Party MOU: 2016 7-Party Supplement to 2012 MOU entered into by the Authority, JPB, Metropolitan Transportation Commission, San Francisco County Transportation Authority, San Mateo County Transportation Authority, Santa Clara Valley Transportation Authority, and City and County of San Francisco.

9-Party MOU: 2012 9-Party Memorandum of Understanding entered into by the Authority, JPB, Metropolitan Transportation Commission, San Francisco County Transportation Authority, San Mateo County Transportation Authority, Santa Clara Valley Transportation Authority, City of San Jose, City and County of San Francisco, and Transbay Joint Powers Authority.

"**Revenues**," within the meaning of Streets and Highways Code section 2704.08, subdivision (d)(2)(D)) means: fare box revenues and ancillary revenues. Fare box revenue is income from ticket sales. Ancillary revenues include other income the Authority may receive from sources related to the everyday business operations of the high-speed rail, including but not limited to on-board sales (e.g., sales of foods or sundries), station-related revenues, advertising, and revenues from leases of excess or non-operating right-of-way parcels or areas, as well as areas above or below operating rights-of-way or of portions of property not currently being used as operating rights-of-way. Ancillary income does not include unexpected or "one time" events.

"**Operating and Maintenance Costs**," within the meaning of Streets and Highways Code section 2704.08, subdivision (d)(2)(D)) means: ongoing operating and maintenance costs, that is, the cost of running the trains and maintaining the infrastructure and rolling stock in a state of good repair. It does not include capital asset renewal (or lifecycle) costs, which is the cost of replacing or refurbishing worn out components at the end of their useful life.

"**Suitable and ready for high-speed train operation**" means, as stated in AB 1889: "if the bond proceeds, as appropriated pursuant to Senate Bill 1029 of the 2011–12 Regular Session (Chapter 152 of the Statutes of 2012), are to be used for a capital cost for a project that would enable high-speed trains to operate immediately or after additional planned investments are made on the corridor or useable segment thereof and passenger train service providers will benefit from the project in the near-term."

"**The planned passenger service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy**" means: within a reasonable period of time after commencement of high-speed train operations on the usable segment, project revenues will reach an operating break-even point at which aggregate revenues up to that point in time equal Authority-borne operating and maintenance costs to that point in time and such revenues will continue to equal or exceed operating and maintenance costs thereafter.

"Useable segment" means the Peninsula Corridor between 4th and King Streets in San Francisco and Tamien Station in San Jose, and includes the Caltrain station at 4th and King Streets in San Francisco and Diridon Station in San Jose.

Disclaimer

Project Finance Advisory Limited ("PFAL") has performed an independent review of the Peninsula Corridor Funding Plan ("Funding Plan") as required by the California Streets and Highways Code 2704.08(d)(2) and as described in PFAL's executed agreement with the California High-Speed Rail Authority (Authority) dated December 2015. This independent review was performed using documents provided by the Authority (listed in the Bibliography and body of this Report) and developed using current accepted professional practices and procedures. PFAL, with the Authority's permission, has relied on the accuracy and completeness of the documents provided by the Authority. This Report does not serve as an accounting audit. Furthermore, this Report should not be relied on for any financing or investment decision. It is possible that there are other elements of risk associated with the Funding Plan beyond those presented. Any financial estimates, analyses or other information used by PFAL in connection with the Report represents the general expectancy concerning events as of the evaluation date and are based solely on the information reviewed by PFAL. However, the accuracy of any financial estimate, analysis or other information is dependent upon the occurrence of future events that cannot be assured. Additionally, these estimates and analyses rely on the assumptions contained therein, the accuracy of which remains subject to validation, further refinement and future events. Estimates should not be construed as statements of fact. There will usually be differences between the projected and actual results because events and circumstances do not occur as expected, resulting in possible differences.

Executive Summary

Project Finance Advisory Limited ("PFAL"), together with our team of consultants, was appointed following a competitive procurement process by the California High Speed Rail Authority ("the Authority") to provide independent consultant services. Our role is to fulfill the legislative requirement to provide an independent analysis of the Authority's funding plans.

This Report is an independent analysis of the San Francisco-San Jose Peninsula Corridor Funding Plan ("Funding Plan") dated December 5, 2016 provided by the California High Speed Rail Authority ("Authority") pursuant to California Streets and Highways Code ("SHC") 2704.08(d)(1).

The purpose of this Report is to fulfill the requirements to review the Funding Plan for the $600 million Prop 1A bond proceeds appropriated in SB 1029 and later reaffirmed in SB 557 to indicate if:

a) Construction of the corridor or usable segment thereof can be completed as proposed in the Funding Plan;
b) If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation;
c) Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service;
d) The planned passenger train service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy; and
e) An assessment of risk and the risk mitigation strategies proposed to be employed.

As an independent consultant, PFAL and our team of sub-consultants have a duty of care to the California State taxpayers to uphold the SHC 2704.08(d)(2) requirements. In keeping with this responsibility, the analysis and conclusions in this Report are not prejudiced by any external interest; our conclusions are completely our own.

The analysis and conclusions provided in this Report are based on our professional opinions and the opinions of subconsultants to PFAL that specialize in passenger rail operations and high-speed rail ("HSR") delivery. These subconsultants include First Class Partnerships Limited ("FCP"), David Evans and Associates, Inc. ("DEA"), Anrab Associates ("Anrab"), and Infrastructure Development Strategies California ("IDSCA").

The approach PFAL implemented, further described in Section 1.2, to independently verify the criteria in SHC 2704.08(d)(2) is based on industry best practices and

PFAL's previous roles of comparable assignments as independent financial advisor and auditor for the Federal Railroad Administration's Railroad Rehabilitation & Improvement Financing ("RRIF") program, the US Department of Transportation ("USDOT"), the Virginia Office of Public Private Partnerships, and the USDOT's Transportation Infrastructure Finance and Innovation Act ("TIFIA") Program, as well as many other government agencies in the US and internationally.

Caltrain's electrification program is a "bookend" project. "Bookend" projects are contemplated in the Authority's 2012 Business Plan, which is referenced in the Legislature's appropriation of $1.1 billion in 2012 via SB 1029. A "bookend" project is described in the 2012 Business Plan as "a project which makes improvements in existing rail systems in the metropolitan regions prior to or, in some cases, in lieu of, high-speed infrastructure." Bookend projects can also "service to connect high-speed rail to already existing modes of transportation." The intent of bookend projects is to "deliver improved service in terms of reliability, safety, and efficiency to users of existing rail systems, providing tangible benefits in the near-term and building rail ridership for the long-term."

The Authority developed the Funding Plan for this PCEP bookend project to contain the information the Authority believes complies with SHC 2704.08(d)(1). PFAL offers no opinion on whether or not the Funding Plan is compliant. PFAL's review and development of this Report, as it pertains to forming an opinion for SHC 2704.08(d)(2), is limited in scope to the contents of the Funding Plan.

The Funding Plan contemplates that upon completion of the planned improvements, Caltrain will operate electric trains in the Usable Segment, defined as the Peninsula Corridor in the Funding Plan and further described in Section 1.2 of this Report. It is the Authority's intent, after completion of the Silicon Valley to Central Valley Line ("Valley to Valley Line"), that high-speed trains will operate in the Usable Segment once connected to the Valley to Valley Line. That work is not contemplated in this Funding Plan.

Because the Authority does not plan to have high-speed trains operating in the Usable Segment until after completion of and connection to the Valley to Valley segment, the planned Authority Revenues or Operations and Maintenance Costs referenced in the 2016 Business Plan are not relevant to the analysis of this Funding Plan. Therefore we are unable to comment on whether the eventual planned passenger train service to be provided by the Authority, or pursuant to its authority, will or will not require an operating subsidy.

We are able to comment on Caltrain's risk mitigation strategies for the PCEP. However, to the extent that unmitigated risk could harm the Authority's interests (for example, pushing PCEP completion date past the Authority's 2025 planned operation

date) and the Authority plans to mitigate that risk in the PMFA, we cannot evaluate the effectiveness of such mitigation because the PMFA has not yet been finalized. We do offer in Section 6 suggestions for certain risk mitigations to be addressed in the PMFA but make no representation that these suggestions are comprehensive or exhaustive.

Key Findings

The Funding Plan sets out to satisfy SHC 2704.08, subdivision (d) for the commitment of $600 million of Prop 1A bond proceeds for the PCEP. The Funding Plan complies with the statutory requirements insofar as it address each of the SHC 2704.08(d)(2) criteria. Table 1 summarizes PFAL's opinion on each component of SHC 2704.08(d)(2).

Table 1: SCH 2704.08(d)(2) PFAL Summary Opinion

SHC 2704.08(d)(2) requirements	PFAL Opinion
Construction of the corridor or usable segment thereof can be completed as proposed in the plan submitted pursuant to the Funding Plan	PCEP can be constructed as proposed in the Funding Plan; See Section 2
If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation	When completed, the PCEP will be suitable and ready as defined in AB 1889; See Section 3
Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service	PCEP can facilitate passenger service; See Section 4
The planned passenger train service to be provided by the authority, or pursuant to its authority, will not require an operating subsidy	No high-speed rail service is contemplated on a stand-alone basis in the Peninsula Corridor; See Section 5
An assessment of risk and the risk mitigation strategies proposed to be employed	Risks are identified and addressed by JPB, see Section 6 for risk summary

1. Funding Plan Overview

1.1 PROPOSITION 1A FUNDING

In 2012, Senate Bill ("SB") 1029 appropriated $1.1 billion of Proposition 1A ("Prop 1A") bond proceeds in "bookend" funding for projects that were deemed necessary to advancing and facilitating the implementation of California's HSR system.

In 2013, SB 557 reaffirmed SB 1029 by specifically approving $600 million of bookend funding for the San Francisco to San Jose Peninsula Corridor without a SHC 2704.08 subdivision (c) Funding Plan. SB 557 acknowledged the Nine Party Memorandum of Understanding ("MOU") entered into by the California High-Speed Rail Authority ("Authority"), the Peninsula Corridor Joint Powers Board ("JPB"), and seven other local public entities in 2012. The purpose of the MOU was to jointly pursue blended service on the Peninsula Corridor and the modernization of the Peninsula Corridor (further described in Section 1.3). The MOU commits the Authority to $600 million of Prop 1A funding.

The Funding Plan addresses this $600 million of Prop 1A bond proceeds appropriated by SB 1029, reaffirmed in SB 557, and agreed upon in the MOU to partially fund the $1,980 million Peninsula Corridor Electrification Project ("PCEP").

1.2 PFAL REVIEW APPROACH & METHODOLOGY

PFAL initiated this review in conformance with SHC 2704.08(d)(2) on September 27, 2016 through a limited task order by obtaining publicly available documents in support of the Funding Plan from the Authority and JPB's website. The intent of the limited task order was to determine what additional information was required for PFAL's independent review. The publically available documents initially reviewed included, but were not limited to:

- California State bills, legislative opinions;
- Authority business plans, memoranda of understanding; and
- PCEP documents available on JPB's website.

On October 21, 2016, the Authority executed remaining task order for PFAL's review of the Funding Plan. The Funding Plan was not made available at that time, as it was still under review by the Authority, but there were numerous supporting documents relied upon in the Funding Plan that PFAL requested to verify the underlying assumptions and statements described by the Authority. After the initial review of the previous documents, there followed an iterative process with PFAL and its

subconsultants posing additional questions, and the Authority providing additional supporting information and clarifications as needed.

To facilitate the process, document and question requests were organized by the following categories:

- Civil;
- Electrification;
- Capital Costs;
- Construction Schedule;
- Environmental;
- Project Management;
- Risk Management;
- Operations;
- Rolling Stock;
- Legislation/Project Agreements; and
- Funding.

The additional information requests included, but were not limited to:

- Risk identification and management plans;
- Project management plans;
- Detailed cost estimates;
- PCEP specifications;
- PCEP implementation schedules;
- Rolling stock specifications;
- Authority's electrification standards;
- PCEP track commissioning and inspection regime;
- PCEP funding plan;
- PCEP FTA quarterly updates;
- Details of the Project Management and Funding Agreement ("PMFA"); and
- PCEP quality management plan.

The additional information was provided to PFAL by the Authority as it became available to the Authority. As a result, the information requests were met at various stages of the review.

Due to the volume of information to process, PFAL and their subconsultants developed questions to the Authority for clarification. PFAL and the Authority conducted two general funding plan meetings (one by teleconference and one in person) for PFAL to clarify any ongoing questions. The nature of the meetings was to facilitate the understanding of the Funding Plan in a factual manner that would aid PFAL's analysis and understanding. After the second meeting, it was determined a

further teleconference specific to the Authority's technical standards was required to verify whether the Peninsula Corridor would be deemed suitable and ready for HSR (see Appendix II – Technical Meeting Notes for summary).

A draft Funding Plan was provided to PFAL on November 14, 2016 and a second revised draft Funding Plan was provided to PFAL on November 29, 2016 by the Authority. PFAL then confirmed that the Funding Plan was consistent with the supporting documents previously reviewed. Once the majority of information was received, PFAL and its subconsultants conducted a teleconference on November 17, 2016 to provide an opportunity for the JPB to clarify six PFAL risk issues. The JPB made available its resources and information to PFAL in a timely manner to address those six risk issues, including the JPB's Risk Register dated November 11, 2016. JPB's responses and information are included in the final opinions of this Report.

The final Funding Plan submitted to the Authority's Board was provided to PFAL on December 5, 2016. PFAL reviewed the changes between the November 29, 2016 version and the December 5, 2016 version to adjust and verify the conclusions in this Report. The relevant changes between previous Funding Plan versions provided to PFAL and the Funding Plan provided on December 5, 2016 were updates to the sources and uses of funds and the JPB's response to the FTA's recommendation for funding or cost overruns or funding shortfalls.

The review of the documents and conversations as outlined above were limited to the scope of the Funding Plan for the purpose of this Report. PFAL's scope of work was limited to reviewing the content of the Funding Plan. **This means PFAL did not review future improvements to the Corridor which may be required to operate at speeds above the current imposed speed in the Peninsula Corridor because they are not included in the Funding Plan. PFAL also did not review any projected Revenues or Operations and Maintenance costs that are relevant to the eventual operation of the high-speed rail system as these were also not contemplated in the Funding Plan.**

To formulate an opinion on SHC 2704.08(d)(2), our report is structured as set out in the following table.

Figure 1: Report Structure

Report Section	Approach
Section 2	Analyzes the constructability of the elements included in the Funding Plan by determining the reasonableness of the following items to formulate an opinion on SHC 2704.08(d)(2)(a): • scope • procurement method • construction schedule • project management • project cost • regulatory standings of the construction program
Section 3	Provides a review the corridor's ability to function as a foundation for HSR while providing near-term benefit to passenger rail service to formulate an opinion on SHC 2704.08(d)(2)(b).
Section 4	Evaluates the ability of Caltrain, or HSR, or both, to operate at prevailing speeds in the corridor to provide an opinion on SHC 2704.08(d)(2)(c).
Section 5	Addresses SHC 2704.08(d)(2)(d).
Section 6	Reviews the risk management plans of both Peninsula Corridor Joint Powers Board ("JPB") and the Authority for the corridor to form an opinion on SHC 2704.08(d)(2)(e).

1.3 SUBJECT OF FUNDING PLAN

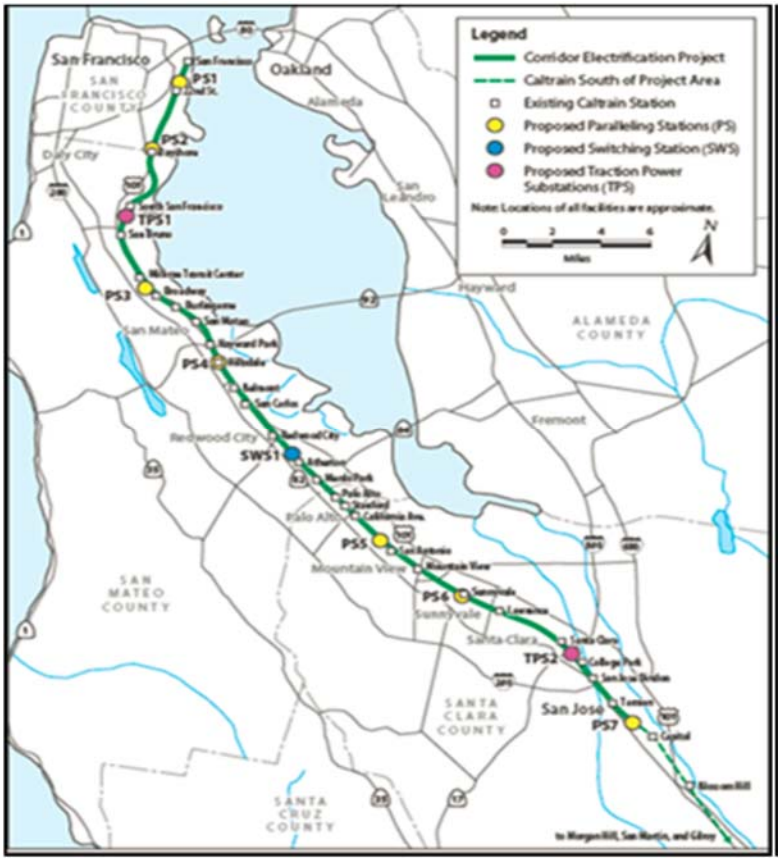
The Usable Segment as defined in the Funding Plan is the Peninsula Corridor, which is the rail corridor between 4th and Kings Streets in San Francisco and Tamien Station in San Jose and includes the Caltrain station at 4th and King and Diridon Station.

The Funding Plan is intended for the construction of improvements to the Peninsula Corridor from the Caltrain Modernization Program ("CalMod"), including the PCEP. CalMod is intended to electrify and upgrade the performance, operating efficiency, capacity, safety and reliability of JPB's commuter rail service through a series of projects outlined in Table 2 and shown in Figure 2. Integration of the Peninsula Corridor, PCEP and the Authority is discussed in Section 2, 3 and 4 of this Report.

Table 2: CalMod Program of Projects Summary

Program	Scope	Approximate Value
CalMod	• CBOSS • PCEP	• $2.2 billion
CBOSS	• Advanced Signal System • Positive Train Control	• $231 million
PCEP*	• **Electrification Infrastructure** • Purchase of EMU's	• **Electrification Infrastructure: $1.3 billion** • EMU: $664 million

*Electrification infrastructure is the only use of Prop 1A funds



- Peninsula Corridor Electrification Project ("PCEP"); and
- Communications Based Overlay Signal System ("CBOSS").

The scope of the PCEP includes:

- Electrification of the Peninsula Corridor; and
- Purchase of electric multiple units ("EMU's")

The subject of the Funding Plan is PCEP, and the focus of this Report is the electrification infrastructure component of the PCEP, the only portion of the project that Prop 1A bond proceeds will fund. Funding for the EMU's is the responsibility of the JPB and is included in the PCEP sources and uses tables in Section 2.4, but will not use Prop 1A funds.

The PCEP will enable the replacement of the existing diesel service with a fully electrified service from the 4th and King Street station in San Francisco to the Tamien station in San Jose. The PCEP's electrification infrastructure components include the installation of two substations for traction power, poles and an overhead contact system, signal and grade crossing circuitry changes, and yard electrification. The project will extend for approximately 51 miles from San Francisco to San Jose. Its intent is to improve Caltrain's ability to provide faster and more frequent service, reduce air emissions, reduce noise and vibration, and provide a foundation for HSR.

The JPB is a legal entity with title to the right of way between San Francisco and Tamien station in San Jose. The JPB is responsible for the passenger service operations, referred to as Caltrain, in the Peninsula Corridor, and is the responsible agency for the implementation of the PCEP. The JPB is the owner and integrator for all the projects that encompass, and may have an interface with, the PCEP including:

- The Balfour Beatty Infrastructure Inc. electrification contract valued at approximately $697 million.
- A separate contract (with a yet un-named contractor to be selected by JPB) to physically modify and install overhead line equipment ("OHLE") in four (4) tunnels at the northern end of the electrification project. This design-build contract will be procured in late 2017 or early 2018 based on the Master Program Schedule. The value of this work is estimated to be $11.02 million..
- The Stadler US Inc. contract which will deliver 96 EMU's configured as sixteen 6-car trains and is valued at approximately $551 million.
- Separate contracts to modify the yard and utility infrastructure for the OHLE.

Several components of the CalMod are not part of PCEP, so are not included in the Funding Plan. Those components will not utilize the $600 million Prop 1A Funding

and were, therefore, not considered in our analysis. Components of the CalMod program that are beyond the scope of the Funding Plan include:

- The Parsons Transportation Group Inc. CBOSS contract
- Several civil works contracts including the Hillsdale grade separation

1.4 USE OF PROP 1A FUNDS

This Funding Plan pertains to the $600 million of Prop 1A bond proceeds appropriated in SB 1029 and again in SB 556. The $600 million allocated to the PCEP will help to fund the electrification infrastructure but not the purchase of the EMUs. Table 3 shows the sources of funds for the PCEP electrification infrastructure and the full allocation of the $600 million. The complete sources and uses of funds for the $1,980 million PCEP (including purchase of the EMU's) is outlined in Section 2.4.

Prop 1A bond proceeds will be distributed from fiscal year 2017 to fiscal year 2020[2] to the JPB in order to partially fund the PCEP. The timing distribution of Prop 1A funds if further described in Section 2.4. The $113 million in Cap-and-Trade or other Authority/State Sources committed to by the Authority in the Seven-Party MOU Supplement is not subject to PFAL's review. Table 4 below provides the uses of PCEP electrification funds, including the $600 million Prop 1A bond proceeds. Section 2.4 provides additional detail on the total PCEP sources and uses of funds as it pertains to the deliverability of the PCEP program.

Table 3: Electrification Infrastructure Estimated Funding Plan Sources[3]

Sources	$ million
FTA Formula Funds	15.68
Prop 1A	600.00
Prop 1B	8.00
Carl Moyer	20.00
JPB Prior Local Funds	9.02
JPB Members	104.91
Bridge Tolls	10.809

[2] *PCEP Funding Plan.* PCJPB. November 7, 2016.
[3] *PCEP Funding Plan - For Planning Purposes Only*. PCJPB.2016.

Sources	$ million
Cap and Trade or other Authority/State Sources	113.00
Bridge Tolls – RM1	8.40
FTA Core Capacity (FFGA Still Outstanding)*	426.31
Total	**1,316.13****

*FFGA risk addressed in Section 2.4; **Total does not include purchase of EMUs

Table 4: PCEP Electrification Infrastructure Fund Uses (excluding EMU associated uses)[4]

Uses	$ million
Electrification	696.61
Tunnel Notching	11.03
Real Estate	28.50
Private Utilities	63.52
Management Oversight	141.51
TASI Support	55.28
RRP Insurance	3.50
Environmental Mitigations	17.69
Required Projects	17.34
Maintenance Training	1.02
Finance Charges	3.17
Contingency	276.97
Total	**1,316.13**

1.5 AUTHORITY COMMITMENT

Pursuant to the guidance in SB 1029 and SB 557, further reflected in the 2012 9-Party MOU, 7-Party Supplement to 2012 MOU, and 2013 MOU, the Authority has

[4] *Caltrain Peninsula Corridor Electrification Project Funding Plan Section 2704.08, Subdivision (d) Funding Plan*. California High-Speed Rail Authority. 2016.

memorialized a number of key funding agreements for the investment of the $600 million in Prop 1A bond proceeds. These documents were reviewed along with the Outline of Desired Basic Terms and Conditions, dated November 15, 2016, provided by the Authority intended to reflect the commercial terms the Authority would like to see included in the final documentation of further agreements with the JPB.

These agreements contemplate the Authority's interest in the Corridor, Authority's oversight of PCEP, and Authority's right to use the Corridor. Additional elements still need to be formalized in a Project Management and Funding Agreement ("PMFA") between the Authority and JPB and approved by the Department of Finance.

The PMFA is under negotiation between the Authority and JPB and will not be executed prior to publication of this Report. The analysis and opinions in this Report are based on the 2012 9-Party MOU, 7-Party Supplement to 2012 MOU, and 2013 MOU and the assumption that all terms in the above-referenced Outline of Desired Basic Terms and Conditions will be included. **Any changes between the November 15, 2016 Outline of Desired Basic Terms and Conditions, which form the key commercial elements of the PMFA, and the executed PMFA may change the conclusions and opinions in this Report, to the extent such changes relate to the five indications this Report is required to address from SHC 2704.08(d)(2).**

2. Constructability

Having completed a review of all requested documentation, we have concluded that construction of the PCEP electrification infrastructure in the Peninsula Corridor can be completed as proposed in the Funding Plan submitted pursuant to SHC 2704.08(d)(2)(a), as specified in, and in compliance with, environmental documents.

PFAL has several observations regarding the implementation of the electrification project:

2.1 PROJECT PROCUREMENT

2.1.1Overall Procurement Plan

The PCEP will be implemented using four primary construction and equipment procurement contracts:

- Electrification Design-Build Services – awarded to Balfour Beatty Infrastructure, Inc., Limited Notice-to-Proceed (LNTP) issued September 6, 2016.
- Tunnel Modifications – planned to be delivered through a Design-Bid-Build Procurement. Design is underway and construction planned to begin in early 2018.
- EMU Procurement – manufacture, delivery, testing and training for 16 electrically powered trainsets. Awarded to Stadler USA
- Centralized Equipment Maintenance and Operations Facility Modification Contractor – planned to be delivered through a Design-Bid-Build Procurement. Design underway and construction planned to begin in late 2017.

In addition to these major contracts, the JPB will manage smaller contracts for modifications to existing infrastructure and implementation of measures to mitigate potential environmental impacts of the project. Third parties will implement the supply of utility power for the traction electric system and will complete necessary public utility relocations.

With the electrification DB and EMU contracts awarded, 79 percent of the project budget (excluding unallocated contingency) is under contract and not subject to design or market risks. The remaining risks, including contract interfaces, agency-caused delays and scope changes, third party issues and differing site conditions could still impact the planned schedule and cost of the project, but eliminating the

market and design risks for the majority of the work increases the probability of successful completion of the program within schedule and budget.

2.1.2 Electrification Contract

The Electrification Design-Build ("DB") contract will implement the elements of the PCEP that are included in the Funding Plan that is the subject of this review. The Authority reviewed and approved the PCEP electrification performance specifications that make up the basis of the Electrification DB contract to ensure it meets their needs. Interfaces between this DB contract and the other elements of work must be effectively managed by the JPB to successfully deliver the electrification program. These interfaces represent risks that could impact the cost and delivery schedule for the work, as discussed in Section 2.10.

The current Project Management Plan for the PCEP documents an extensive outreach program to industry, with multiple rounds of questions and answers and many instances of agency acceptance of industry recommendations for clarifications and improvements to the contract. This outreach program contributed to a clear definition of the scope of work and responsive proposals from three design-build teams.

The Engineers Estimate ("EE") for the Electrification DB contract was $599.3 million and the Balfour Beatty proposed price was $704.1 million – 17.5 percent higher than the EE. The price is a combination of a lump sum amount and a not to exceed amount for work that will be compensated based on unit price and actual quantities. Two other bids were received, with one slightly higher and the second substantially higher than the Balfour Beatty price. The final negotiated price is $696.6 million, which is composed of a lump sum amount and a provisional, not to exceed amount based on unit prices for work that will be paid based on measured quantities. There is a 5 percent contingency identified in the DB contract, which is under the control of the JPB Executive Director. This contingency is included in the total contingency for the PCEP program. While the executed DB contract price exceeded the EE, the most recent program budget[5] reflects the DB contract award prices for both the Electrification DB and EMU contracts.

Implementation of the Electrification DB project delivery method transfers significant risks from the JPB to the DB contractor, while leaving many other risks to be absorbed by the JPB. As discussed in the Construction Risk Section, the contract terms limit the contractor's risk exposure for differing site conditions, third party

[5] Final PCEP FTA Quarterly Update_October 2016.pdf, page 20.

interfaces and other risks that are retained by the JPB. The contract is favorable to the contractor, as it does not require it to assume risks that are beyond its immediate control. With the DB contract price negotiated and limited notice to proceed ("LNTP") issued, Balfour Beatty Infrastructure Inc., the DB contactor, has taken on the design risk for the work, including risks associated with the constructability of its design as well as market risks for subcontracts and material prices. The notice to proceed ("NTP") is expected in March 2017 as further described in Section 2.4. The DB contract specifies the time from NTP to substantial completion and final completion of the work. The DB contractor is responsible for planning its work to complete the scope, subject to changes that may occur as the result of risks retained by the JPB as outlined in the Electrification DB Contract.

The Electrification DB contract provides for liquidated damages ("LDs") in the event of schedule delays that are the responsibility of the DB contractor and for impacts to rail services by contractor activities. The contract specifies the following LDs related to contract milestones:

- Overall substantial completion - $20,000 per day of delay in achieving substantial completion
- Intermediate milestone 1 (test track completion) - $10,000 per day of delay in completing milestone 1
- Final acceptance - $10,000 per day of delay in achieving final acceptance

LDs for rail service interruption are $1,000 per five minute increment of delay to each train, with a daily maximum of $50,000. The combined LDs for service delays and contract are capped at $7.3 million or on the order of one percent of the contract value, which is consistent with industry practice. A delay of 360 days in achieving substantial completion would result in $7.2 million in LDs for contract delays. The contract notes that the LD amounts have been negotiated, rather than based on a calculation of the actual damages that the JPB would suffer as a result of delayed completion, as these damages could not be determined.

The Electrification DB contract scope of work clearly identifies what is required of the DB contractor and also specifies key areas of work which are the responsibility of others, including:

- Aerial utilities are to be relocated by others and are not in the DB contact. JPB will relocate aerial utilities that will be impacted by the installation of the electrification facilities; and aerial utility relocations are not in Contract.
- The design shall minimize or negate the impact to underground utilities, and the DB contractor shall be responsible for underground utility relocations required due to design decisions to ease the DB contractor's construction effort. The DB contractor is responsible for contacting utility companies to

request location information. The DB contractor is to conduct potholing or otherwise confirm location of the utilities.

- There are four tunnels on the northern end of the Project that are not included in this Project's Scope of Work, however the interface with each tunnel's existing systems are included and they will be an existing constraint for movement of construction equipment. The interface will include dead-ending of the OHLE, feeders and static wire onto the termination structures at each tunnel portal installed under a separate contract. The Contractor shall field verify the installation of these systems and design and construct the required systems to interface with them.
- The DB Contractor shall, as part of its design, locate, design, and install underground cable system infrastructure, including under track ductbanks, surface cable troughs and supporting manholes to coordinate with future Caltrain projects within the Project limits. Final locations and designs for the underground and under track conduits and ductbanks shall be coordinated by the Contractor with the other projects.

The Electrification DB contract includes appropriate management and control requirements on the Contractor, which are consistent with project and quality control procedures documented in the PCEP PMP, including:

- Variances from the Design Criteria are not authorized without specific written approval from the JPB, and require the formal request specified in Volume 3, Part A, Section 15, Design Variance. Design Variances must be approved by the JPB Project Delivery Director.
- Interface coordination with other operators is defined in the contract. There also are requirements for coordination of work with other contractors. Where this coordination results in restriction to the Contractor's Work Site access, the Contractor shall provide for reasonable work-arounds to allow the continuance of construction. The workarounds shall not constitute the basis for a Contractor delay, time extension claim or for additional cost to JPB in any way.
- The DB contractor shall design, build, install and document the systems provided under the Project that shall achieve the required reliability, availability, maintainability ("RAM") goals and accessibility of the work. No aspect of the work shall cause a failure or a condition which can affect passenger service or make the work unavailable during the hours of operation. Additionally, no aspect of the work shall preclude the future operating railroad system from achieving the requirement of no service-affecting failures caused by the work. RAM and accessibility for inspection and maintenance activities shall be ensured through application of federal, state, and city codes and best practices per the Design Criteria, other Contract Documents, and quality control and assurance processes. It shall be in compliance with the requirements of Volume 3, Part A, Section 14. Although the above quoted contract language requires achievement of RAM goals, no values related to RAM performance are identified in the contract.

The JPB and the Authority are urged to agree RAM performance specifications to mitigate any risk to the suitability and readiness of the system to accommodate Authority service.

- A very well developed requirements management system is included in the contract. Change and Requirements Management processes are identified in the contract, with specific requirements. The contract requires use of a tailored software package for requirements management. The contract requires that the contractor provide an Independent Checking Engineer and Independent Site Engineer to verify compliance with requirements.
- Requirements in the contract regarding contractor schedules are consistent with good scheduling practice. Any float included in the contractor's baseline schedule is considered to be shared between JPB and contractor. This is good schedule management practice.
- The DB contractor's QC manager reports to an officer of the firm, not the contractor's PM – consistent with accepted practice. Personnel responsible for ensuring quality shall be independent of those directly related for the work being performed and shall have no other work activities assigned except for ensuring quality. Personnel shall be free from the pressure of costs, construction scheduling, and production, and shall have the necessary independent authority to perform their roles effectively.
- A specific process for identifying, tracking, dispositioning and resolving non-conforming work is provided in the contract.

The review finds that the Electrification DB contract was awarded through an effective process that included substantial industry outreach. The contract terms and conditions are appropriate for a contact of this type and scale and include well-developed quality and requirements control systems that increase confidence that the contract will deliver the intended facilities and functions. The contract terms and conditions assign a substantial number of identified risks to the JPB, which could result in increased costs and delayed completion of the project as documented in Section 2.10. These risks have been identified by JPB in the November 11, 2016 Program Risk Register. Mitigation measures are identified in the register for all risks, but not all mitigations have been implemented and the mitigations may not be fully effective in completely eliminating the risks. However, it is unlikely that the completion of the construction would be delayed to the extent that use of the Peninsula Corridor by Authority trains by 2025 would be precluded.

2.2 PCEP SCHEDULE

The PCEP program is projected to achieve a revenue service date of August 2021 (inclusive of slack for the impact of schedule risks, the master program schedule risks, the master program schedule projects a revenue service date of December

2021) - well in advance of the introduction of Authority trains into the corridor in 2025. Furthermore, there are planned grade separation activities along the route, including the Hillsdale station and a new station for high-speed rail at Millbrae, they are not included in the current PCEP Master CPM Schedule. In San Mateo, 25th Ave., the construction phase is due to take place between "Summer 2017 and Spring 2020"[6]. This could seriously impact the progress of electrification along the affected area. Other capital projects with potential schedule interface risks include the South San Francisco Station and Los Gatos Creek Bridge Replacement that present opportunities for schedule slippage. JPB staff members are aware of this risk and their ability to manage the schedule interface through system integration workshops, monthly schedule reviews and prioritizing CalMod projects. It may not be likely that such slippage will affect the start of Authority rail service in 2025, but the PCEP schedule management will present significant challenges to the JPB. Based on our current understanding of the desired risk allocation between the JPB and the Authority, we do not expect that schedule delays would impact the Authority's plans to implement high speed rail provided that any delays do not exceed a 5-year time period.

Table 5: PCEP Electrification Schedule

Electrification Contract Dates	Date
Limited Notice To Proceed	9/6/2016
Duration to Substantial Completion	1330 days
Date of Substantial Completion	4/28/2020
Duration to Final Completion	1450 days
Date of Final Completion	8/26/2020

[6] Peninsula Corridor Electrification Program, Request for Proposal for Electrification Design-Build Services RFP No.: 14-PCJPB-P-053, CONTRACT DOCUMENTS, CONFORMED, JULY 5, 2016, Volume 2, Part A, Section 1, pages 7 and 8.

Table 6: PCEP Master Program Schedule Dates

PCEP Master Program Schedule Dates	Date
Initial 6 Trainsets Complete	9/21/2020
Additional 10 Trainsets Complete	7/23/2021
PG&E Infrastructure Complete	9/4/2020
Integrated Testing Start	2/26/2020
Integrated Testing Complete	4/24/2020
Pre-Revenue Service Start	9/22/2020
Revenue Service Date (RSD) w/Contingency	12/15/2021

The following items are noted that pertain to the schedule:

2.2.i Access for Construction

DB contractor for the electrification infrastructure, excluding the tunnel work, is generally required to construct the OHLE when given access to one track while the other track is open to operations. Double track availability during the week varies between 2 and 4 hours, which does not allow significant time for safe, productive work. Even during JPB non-revenue hours, the DB contractor must allow Union Pacific Railroad ("UPRR") freight traffic to pass which can affect worker productivity because work must be suspended while trains pass the construction site, including JPB passenger services. This means that mechanized plant used in construction must be suitable for single line operation and must be prevented from fouling the open track. It can be difficult to obtain safety approvals in such situations. Furthermore, the locations for crossovers, anchoring of wires and erection of back-to-back cantilevers will require access to both tracks, which will also impact the construction schedule. It may prove to be difficult to achieve an acceptable rate of construction depending on the number of times that construction must be suspended to allow trains to pass with a consequential risk that construction timescales may not be met and may affect the final cost of the PCEP.

2.2.ii Overhead Line Equipment (OHLE)

Installation of catenary cannot take place until all the poles in a tensioned length are in place. Contractors usually set out to achieve good progress by installing the "easy" locations first, which can give an overly optimistic impression of construction rates early in the project not representative of construction rates later in the project. Locations where utilities must be moved, or where there is conflict with signal sighting, or where special designs/bridge attachments may be needed in a span slow overall progress and the DB contractor progress reports should be studied carefully

for these details to ensure the project will be completed within the timeframe outlined in the Funding Plan.

Installation of the catenary can be done by high output methods by using special equipment so the conductors are run out together under tension and effectively the tensioned length is installed in one pass, or by more traditional methods that require several passes. Depending on the method chosen to install the catenary, the contractor's rate of progress will be affected by the need to cease work to pass trains.

The need for night and weekend working can lead to increased complaints from local residents and the need to string wires over the at-grade crossings will involve their closure to road traffic. This will require a proactive community communications program. JPB is aware of these risks and is confident in their ability to manage them.

2.3 PCEP COST

The Electrification DB contract was awarded based on a completive process with three firms participating at the best and final offer ("BAFO") stage. The final results were:

Table 7: Electrification Bid Results[7]

Company	Total BAFO Price Proposal Amount	Total BAFO Total Proposal Score
Engineer's Estimate	$599,304,916	N/A
Balfour Beatty Infrastructure, Inc., SSF, CA	$704,070,706	186.5
Mass Electric/Siemens JV.	$1,001,776,130	159
Shimmick/Alstom JV	$793,197,862	133.5

The Balfour Beatty price was the lowest overall bid compared to the other bidders, but approximately 17.5% above the Engineer's Estimate. So it is clear that the Balfour Beatty price is very competitive in an emerging railroad electrification market. That said, the JPB is assuming many of the major risks, like utilities, land acquisition and the responsibility of the owner. If risks that are the responsibility of the JPB are not well managed, there will be many opportunities for Balfour Beatty to increase its contract value through change orders.

[7] Caltrain. *Summary of Proposals RFP 14-PCJPB-P-053.* 2016.

Table 8 shows the current PCEP cost estimate. With the Electrification and EMU contracts awarded, 79 percent of the project budget (excluding unallocated contingency) is under contract and not subject to design or market risks. The remaining risks, including contract interfaces, agency-caused delays and scope changes, third party issues and differing site conditions could still impact the planned schedule and cost of the project, but elimination of the market and design risks for the majority of the work increases the probability of successful completion of the program.

Table 8: PECP Capital Costs (including electrification and EMUs)[8]

Uses	$ million (Year of Expenditure)
Guideway & Track Elements	14.257
Stations, Stops, Terminal, Intermodal	0
Support Facilities	2.265
Sitework & Special Conditions	255.253
Systems	504.812
ROW, Land, Existing Improvements	37.316
Vehicles	630.535
Professional Services	368.084
Unallocated Contingency	162.620
Finance Charges	5.110
Total	**1,980.253**

FTA's risk assessment supporting the approval to enter Engineering indicated that the project budget provides a 50 – 65% probability of covering the risk-adjusted project cost. The Funding Plan indicates a contingency of 20%, but was indicated to currently be 19% from PFAL's call with the JPB on November 17, 2016 and PCEP's October 2016 FTA Quarterly Report[9]. The JPB did not report a confidence level for the adequacy of the cost contingency included in the current budget. This level of contingency would be considered low at the start of Engineering (FTA recommends 25%)[10], but the successful award of the two largest contracts in the program

[8] PCEP Cost Estimate. JPB. May, 18, 2016
[9] Peninsula Corridor Electrification Project Quarterly Update. JPB. October 2016. Pg 20.
[10] Federal Transit Administration, Oversight Procedure 40b, Risk Assessment, Abbreviated, September 2015.

mitigates the design and market risks that are associated with traditional Design-Bid-Build project delivery and we are informed by the Authority that FTA agreed that the contingency included in the project budget was appropriate for the current level of project definition. Additionally, JPB provided the FTA a letter on November 22, 2016[11] stating local partners agreed to fund up to $200 million (10% of the PCEP total cost) for any potential cost overruns or funding reductions.

The MOU states that the Authority's contribution to the electrification project is capped at $600 million and that cost increases will be the responsibility of the JPB. SB 1029 requires Caltrain to provide the Authority quarterly reports, and the November 15, 2016 PMFA Outline of Desired Basic Terms and Conditions further protects the Authority by requiring Caltrain to provide a remediation plan to address any cost overruns. The JPB's ability to absorb cost overruns is described in Section 2.4.

2.4 PCEP FUNDING SOURCES

The analysis of the PCEP funding sources is important to demonstrate that sufficient sources of funds are available to meet PCEP's construction schedule needs. Total PCEP funding is $1,980.25 million as seen in Table 9. Federal sources constitute nearly half of the funding, with the remainder coming from State and local sources as shown in Table 9 below.

[11] FTA's Financial Capacity Assessment Recommendations. JPB. November 22, 2016. Page 3.

Table 9: Sources of PCEP Funds from JPB dated October 31, 2016

Source	Amount ($ millions)
Electrification	
FTA	15.68
Prop 1A	600
Prop 1B	8.00
Carl Moyer	20.00
JPB Prior	9.02
JPB Members	104.72
Bridge Tolls	11.00
HSR/State Non 1A funding	113.00
Bridge Tolls – RM1	8.40
FTA Core Capacity	426.31
EMU	
FTA	315.00
JPB	19.44
7-Party member	69.00
TIRCP	20.00
Bridge Tolls – RM2	20.00
FTA Core Capacity	220.69
Total PCEP Funding	**1,980.25**

The background of each of the committed funding sources is described in the Funding Plan, which identifies the funding party, the level of committed funds, agreements that have been signed, how the parties are committed to working together on issues such as cash flow, and any funds that have already been received. However, uncertainty remains around future funding sources as we describe in further detail below.

2.4.1 Prop 1A Bond Proceeds

The JPB's indicative funding plan for the PCEP dated November 7, 2016 shows the $600 million Prop 1A bond proceeds will be distributed as listed in Table 10. During the November 4, 2016 meeting, the Authority indicated there were no restrictions on the yearly distribution amounts requested by JPB, but annual requests are required

to go through the Authority. The Authority will then submit a biannual bond survey to the Department of Finance for sale of the Prop 1A bonds through the State Treasurer's Office. The Funding Plan generally addresses the anticipated timing of bond proceeds in Appendix I of the Funding Plan, and the Outline of Desired Basic Terms and Conditions provided by the Authority provides for a pro-rata even metering of spend rate of all PCEP funding sources. As mentioned in Section 1 of this Report, the terms of the PMFA are under development and PFAL believes further requirements need to be stipulated to protect Prop 1A funds. This is described further in Section 6.

Table 10: JPB's Funding Plan for Prop 1A

Prop 1A ($ millions)	FY17	FY18	FY19	FY20
Approximate Yearly Allocation	$87.23	209.96	194.10	108.71

2.4.2 Other Funding Sources

As noted in the Funding Plan and recognized in JPB's risk register, the Section 5309 Core Capacity funds are awaiting a Full-Funding Grant Agreement ("FFGA") from the Federal Transit Administration ("FTA"). The FFGA is expected in early 2017[12], which is seen as a low risk to JPB and further mitigated by issuing a limited notice to proceed. The heavy reliance on FTA Core Capacity funding does provide a timing risk to JPB funding sources. Once the FFGA is executed, yearly appropriations from Congress are still required. Appropriations delays could have an impact on JPB's funding plan. JPB recognizes this risk, and mitigates this risk through PCEP's contingency and other funding sources. In the JPB's November 22, 2016 letter to the FTA, the JPB has a $150 million revolving credit facility for short term financing needs to cover such events. PCEP contingency's resilience to mitigate any funding timing risk is strong in the early stages of the project, where the highest likelihood of risk lies for timing of funds, but is less resilient at later stages of the project depending on the number of change orders.

The risk of delivery of the Cap and Trade proceeds from the Low Carbon Transit Operations Program ("LCTOP") is mitigated largely by the fact the LCTOP funding will be used only for procuring the EMUs. Therefore, a delayed or reduced delivery of this source of funds will not impact the electrification works. This risk if further mitigated by the contingency carried in PCEP and relatively low quantum of funding

[12] *PCEP Risk Register*. PCJPB. November 11, 2016.

from LCTOP. Any cost overruns or funding shortfalls are expected to be addressed as described below.

We believe that there is a low likelihood that any additional Prop 1A funding would need to be made available to fund cost overruns. In the JPB's November 22, 2016 letter to the FTA, the JPB indicated local funding partners agreed to fund any cost overruns up to $200 million which would cover a 10% cost overrun. The risk of obtaining funds from local, State or Federal agencies is unlikely to affect the delivery of the PCEP beyond 2025, but highlights the importance of executing the PMFA in line with the November 15, 2016 Outline of Desired Basic Terms and Conditions to protect the Authority.

2.5 PROJECT MANAGEMENT

The review addressed the latest version of the PCEP Program Management Plan ("PMP").[13] Project management information for the PCEP from the latest FTA Quarterly Review presentation (ibid) by the JPB was also reviewed.

The PMP was evaluated against recommended project management capability, capacity and procedures documented in the latest versions of the Federal Transit Administration's Construction Project Management Handbook[14] and Project and Construction Management Guidelines.[15] The review followed portions of the review procedures for Project Management Plan reviews documented in the latest Oversight Procedures published by the Federal Transit Administration ("FTA").[16] The PMP was approved by FTA on August 12, 2016 as documented in the latest FTA Quarterly Review materials.

The review concluded that the PMP includes the necessary elements for successful management of the PCEP program, which is consistent with FTA's recent approval of the PMP. The PMP references numerous sub-plans and companion documents, most of which were not reviewed as part of this assessment. Observations and suggestions for improvement of the procedures documented in the PMP from the review are documented in the following paragraphs. None of the suggested

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[13] Peninsula Corridor Joint Powers Board, Peninsula Corridor Electrification Program, Program Management Plan, Revision 1.1, October 12, 2016.

[14] Kam Shadan and William Plumpton (Gannett Fleming), Michael Eidlin (Kal Krishnan Consulting Services), David Sillars (Sillars), Paul Krogh (K2 Construction Consultants), Dain Pankratz (Boyd Caton & Grant), and Robin Hazy (Raul V. Bravo + Associates), Construction Project Management Handbook, February 2016.

[15] Kam Shadan, William Plumpton (Gannett Fleming), Michael Eidlin (Kal Krishnan Consulting Services), David Sillars (Sillars), Paul Krogh (K2 Construction Consultants), Dain Pankratz (Boyd Caton & Grant), and Robin Hazy (Raul V. Bravo + Associates), Project and Construction Management Guidelines, March 2016

[16] U.S. DOT Federal Transit Administration, TPM-20 Office of Capital Project Management, Project Management Oversight, Oversight Procedure 20 - Project Management Plan Review, September 2015.

procedural improvements are considered critical to the requirements of the Funding Plan that is the subject of this review, but they could help to mitigate risks and enhance the probability of on-time and on budget completion of the program.

- Page 1-2 of the PMP Overview references FTA Construction Guidelines dated 2011. These were updated in March 2016 (ibid) and should be updated accordingly in the PMP. The PMP also should mention the FTA requirement for reporting the status of all management plans to FTA on a Quarterly basis.
- The PMP should reference a comprehensive fleet management plan (FMP) that demonstrates the technical capacity to manage vehicles, meet FTA requirements, efficiently operate and maintain vehicle investments, on time performance and other metrics. Section 17 addresses some operational interfaces; however, this information does not remove the need for a reference to the FMP. The review noted that the latest Quarterly Review presentation indicates that a Rail Fleet Management Plan has been submitted to FTA for review. Furthermore, we have been informed that JPB has performed a movement analysis to ensure that the new EMUs can be brought into the maintenance yard, tested and commissioned without impact on Caltrain's revenue service operations.
- Professional services contracts are appropriately identified, including Program Management (AECOM), Electrification (Gannett Fleming), EMU (LTK) and Systems Safety Specialist (B&G). The PMP documents the proposed program delivery approach and major construction and equipment contracts.
- The PMP identifies interfaces to be managed in delivering PCEP.
- The PMP documents a well-developed document control system, including a centralized document control platform that should help to assure that users have access to the latest versions.
- Project Delivery and Program Management functions are separated in the PCEP organization. This is an effective way to assure independence of the Project Controls function from day-to-day delivery.
- Real Estate Acquisition function reports to Caltrain Planning Manager, which is independent from Project Delivery Manager. There is one Senior Real Estate Officer (agency employee) and 10 real estate consulting firms. Real estate acquisition progress should be monitored to avoid delays to construction work.
- The Program Master Schedule should be reviewed and updated to reflect the provisions of the awarded contracts, as discussed in Section 2.4.
- A Change Control Board (CCB) is established to review and approve/reject proposed changes. Board includes Directors of: Project Delivery, Program Management, Planning and Engineering and Construction (Infrastructure Program Manager in the PCEP organization chart). This is an appropriate control mechanism.

- In general, the JPB does not approve design, material, and equipment submittals. The contractor is responsible for reviewing and self-certifying its own design according to Verification, Validation and Self-Certification process, as specified in its contact. The PMP and sub-plans should document the JPB's process and procedures for verifying that the contractor has completed its obligations for self-certification.
- The Infrastructure Program Manager is responsible for tunnel modifications and yard modifications. This individual reports to the same manager as the Electrification Program Manager (Director of Project Delivery). This is an appropriate reporting relationship that should facilitate coordination and interface management.
- The PCEP Operations Planning Manager is assigned to oversee coordination of construction and testing work with railroad operations.
- The JPB (not the contractor) is responsible for coordination with UPRR for any activity that might impact UPRR operations or facilities.
- 3rd Party Agreements are identified in the PMP and a tracking methodology is described.
- Section 11 discusses safety and security and hazard analysis. It should also include threat and vulnerability analysis to address natural disasters, protection from terrorist activity, and resiliency from both.
- Section 20 addresses testing, startup and Third Party Training. Section 10 also makes reference to training. A description of training, certification and retention of internal Caltrain forces to maintain an adequate bench of specialized skillsets that meet the level of resource required should be provided as part of a Force Account Plan.
- The PMP should describe the process of how and when an operating plan will be developed. This discussion should support the options of how operations will be implemented and maintained on the corridor. A methodology for attracting specialized skillsets to carry-out agency oversight of contractor activities should be presented. This should include operators, maintainers, and others. The review noted that the Quarterly FTA presentation indicates that an Operating Plan and a Start-up and Testing Plan have been provided to FTA for review.

A May 2016 APTA Peer Review Panel of the CBOSS project raised serious questions about Caltrain's project management capabilities and JPB oversight that have similar implications to PCEP. These include:

- *"The panel notes that the PTC CBOSS project is just one of several complex infrastructure projects that will require Caltrain to take a serious look at in-house technical management resources."*

- *"Caltrain needs to directly hire a project manager with requisite technical experience and provide that person with the authority to manage the interests of Caltrain"*

- *"…this has consequently led to unresolved technical and contractual issues. Despite the recent partnering session, there continues to be a lack of commitment to resolving contractual issues such as scheduling and cost."*

The PCEP Organization Structure provided by JPB on November 17, 2016 and dated August 4, 2016 shows consultants in most key roles. The review noted that the majority of the PCEP project management team members are consultants, including the Chief Officer, who reports directly to the JPB's General Manager. The highest ranking positions that are filled with agency staffer members are the Deputy Chief Officer and Caltrain/PCEP Program Management Director. The Organization Chart also indicates a "Mod-Squad" of senior officials that includes the Chief Communications Officer, Chief Operating Officer/Rail, Chief Financial Officer/Treasurer, Chief Officer of Planning and Grants for the Transportation Authority and the General Counsel.

However, we note that one of the issues on the CBOSS project was that, while consultants were in project management positions, they were not mandated and empowered to make commitments on behalf of the JPB and this led to project delays.

With few agency staff members in the overall project organization and senior executive leadership provided by consultants, there is a question whether the consultant staff will have sufficient authority to act on behalf of the agency for effective management of the various design and construction contracts. There also is a question whether the organization provides adequate representation of agency and public interests. The agency's Executive Director and the Mod Squad will need sufficient time and understanding of project technical and management issues in order to provide the necessary oversight and authority for effective program delivery. The agency is aware of this situation and have informed the reviewers that they believe that they have the means and processes in place to manage the project.

2.6 REGULATORY STANDING

PCEP Final Environmental Impact Report ("FEIR") was approved by JPB on January 8, 2015 and Finding of No Significant Impact ("FONSI") on December 17, 2009 from the FTA. See section 3.1 for further information on the FEIR.

2.7 SYSTEM INTEGRATION

Interface coordination and design integration are, at best, ambiguous within the Electrification DB contract. For example:

- "The Contractor shall be responsible for coordinating the interfaces and performing integration with adjacent contractors, third parties, UPRR…." (Volume 3, Part A, Section 1, Scope of Work, Page 10)
- General Obligations of JPB: "Facilitate systems integration with the EMU Contractor, CBOSS Contractor and ROCs Contractor" (Volume 3, Part A, Section 1, Scope of Work, Page 22)
- "The Design Build Contractor…shall be responsible for the System-wide integration of all hardware and software within their scope of work" (SP 01800 Systems Integration and Integrator Requirements Page 1)

However, the initial Risk Allocation Matrix in the design build contract clearly assigns many major interfaces and risks, and the responsibility for their management to the JPB (Volume 2, Part A, Section 9, Page 3). The Caltrain Risk Identification and Management Plan, dated June 26, 2015, is too generic and academic to be effective for the size of the PCEP. However, the PCEP Risk Register, dated November 11, 2016, contains most of the risks of concern in the PFAL review. Actively managing the PCEP with that Risk Register is expected to mitigate the program's risks.

PFAL believes excluding the tunnel work in Section 1 of the PCEP from the DB Contractor's scope creates an unnecessary interface that outweighs the benefits.

Furthermore, there is a broader systems integration challenge in integrating the PCEP with all the remainder of the CalMod program. We have not seen an Integrated Master Schedule, covering all related activities along the corridor or systems integration plan for the entire CalMod program.

2.8 TRACK IMPROVEMENT COMPATABILITY WITH CATENARY INSTALLATION

It is good practice for any track improvements (including renewals) to be carried out in advance of electrification so that only the final alignment can be designed and wired. It is also essential that the track centerline is fixed and identified, particularly at curve transition points, so that the catenary can be designed, installed and maintained as specified. Allowance should be made by the designer for known track projects that have not been completed before installing the catenary. Though the JPB has identified this, it is of particular concern to point out with respect to the Hillsdale grade separation and the need to fully incorporate that project into the PCEP Master CPM Schedule. To support that view, the PFAL team was informed by JPB in a teleconference on November 17, 2016, that there were plans for the Hillsdale contractor to install the foundations for the catenary poles as part of its work. Consistent with our comments on interface management in this report, PFAL would expect that the JPB will prepare an interface management diagram for use by both the Hillsdale contractor and Balfour Beatty.

Track maintenance crews must be trained to understand that they are no longer free to move the alignment, cant or elevation of the track except in accordance with allowed tolerances from the designed position and that this discipline should be applied before catenary design takes place, to avoid abortive design or construction work. Permanent markers should be installed on poles that should record the track running edge to face of steel dimension, cant and contact wire height so that maintenance teams can readily check if movement has taken place. If reduced track tolerances are applied in places to ease OHLE construction they must also be marked at the site. This is particularly important because PFAL understands that Caltrain and/or the Authority will make track upgrades to enable 110 mph speeds in the foreseeable future. Though the track improvements compatibility risk described here mainly poses a risk to the PCEP schedule for the purposes of this review, a secondary issue is the potential for throw away costs due to the possibility of replacing electrification infrastructure.

2.9 RELIABILITY, AVAILABILITY AND MAINTAINABILITY (RAMS) PERFORMANCE

The decision to operate blended services on the Peninsula Corridor from San Jose to San Francisco means that high-speed trains will be operating on JPB property and subject to the consequences of JPB design decisions and JPB maintenance activities. The specification[17] requires the DB Contractor to perform a RAMs analysis but, unlike the CBOSS contract, there are no reliability, availability and maintainability performance requirements. In our experience, this is a very unusual approach and leaves what would normally be key acceptance criteria unstated. The Authority should consider working with JPB to establish RAMs performance targets including response time to incidents and repair time in the case of de-wirements -- and getting those requirements agreed with the Contractor.

2.10 CONSTRUCTABILITY SUMMARY

The review finds that there is very little risk that the PCEP can't be constructed as currently designed. Most of the design and construction risks for the electrification program have been transferred to a DB Contractor with experience in the delivery of similar rail electrification projects. The interface of the work in this contract with the CBOSS work now being completed will be facilitated by the presence of Alstom as a key subcontractor on both the CBOSS and Electrification contracts. The remaining

[17] Volume 3, Part A, Section 14, RAMS

risks potentially impacting the constructability of PCEP, as independently identified by PFAL and addressed in JPB's risk register, include the following:

- Interface risks among the contracts being used to implement the program (e.g. tunnel contract and electrification contract) and with other capital projects in the corridor
- Interface risks between the electrification work and work by 3rd parties
- Management risks associated with JPB activities supporting the various contracts (e.g. operations staff supporting stipulated work windows)
- Time extensions (and associated costs) related to delayed completion of predecessor work, including right-of-way acquisition and utility relocation
- Delayed completion of utility power supply
- Differing site conditions requiring specialized construction operations (e.g. hazardous materials), redesign or rework (e.g. unidentified utilities or inaccurate data and assumptions regarding clearances and structural capacity of overhead structures)
- Unanticipated work restrictions due to community complaints
- Changes in regulatory requirements for system performance or testing
- Unanticipated restrictions due to ongoing operations and maintenance work
- Force majeure

The Electrification DB Contract spells out 60 individual risks covering these categories and assigns ownership between the JPB and the contractor. The JPB retains ownership of 32 of the risks and the combined effects of these risks are likely to impact the project cost and duration. The PCEP has a well-developed Risk Management Process, which is described in general terms in the Risk Identification and Mitigation Plan. The specific risk mitigation program is defined in the risk register for the project. All of the risks called out as JPB-owned in the contract are included in the risk register with appropriate mitigation strategies. However, not all of the mitigation strategies have been implemented and some of the mitigations may not be fully effective in eliminating the identified risks or preventing them from impacting the project cost and/or schedule.

This review concludes that the constructability risks do not threaten the eventual completion of the PCEP as proposed in the Funding Plan, but that there is a potential for project delays beyond the planned RSD of December 2021 and there is a potential for the cost to exceed the established budget. It is unlikely that the project would be delayed to such a degree that the Funding Plan requirement for Authority operation in the corridor in 2025 could not be

met. Furthermore, any cost overruns are likely to be covered by the available contingencies and the additional $200 million committed to by local agencies[18].

[18] FTA's Finance Capacity Assessment Recommendations. JPB. November 8, 2016.

3. Suitable and Ready for High-Speed Rail

The Peninsula Corridor along with the PCEP is suitable and ready for HSR under the definition stipulated in AB 1889 and as proposed in the Funding Plan submitted pursuant to SHC 2704.08(d)(2)(b).

However, PFAL has several observations regarding the usable segment:

In principle, from a technical point of view, there is no reason why "high-speed trains" of the type proposed by the Authority could not operate over the existing Caltrain route between Tamien and San Francisco, provided the necessary OHLE was installed and commissioned as specified in the scope of work defined in the PCEP RFP document[19], and the electrification of the four tunnels at the northern end of the route had been completed, commissioned and linked to the catenary.

The "high-speed trains" would be limited to a maximum of 79 mph within the present limitations of the signaling and grade crossing technology. Higher speeds, up to 110 mph, will only be permitted when the Authority makes the necessary improvements to the grade crossings and other improvements, all of which are still under development and subject to environmental approval. The Authority's traffic analysis indicates that there is no need for additional passing tracks.

For the Authority's trains to operate in the Peninsula Corridor, they will need to be fitted with automatic train protection ("ATP") equipment (or Positive Train Control ["PTC"]) that is compatible with the Caltrain CBOSS signaling overlay project. From discussions with the Authority, it is our understanding the Authority intends to include all communication systems on Authority trains which are required to operate over the Peninsula Corridor. In addition, the on-board CBOSS safety modules must be integrated with the HSR signaling system interfaces that monitor and control train speed. The Authority has indicated to us that it intends to do this.

The implementation of PCEP will provide significant near term benefit to the JPB's passenger service operations. Benefits from the PCEP include faster and more frequent service, reduction of air pollutant emissions, reduction of noise and vibration, and providing a foundation for eventual HSR service.

[19] 14-PCJPB-P-053 DB Elect RFP - Vol 3 - 2-27.pdf

3.1 FUTURE IMPROVEMENTS

The environmental documentation (particularly the Final Environmental Impact Report ("FEIR") dated January 2015) is written for the PCEP and incorporates provisions and assessments to accommodate future HSR. Accommodating, as used in the FEIR:

- Involves "providing the electrical infrastructure compatible with HSR and not precluding HSR."
- Provides for blended service for up to "six Caltrain trains per peak hour per direction and up to four HSR trains per peak hour per direction" in accordance with the JPB, Authority, and the MOU partners' agreement
- Anticipates that "other improvements needed to enable high-speed trains would be evaluated in a separate environmental process led by the Authority as the lead agency for HSR."

The FEIR further states that PCEP would not preclude HSR. PCEP, however, does not include other improvements that might or might not be (still under evaluation) necessary for blended operations that include high-speed trains "such as platform improvements, high-speed rail maintenance facilities, passing tracks, or other Core Capacity projects." Furthermore, the FEIR does not address speeds greater than 79 mph or high speed operations, although the document does include a conceptual cumulative impact assessment of blended service. The Authority currently plans to have separate rolling stock maintenance and stabling facilities. The Authority will have separate high-level platforms at Diridon Station (San Jose), Millbrae, and TTC dedicated to CHSR service. The Authority is also considering the construction of a high-level platform in the tunnel section at 5th & Townsend. This platform could be shared with Caltrain if desired by Caltrain. Caltrain and the Authority rolling stock both provided for level boarding on a 51-inch high platform.

The Authority obtains considerable benefit from the PCEP FEIR and from the associated electrification project. The investment that the Authority makes in PCEP will deliver, as stated above, infrastructure compatible with HSR and not preclude HSR. These benefits, however, are contingent upon JPB (1) meeting its environmental mitigation commitments in accordance with the FEIR; (2) delivering the PCEP in accordance with all of its agreements with the Authority and other partners (including the JPB, Authority, and the MOU partners); and (3) meeting its commitments to the FTA, FRA, and to the standards embodied in NEPA and CEQA.

Key environmental risks that the Authority will continue to face in order to deliver HSR on the Peninsula Corridor include:

- Successful development of CEQA and NEPA documentation for HSR on the peninsula

- Developing appropriate mitigations for environmental impacts associated with “other improvements needed to enable high-speed trains” and the following issues
- Addressing:
    - Cumulative impacts beyond the conceptual impacts of Blended Service that are addressed in the FEIR, including those that are beyond noise, traffic, and intersection and roadway impacts for which Caltrain alone can commit resources
    - Impacts of speeds greater than 79 mph and committing to the simulations needed to address speeds between 100 and 125 mph
    - Traffic impacts at intersections beyond those required for Caltrain’s EMUs

4. Passenger Service Compatibility

The implementation of PCEP as proposed in the Funding Plan will provide passenger service compatibility pursuant to SHC 2704.08(d)(2)(C) (*i.e.*, upon completion, one or more passenger train service providers can begin using the tracks or stations for passenger train service) and is consistent with AB 1889.

PFAL has several observations regarding the compatibility of the electrification project:

4.1 PCEP COMPATABILITY WITH JPB PASSENGER SERVICE

Integration risk of PCEP and CBOSS is critical to the ability of PCEP to deliver passenger service compatibility for JPB passenger service. The integration risk between PCEP and CBOSS is mitigated by the incorporation of Alstom, the signaling manufacturer of CBOSS, onto the DB Contractor team. PFAL believes the integration risk between PCEP and CBOSS is well mitigated by this arrangement, and should enable the JPB to provide passenger service, thus meeting the requirements of SHC 2704.08(d)(2)(c).

4.2 PCEP COMPATABILITY WITH AUTHORITY FUTURE HIGH-SPEED TRAIN SERVICE

The Authority set out its requirements for electrification infrastructure in the shared use corridor in their Project Technical Memorandum TM 3.2.1. Revision 1 dated 16 August 2010. The PCEP technical requirements for the DB Contractor are set out in their document 14-PCJPB-053 (conformed) dated 5 July 2016. Examination of these documents indicates that not all of the Authority requirements have been incorporated into the PCEP project. PFAL wishes to bring the following matters to the attention the Authority.

- Use of standards such as the EU Energy TSI for Interoperability would guarantee that whoever supplies the high-speed trains for the Authority would have a defined interface for the pantograph. The PCEP specification does refer to this standard but not to the current version.
- The Authority's original intent that the design for the shared corridor and the high-speed route be generally similar is not being realized. The use of similar designs would have been of economic advantage in the provision of spares, training and maintenance operations. The PCEP has specified a non-sagged catenary design while the high-speed catenary will be a pre-sagged design.

Sagged designs are more appropriate for good current collection at higher speeds and it remains to be seen what commonality, if any, will be finally achieved between the designs.

- Despite this difference in approach to OCS design the shared corridor design will be suitable for HSR operating in the speed range of 79 to 110 mph

It has not been possible to provide a complete assessment for Authority operations since no technical details are available on the catenary to be installed in the tunnels. The RFP issued by JPB shows the possibility that conductor rail may be used. But, at the time of this report, the contractor for the tunnel modifications and the catenary installation has not been chosen.

We recommend that the Authority satisfies itself that the proposed tunnel OCS will allow HSR to run, when this information is available. We address this in Section 6.

4.3 CLEARANCES

The specification allows the DB Contractor to work to closer electrical clearances than those specified by the Authority. The Authority's electrical clearances reflect a green field site while the PCEP electrical clearances reflect the realities of installing OCS onto an existing railway. The PCEP electrical clearances are consistent with recognized electrical clearances as adopted by AREMA. However, Caltrain and the Authority need to take care these closer electrical clearances do not increase the incidence of flash over or bird strikes, risking the possibility of damage to the OHLE and disruption to rail services.

4.4 PCEP STATION IMPROVEMENT COMPATABILITY WITH PASSENGER SERVICE

The issue of station improvement compatibility with passenger service presents a number of issues as follows:

- Elimination of the "hold out rule" and any stations which are subject to it;
- Caltrain and the Authority will evaluate each station with a "hold out rule" on a case-by-case basis using a risk based methodology.;
- Platform heights.
- Civil engineering works related to stations such as grade crossing elimination. Caltrain and the Authority will design modifications to stations will be planned and designed as an integral part of the design of the grade crossing project;
- Civil engineering works related to stations such as grade crossing elimination;
- Timing of any station works relative to the electrification program.

4.5 SIGNALING COMPATABILITY WITH PASSENGER SERVICE

The CBOSS system is a train control system that is overlaid on the existing track circuit based fixed block signaling system. It is therefore assumed that the track occupancy status is provided to the CBOSS in parallel with the GPS positioning signals generated by the movement of individual trains. It seems, from the scope of work for the electrification contractor that it will be responsible for testing these links after its work on track circuits is finished. This is a high risk safety area.

In our experience, any work requiring safety related technical interfaces with signaling already installed on an existing system is high risk in terms of interface management, approvals for designs by the operator and regulators and in the installation `ment by the electrification contractor for intrusive access to a new and complex system like CBOSS is bound to cause some delay to the project completion date, particularly if the alteration (e.g. track circuit replacement) involves interfaces with other operators like the UPRR.

The Authority has informed us that the electrification contractor has Alstom as its subcontractor for signaling equipment and interfaces. Alstom is also the main contractor for the CBOSS project. The PFAL team believes that this is an appropriate mitigation for the risks involved.

4.6 ROLLING STOCK COMPATABILITY WITH PCEP

In the adoption of a rolling stock design for the HSR services, there are a number of possible designs from which to choose and any of these will be suitable for the Peninsula Corridor provided that:

- The wheel rail interface of the HSR train is compatible with the existing Caltrain rail profile.
- The train fits inside the Caltrain structure gauge and dynamic envelope. The Authority confirms that it will work closely with the JPB on this matter.
- The traction system is compatible with the planned 25kV 60Hz traction supply system being installed along the Peninsula Corridor. The Authority confirms that the traction power systems of the PCEP are compatible with Authority rolling stock requirements.
- The HSR train overhead contact pantograph design matches the Caltrain OHLE design and installation.
- The traction equipment of the train meets the EMI/EMC requirements of the Peninsula Corridor. The Authority confirms that the rolling stock technical specification meets the latest requirements of PG&E, FCC, IEEE and the applicable specifications.

- The train is provided with the necessary ATP equipment to allow it to conform to the Caltrain signaling and train control requirements. The Authority
- The HSR train is provided with the necessary communications equipment to allow it to operate with the Caltrain communications systems.
- The train design meets the platform height requirements of the stations where it is planned the HSR services will stop along the Peninsula Corridor (see para. 4.3 above) The Authority confirms that this will be the case.
- There are sufficient stabling and maintenance facilities at or near the San Francisco terminal of Caltrain that are available for HSR trains when or if required. The Authority confirms this case.
- Suitable breakdown and train/passenger rescue arrangements are in place along the Peninsula Corridor. The Authority confirms that this will be the case.

The Authority has taken all of these elements into consideration in its plans for the purchase of high-speed rail rolling stock and operations on the blended infrastructure in the Corridor. We see no issues that would preclude such operations.

5. Operating Subsidy

Section C of the Funding Plan indicates the Authority will not operate stand-alone high-speed train service in the Peninsula Corridor until the Silicon Valley to Central Valley Line ("Valley to Valley"), as defined in the Authority's 2016 Business Plan, is completed and connected to the Peninsula Corridor. This is also reflected in the Ridership and Revenue Forecasting Technical Supporting Document to the 2016 Business Plan which assumes High-Speed Train Service after the Valley to Valley line is connected.

Any High-Speed Train Service contemplated by the Authority is outside the scope of this Funding Plan because no Authority High-Speed Train Service will be provided in the usable segment. As such, no Revenues and no Operating and Maintenance Costs have been contemplated in the Funding Plan. We are therefore unable to comment on whether or not an operating ubsidy is required.

Passenger rail service provided by JPB in the usable segment will be JPB's responsibility, not the Authority's. Neither the 2013 MOU, nor the 7-Party MOU, nor the 9-Party MOU, nor the November 15, 2016 Outline of Desired Basic Terms and Conditions, suggest that the Authority intends to assume any obligation to fund any operating or maintenance costs incurred by JPB in the Peninsula Corridor or prior to commencement of Authority service on the Corridor.

6. Risks and Risk Mitigation Strategies

6.1 JPB RISKS AND RISK MITIGATION STRATEGIES

PFAL reviewed JPB's June 26, 2015 Risk Identification and Mitigation Plan ("RIMP") and JPB's PCEP Risk Register dated November 11, 2016. Though we note the RIMP has not been updated in over a year, JPB's risk register is up to date. We find JPB has identified many of the same risks that we have described in Sections 2 - 5 and provided mitigating actions for each risk.

There are additional risks in PFAL's view that should be considered for inclusion in the risk register:

- The risk of implementing the measures necessary for the control of stray AC and DC currents in the vicinity of other railway operators (BART etc.) is not included in the risk register. The risk for identifying and implementing the necessary measures is with the DB Contractor who will have to engage with the other operators. This is another example where an interface schedule would provide clarity.

- The risk of signal sighting issues arising with the addition of the electrification infrastructure is identified in the risk register but if it is found to be necessary to move any existing signals a further risk arises in ensuring that other operators on the route are properly advised of the changes and that their train drivers are trained accordingly.

6.2 AUTHORITY RISKS AND RISK MITIGATION STRATEGIES

The Authority has not developed a Project Risk Management Plan specific to the PCEP since delivery and management of PCEP is the responsibility of the JPB. The Authority's main risk mitigation is governed by its agreements with the JPB including the PMFA, which is yet to be finalized. The timely execution of the PMFA and the ability for the Authority to negotiate all terms in the November 15, 2016 Outline of Desired Basic Terms and Conditions provided by the Authority is critical to mitigating any risks to the Authority. The ability of the Authority to successfully negotiate the PMFA is the main risk to protecting Prop 1A funds from the Authority's perspective.

There are additional risks in PFAL's view that the Authority should consider for inclusion in the PMFA.

- Specify the schedule of Prop 1A bond distributions to the JPB and the events in which funding could be accelerated or halted to ensure Prop 1A funds are protected. The Authority has recognized this risk, but no formal procedure or criteria to accelerate funding or restrict funding is outlined. To address this, we recommend ensuring the PMFA limits Prop 1A funding to the timing from Table 10.

- The PMFA should specify and outline voting representation for the Authority on the PCEP Change Control Board to provide the Authority greater certainty. The PMFA Outline states that the Authority must approve material changes to contract specifications, such as through change orders, which we would view as a useful risk mitigation.

- The PMFA should specify that the Authority must approve the design for electrification in the tunnels.

7. Conclusions

The Funding Plan sets out to satisfy SHC 2704.08, subdivision (d) for the commitment of $600 million of Prop 1A bond proceeds for the PCEP. The Funding Plan complies with the statutory requirements insofar as it address each of the SHC 2704.08(d)(2) criteria. Table 11 summarizes PFAL's opinion on each component of SHC 2704.08(d)(2).

Table 11: SCH 2704.08(d)(2) PFAL Summary Opinion

SHC 2704.08(d)(2) requirements	PFAL Conclusion
Construction of the corridor or usable segment thereof can be completed as proposed in the plan submitted pursuant to the Funding Plan	PCEP can be constructed as proposed in the Funding Plan
If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation	When completed, the PCEP will be suitable and ready as defined in AB 1889
Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service	PCEP can facilitate passenger service
The planned passenger train service to be provided by the authority, or pursuant to its authority, will not require an operating subsidy	No high-speed rail service is contemplated on a stand-alone basis in the Peninsula Corridor
An assessment of risk and the risk mitigation strategies proposed to be employed	Risks are identified and addressed by JPB, and execution of the PMFA is important for the Authority to undertake as soon as possible

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Appendix II – Technical Meeting Notes

Notes of a Telephone Conference Call

Date: Thursday 10 November 2016

Subject: CHSR Technical Discussion: Shared Use Corridor

Call Participants:

John Popoff -HSR	(NB)
Greg Tseng - PFAL	(GT)
Les Elliott - FCP	(LE)
Piers Connor - FCP	(PC)
Noel Broadbent - FCP	(NB)

Discussion centered mainly around the details contained in a brief produced by NB, key issues discussed were noted as follows, additional post meeting comment provided by JP has been incorporated in these notes

1. The Capltrain specification and contract with the DB Contractor does not comply with some of the initial CHSRA requirements (dated 2010) for the electrification of the shared use corridor. JP said that the authority was aware of this and had been party to the decision to award the DB contract. Additionally JP has commented that the 2010 requirements assumed a dedicated HSR alignment to be constructed, owned and operated by CHSRA – as a result, the technical specifications were CHSR specs. When the Legislature required that the section from SJ-SF be a blended operation (i.e., CHSR would be operating on Caltrain property and the train operations blended) we became tenants on the Caltrain property. At that time we reviewed the Caltrain proposed specifications to make sure that they were suitable for the CHSR equipment and planned operations and are satisfied that our trains will work satisfactorily on the Caltrain Electrification.
2. The HSR refers to the use of international standards,(see response to 1.) the ones contained in the Caltrain specification were out of date. JP said that he expected the current standards to be applied.
3. Noted that legal requirements in California requires compliance with PUC general orders that the Authority believes need amending to allow the construction of a 25 kV railroad. The risk of any amendments in the Caltrain corridor lies with the JPB. JP said that the Authority view now was that these requirements did not apply to the high speed route. We need to keep the Caltrain territory and the CHSR territory separate. CHSR has a new GO 176 that covers the electrification of a dedicated high-speed line – we were the proponents of that GO and will comply with it. GO 176 does not apply to the Caltrain blended section (where there are freight trains, Caltrain trains, ACE, Amtrak and CHSR trains operating – Caltrain has filed with the PUC an application for a GO to cover this territory. CHSR has reviewed Caltrain's application and has provided minor comments to CPUC- but see no reason why we could not operate within the confines of the proposed GO. We expect that the CPUC will implement the new GO for the Caltrain blended sections imminently.
4. The specification for traction power was for 110 mph running, not 125 mph. JP explained that the existence of many at grade crossings meant that they accepted 110 mph was acceptable. (post meeting note - is any capacity being built into the supply for any future load growth?) JP has commented It is extremely unlikely that the SF-SJ route will be fully grade separated and the curves aligned to allow 125 mph running (the curve adjustment would require significant deviation from the existing ROW. In any event, the increase in electrical demand from 110 mph to 125 mph is easily covered by the thermal capacity of the Power Transformers.
5. The OCS design is for 79 mph and will accommodate running at 110 mph in future. JP believes that it is being built to allow 110 mph without further modification.
6. The Authority specified a sagged construction of OCS but a non-sagged design has been specified by Caltrain. (See note 1) JP said that provided current collection was satisfactory they will accept this. At low speeds we do not foresee a problem with current collection.
7. The contact wire height specification is at variance with CHRSA requirements. JP explained that the need to accommodate other trains determined the difference in height. See notes 1 & 3. CHSR specs assume that only CHSR train are operated. The Caltrain specs assume that a variety of train dynamic envelopes must be accommodated including double stack freight traffic – hence the different contact wire height
8. NB noted that back to back cantilevers were not to be used on the high speed line but were likely to be used by Caltrain. Such cantilevers did not provide for mechanical independence necessary for reliable performance. JP understood the reasons why Caltrain might use them and confirmed they would not be

used on the high speed sections. (See note1) Back to back cantilevers are undesirable but, due to environmental constraints Caltrain has been forced into using them in selected (limited) areas. They are not contemplated for use on the CHSR sections.

9. NB noted that the DB contractor was at risk for meeting unspecified PG&E quality standards for harmonic distortion etc. JP explained that the Authority had carried out work with PG&E at a weak point in their 115 kV distribution system and was satisfied that requirements could be met. He further said that the results of this work would be made available to the DB Contractor and that the supply system was more robust in the San Francisco area.
10. NB commented that the lack of a final OCS design had caused cost and program overruns with other projects and that geotechnical surveys were paramount in getting foundation design right first time. JP said that there was good geotechnical knowledge of likely ground conditions along the Caltrain corridor and that the DB contractor seemed to be relaxed about the issue.
11. PC queried the program to remove at grade crossings and noted that any such work after electrification would have to fund necessary changes to the OCS. JP noted that it had been an aspiration for many years to eliminate such crossings but the reality is that the work is not funded and is extremely unlikely to be funded before the PCEP is completed.
12. PC asked what leverage could be exerted by the DB contractor with local utility owners. JP commented that Caltrain has granted the licenses/easement to the utilities, Caltrain had good knowledge of the position of utilities and had influence with the owners.

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