MONTHLY MONITORING REPORT
June 2018

Central Subway Project
San Francisco Municipal Transportation Agency (SFMTA)
San Francisco, CA

Draft Report Delivered to FTA on July 20, 2018
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PMOC Contract No.: DTFT6014D00010
Task Order No. 5
Project No.: FTA-13-0294

Work Order Number: 002
OPs Referenced: 01 and 25
CLIN 0002B

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Time on project: 4 years

EXECUTIVE SUMMARY

Project Description

The Central Subway Project (CSP) involves construction of a 1.7-mile extension of Muni's T Third Line along 4th Street and Stockton Street in downtown San Francisco. The CSP is Phase 2 of the San Francisco Municipal Transportation Agency's (SFMTA) T Third Light Rail Transit (LRT) Project. The CSP will extend the T Third Line from the 4th Street Caltrain Station to Chinatown, providing a direct rapid transit link from the Bayshore and Mission Bay areas to South of Market, Union Square, and downtown.

Four new stations are being constructed as part of the project—an at-grade station at 4th and Brannan streets and three underground stations at Yerba Buena/Moscone Center (YBM), Union Square/Market Street (UMS), and Chinatown (CTS). Four light rail vehicles (LRVs) are included in the budget for the CSP as part of a larger procurement that will expand the LRV fleet and includes options for replacement of the entire fleet. Average weekday boardings are projected to be 43,521 in 2030.

Project Status

The project has been under construction since February 2010. *At the end of May 2018, the project was 77.2% complete based on expenditures.* The one active construction contract: 1300 Stations and Systems/Trackwork being constructed by Tutor-Perini Corporation (TPC), *was 69.5% complete based on incurred cost.* Substantial completion of this contract was originally scheduled for February 10, 2018, but the latest master program schedule update forecasts substantial completion on July 26, 2019, a delay of 532 days. SFMTA's most recent update of the program schedule forecasts the Revenue Service Date (RSD) to occur on January 14, 2020. This is 384 days later than the required RSD of December 26, 2018 in the Full Funding Grant Agreement (FFGA) *and unchanged from the previous month. Changes to the design of the invert slab at the CTS headhouse have been implemented and further delays due to these changes are not expected.*

SFMTA reported that it was unable to agree on employment terms with the selected candidate for the Program Director position. SFMTA has extended the Acting Director's term while recruitment for this key position continues.

SFMTA also reported that the procurement process to directly obtain replacement rail for the project has been delayed. Delivery of the rail is now forecast to occur in mid-September. SFMTA continues to demand that TPC take action to replace the non-conforming rail and will use the rail it procures on other projects if the contractor complies with this direction.

SFMTA has delivered final proposed contract language for the de-assignment of Automated Train Control System (ATCS) work from the TPC contract to Thales for review. SFMTA has completed drafting changes to the TPC contract for the de-assignment and will forward them to TPC once Thales has accepted its contract changes.

Restoration of the street surface at three intersections on 4th Street remains on hold pending resolution of the traffic control requirements and schedule for the work. An executive level meeting between the CSP management team and SFMTA Sustainable Streets Division (SSD) was scheduled for July 13to resolve the traffic control issues.

Table 1 - Core Accountability Items

Project Status: *(as reported in SFMTA's May 2018 Monthly Progress Report)*		**Original at FFGA:**	**Current Estimate:**
Cost	Cost Estimate	$1,578,300,000	$1,578,300,000
Contingency	Unallocated Contingency	$74,722,000	$9,005,903
	Total Contingency (Including Approved Contract Changes)	$185,500,000	*$73,716,032*
Schedule	Revenue Service Date (RSD)	12/26/2018	1/14/2020 (SFMTA forecast)
Total Project Percent Complete	Based on Expenditures	*77.16%*	
	Based on Earned Value	*77.40%*	
Major Issues	**Status**	**Comments/Planned Action**	
Schedule Contingency	All schedule contingency has been consumed.	SFMTA to publish a revised RSD reflecting remaining schedule risks and the current status of construction.	
Cost Contingency	Total Contingency is *$73.72 million – 18.7% of the remaining work.*	The contingency appears adequate for the current level of project completion, although increasing contractor claims are a concern.	
Technical Capacity and Capability	Recruitment underway for the Program Director and Start-up and Testing Manager.	The Project Management Oversight Contractor (PMOC) is monitoring the agency's progress in recruitment and hiring of needed staff.	
Date of Next Quarterly Meeting:		*August 08, 2018*	

Earned Value (EV): *$1,221,579,918, an increase of $7.60 million from April.*

Planned Value (PV): *$1,520,462,191, a planned increase of $2.16 million from April.*

Actual Cost (AC): *$1,217,832,759, an increase of $11.50 million from April.*

Cost Performance Index (CPI): *1.00*, indicating that the value of completed work is consistent with the incurred cost.

Schedule Performance Index (SPI): *0.80*, indicating that the amount of work completed is significantly less than planned and the project is behind schedule.

Contingency

Cost Contingency

The total available contingency (approved contingency less approved contract changes) as of July 11, 2018 was $73,287,105 which is above the minimum required contingency of $25 million. SFMTA's latest trend summary report estimates a total potential additional cost increase from claims, denied change order requests, and pending changes of $69.34 million, which is $3.95

million less than the available contingency. The Project Management Oversight Contractor (PMOC) notes that claims did not increase appreciably in the past month.

Schedule Contingency

All contingency in the schedule has been consumed, and there are about 13 months of negative float from the baseline schedule. *The forecast RSD did not change in the past month. SFMTA provided to the PMOC a detailed schedule for ATCS work, but this schedule has not been integrated into the program schedule. Contract amendments to the Thales and TPC contracts regarding this work remain to be executed. Coordination issues have arisen with architectural finishing work at YBM and at UMS. Delays associated with these issues have not yet impacted the program critical path. However, the PMOC believes that the remaining significant risks associated with the completion of the ATCS work and the coordination of architectural finishes and mechanical and plumbing work at CTS could impact the overall schedule and the RSD.* The Federal Transit Administration's (FTA) recommended schedule float at the current stage of project completion is four months. Applying this float to the current program schedule yields an estimated RSD in May 2020.

PMOC Observations, Opinions, and Concerns

The PMOC continues to recommend that the estimate at completion for project management costs should be updated to account for higher costs due to the extended duration of the project.

The PMOC recommends that SFMTA quickly complete the contract actions regarding management of the ATCS. In the opinion of the PMOC, until the contract modifications to remove the ATCS work from the 1300 Contract are complete, significant risks to the schedule are associated with the ATCS work. *The PMOC further recommends that SFMTA order replacement rail for the project as soon as possible.* Once the ATCS contract actions and rail procurement are completed, the PMOC plans to conduct a comprehensive schedule review for the project.

The PMOC notes that coordination issues and missing design details have led to delays in the completion of architectural finishes and other work at YBM and UMS. SFMTA is encouraged to work with the designer to expedite solutions to design issues identified by the contractor to avoid delays to the program critical path.

The PMOC recommends that SFMTA complete its review of its Quality Assurance (QA) procedures and process to determine how non-conforming rail was accepted and installed for a significant portion of the alignment before the issue was identified. The PMOC also recommends that SFMTA assess its design control procedures to identify how to avoid conflicting requirements for specified materials in different portions of the specification.

The PMOC continues to recommend that SFMTA quickly resolve the traffic control requirements for restoration of surface streets so that this work can proceed. *Hopefully the executive level meeting held on July 13 resulted in an agreement that can allow street restoration work to proceed.*

The PMOC encourages SFMTA to act quickly to fill the open positions for Program Director and Start-up and Testing Manager. Developing a plan for testing and commissioning is a critical item for avoiding further delays to the project schedule.

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A. PROJECT STATUS

Full Funding Grant Agreement (FFGA)

The FFGA for the Central Subway Project (CSP) was signed on October 11, 2012.

Design

Design is complete.

Construction

Contract 1250 (UR #1). This completed contract relocated utilities within the footprint of the proposed Yerba Buena/Moscone Center (YBM) Station.

Contract 1251 (UR #2). This completed contract included the relocation of utility lines within the footprint of the proposed Union Square/Market Street (UMS) Station and temporarily rerouted existing trolley coach lines around the construction zone.

Contract 1252 Tunnel. This completed contract included the construction of 1.5 miles of twin tunnels excavated by tunnel boring machines and construction of the tunnel portal, retrieval shaft, and five cross-passages. Final completion has been achieved, and final contract close out is now underway. *The causes of voids around the tunnel at Chinatown Station (CTS) have not been conclusively identified and the actual impact to follow-on station construction work is uncertain. San Francisco Municipal Transportation Agency (SFMTA) has concluded that it should release the remaining retained amounts from payments to the contractor and close out the contract.* Warrantee provisions of the tunnel contract will be enforced if additional costs are later determined to have been caused by non-conforming work on the tunnels. *The close-out paperwork is expected to be completed in the next two months.*

Contract 1300 (Combination of UMS, CTS, YBM, and STS). This contract includes the construction of three underground stations, one surface station, all surface works required for the installation of Light Rail Transit (LRT) between 4th and King streets and the tunnel portal, and all LRT track and systems components. *As of the end of May 2018, the construction of the Stations and Surface, Track, and Systems (STS) Contract was 69.51% complete based on cost and 71.24% complete based on the value of completed construction.*

The contractor and SFMTA have been establishing "Big Hairy Audacious Goals" (BHAGs) as a means of encouraging focus and collaboration between the contractor and agency project team members to maintain and enhance schedule performance. The BHAGs are established for critical path and other important activities in the schedule and are defined so as to be difficult to achieve. Thus far, few of the identified BHAGs have been achieved. *See Table 5 on Page 15 for the latest available information on the status of BHAGs. New BHAGs were to be agreed at a partnering meeting between Tutor Perini Corporation (TPC) and SFMTA scheduled for July 12, 2018.* The following paragraphs describe ongoing work for each construction package.

Union Square/Market Street Station (UMS*): The vent shaft at the Union Square Garage was completed in early July. Pads for equipment are being placed in the area beneath the Union Square*

Plaza and in the north concourse, along with interior block walls. Stair 7 is scheduled for completion, and work on the glass roof was expected to begin in July. Encasement of permanent walers and struts was completed at the Mezzanine and Concourse levels of the station box. Interior walls are being constructed, and mechanical, electrical, and plumbing (M/E/P) work is ongoing. Design issues were delaying the completion of the Mezzanine-level floor in the station box. Structural work for the emergency exit stairs at O'Farrell Street was completed, and utility relocations are continuing in advance of final street restoration work. Final street and sidewalk finishing at the Ellis/Market/Stockton intersection has not been completed and still is not indicated on the look-ahead schedule. Construction of the escalator walls in the south concourse is complete, and two support struts for the opening are scheduled to be complete by early August. Escalators 7 and 8 are scheduled to be installed in mid-July. Ring beams at the interface of the tunnels with the station box are scheduled to be completed in July.

Chinatown Station (CTS): *At CTS, the invert slab for the headhouse was completed on June 22. This was later than projected in the master program schedule, resulting in a delay to the substantial completion date for the STS contract and the Revenue Service Date (RSD). Work on the platform level slab is underway and scheduled for completion July 24. Placement of columns will follow, with pouring of the concourse level slab expected to start in early August. Installation of the vaults for Pacific Gas and Electric Company (PG&E) power feeds was scheduled for July 16, but SFMTA Sustainable Streets Division (SSD) is requiring that a walkway be maintained along the west side of Stockton Street adjacent to the work site. TPC asserts that this walkway is not required by the contract and is extra work. SFMTA is working toward a resolution of this issue so that work can proceed.*

Waterproofing of the arches of the north and south platform caverns was continuing. A special form for placement of concrete for the crossover cavern arch was being constructed and due to be complete on July 14. A sequence of pours of the arch structure was scheduled to begin on July 17 and continue every two to three days into early August. Work on the platform cavern arches will follow completion of the crossover cavern arch.

Yerba Buena/Moscone Station (YBM): *Utility work continues to progress slowly at the intersections of 4th Street with Howard Street and Folsom Street. The contractor has proposed a design modification that would streamline the remaining work. The design modifications are being evaluated by San Francisco Department of Public Works (SFDPW) designers. Water leak repairs at the station and headhouse invert level are continuing, with no end date currently in the schedule.* **The Project Management Oversight Contractor (PMOC) remains concerned that, based on experience at the South Ferry Station in Manhattan, complete repair of the water leaks may be difficult to achieve. Diligent inspection should occur for all critical waterproofing work to assure that the installation meets contract requirements.** *M/E/P and elevator work is continuing in various parts of the station. Placement of the under-surface deck of the headhouse was completed in June, and preparations to place the surface level deck are underway. The contactor has identified issues with the proposed support of drainage pipes located between the surface deck and the undersurface deck. SFMTA may revise the design of the surface level deck to eliminate the need for subsurface storm drainage pipes. At the weekly status meeting for YBM,*

TPC continued to note that progress on station finishes work is being delayed by insufficient detailing and dimensioning on the architectural plans in several areas. Revised designs are pending, with work delayed until the related contract modifications can be issued. SFMTA is following up with the designer to expedite responses to requests for information (RFIs) regarding dimensions of finish materials.

Surface, Track, and Systems (STS): Very little work is ongoing on the surface section of the alignment on 4th Street, due to unresolved requirements for traffic control for street restoration and due to delays for procurement of rail to replace non-conforming rail obtained by the contractor. *An executive level meeting between CSP management and SSD management was scheduled for July 13 to resolve the traffic control issues for 4th Street restoration.* SFMTA is still awaiting an Encroachment Permit from the California Department of Transportation (Caltrans) for work at the Interstate 80 off-ramp at Bryant Street. Caltrans will not issue a permit without a Traffic Control Plan (TCP) approved by SFMTA SSD.

Systems

SFMTA is continuing the process of removing the contract for the Automated Train Control System (ATCS) from the 1300 Contract. SFMTA has provided final contract language to Thales and is awaiting a response. When SFMTA and Thales agree on the terms of their contract, SFMTA will issue revised contract language to TPC. This language has been prepared, and a letter is ready for transmittal as soon as Thales agrees to its contract terms. SFMTA has prepared a detailed schedule of ATCS activities based on Thales input, but this schedule has not been integrated into the overall construction schedule. The schedule indicates that ATCS work will be complete in October 2019, which would provide about two months for SFMTA commissioning work prior to the forecast RSD in January 2020. ***In the opinion of the PMOC, the available time for SFMTA commissioning work after ATCS completion in the current schedule is inadequate. Until SFMTA completes the contract actions to remove ATCS work from the 1300 Contract and develops a realistic program schedule incorporating the ATCS work, establishing a reliable forecast of the project completion date will not be possible.*** **The PMOC continues to recommend that SFMTA quickly resolve the ongoing contractual issues regarding the schedule for and management of the ATCS to avoid further schedule delays.**

Tunnel Work

In the tunnel section of the project, track in both tunnels has been installed to UMS. Installation of track through UMS and on to CTS is awaiting receipt of hardened rail, which is being procured directly by SFMTA to replace the standard rail that was procured by the contractor (see below). The walkways along the track have been installed in both tunnels as far as the track has been completed and cannot progress until track installation resumes.

SFMTA and the contractor are in dispute regarding how to respond to the installation of rail that does not meet the requirements of the rail procurement section of the contract specifications. The specification calls for hardened rail, but standard rail was procured and has been used wherever track has been installed. SFMTA has directed the contractor to replace all installed rail at its cost. The contractor has issued a Notice of Potential Claim (NOPC) for more than $3 million in

response to SFMTA's direction to replace the rail. SFMTA is evaluating how the Quality Assurance (QA) process failed to identify the non-conforming rail prior to its ordering, delivery, and installation.

Meanwhile, SFMTA has initiated the process to procure hardened rail for use in the areas where track has not been installed and for replacement of installed track. Delivery of the replacement rail is now forecast in mid-September 2018. Schedule impacts of holding track installation until the replacement rail is on hand are unknown at this time. SFMTA estimates the cost of acquiring the rail to be about $800,000. If the contractor ultimately acts to replace the rail, SFMTA will use the procured rail on other agency projects. ***The PMOC supports SFMTA's action to directly procure replacement rail to minimize further delay to the project.***

The electrical subcontractor was reported to be making good progress with the installation of conduits and Overhead Contact System (OCS) support equipment in the tunnels south of UMS. Traction power cables are being pulled where the progress of other work allows.

Third Party Agreements Including Utilities, Railroads, Other Agencies, Etc.

Bay Area Rapid Transit (BART)

BART has requested that installation of a roll-up door in the wall separating UMS from the Powell Street Station be expedited.

California Department of Transportation (Caltrans)

SFMTA needs an Encroachment Permit to install electrical and traffic signal equipment at the I-280 off-ramp. *Resolution of the traffic control issues for this work with SSD is required prior to obtaining the Caltrans permit.*

CPUC

The California Public Utilities Commission (CPUC) is participating in the various safety meetings, including the Safety and Security Certification Review Committee (SSCRC) and Fire and Life Safety Committee (FLSC) meetings. Representatives of the CPUC also regularly attend the SFMTA/Federal Transit Administration (FTA) Quarterly Progress Review Meetings (QPRM), although they were not present at the May 9, 2018 QPRM. The FLSC is working to approve items on the certifiable items list for the Stations Contract. SFMTA has expressed concern that CPUC may have insufficient staff to witness the required safety tests for CSP, which could further delay the RSD. ***This potential risk is being monitored in the risk register and mitigation strategies have been identified.***

San Francisco Public Utilities Commission (SFPUC)

No updates to report.

San Francisco Department of Public Works (SFDPW)

SFDPW inspects completed street and sidewalk facilities that the contractor has proposed to release to the City. SFDPW develops punch lists of required repairs that must be completed by the

contractor prior to acceptance of the streets and sidewalks. *SFDPW is reviewing proposed changes to the design of sewer facilities at 4th and Howard streets to simplify the construction process.*

San Francisco Parks and Recreation Department

No updates to report.

Private Property Owners

All real estate acquisitions are complete. There will be a need to extend the duration of some of the licenses for compensation grouting. A number of private property owners and businesses have issued claims for damage associated with the project construction. The builder's insurance policies maintained by the contractor cover the costs associated with these claims, and the contractor has demonstrated improved responsiveness to damage claims that are associated with ongoing construction work.

Status of Vehicle Design, Procurement, Testing, and Integration

The four Light Rail Vehicles (LRVs) for the Central Subway have been delivered and accepted by SFMTA. An additional 24 LRVs for near-term fleet expansion (4 for service to the new Warriors Arena), and 151 LRVs for fleet replacement are in various stages of production and delivery. SFMTA has identified which of the new cars are considered to be funded by the CSP and will provide information on the date they are placed into revenue services for ongoing tracking of these assets in which the federal government has a financial interest.

Real Estate

SFMTA has acquired all project right-of-way, and all commercial and residential relocations are complete.

Labor Relations and Policies

Appendix G of the Project Monthly Report details the Small Business Enterprise (SBE) goals and actual participation on each contract as of March 31, 2018. SFMTA contract goals range from 6% to 30% on each of the contracts. The majority of the contracts have met these goals to date.

Compliance with Applicable Statutes, Regulations, Guidance, and FTA Agreements

The 1300 contractor had previously raised the possibility of Buy America compliance issues with cooling equipment for the three underground stations. The contract specifications for the Variable Refrigerant Flow (VRF) cooling units identify four manufacturers that are all foreign, and the contractor has not been able to identify a domestic supplier that can meet the specifications. SFMTA has applied for a waiver of Buy America requirements for this equipment, which is under review by FTA.

B. PROJECT MANAGEMENT PLAN AND SUB-PLAN IMPLEMENTATION

Project Management Plan (PMP)

SFMTA delivered an update of the PMP in April 2018.

Environmental Assessment/Mitigation Plan/Archaeological Plans

The PMOC received the First Quarter 2018 Mitigation Monitoring Reporting Program (MMRP) update from SFMTA on July 10, 2018. The PMOC will review this report in the coming weeks.

Real Estate Acquisition Management Plan (RAMP)

SFMTA submitted RAMP Revision 5, dated September 26, 2013, to FTA on November 19, 2013. SFMTA has acquired all required real estate for the project in accordance with the RAMP.

Quality Assurance/Quality Control (QA/QC) Program Plan

See section F.

Safety and Security Management Plan (SSMP)

See section H.

Risk and Contingency Management Plan (RCMP)

See section I.

C. PROJECT MANAGEMENT CAPABILITY AND CAPACITY

Agency Staff

The CSP Program Director, John Funghi, left the project effective February 1, 2018. SFMTA announced that Albert Hoe, the Deputy Program Director has been appointed as the Acting Program Director. *SFMTA reported that negotiations on employment terms with the selected candidate for the Program Director position failed and that recruitment efforts are continuing. Mr. Hoe's term as Acting Program Director has been extended.* **The PMOC will continue to monitor agency efforts to fill the Program Director position.**

SFMTA's efforts to hire a Start-up and Testing Manager have been delayed while CSP and SFMTA operations management resolved differences of opinion regarding the required skills and experience for the position. *SFMTA Operations has nominated two staff members to work on the start-up and testing process. Mr. Hoe does not believe that the appointed staff have sufficient experience in systems testing and start-up activities. Mr. Hoe intends to secure support services from a consultant to supplement the assigned Operations Division staff members.* **The PMOC encourages SFMTA to obtain the required consulting support for testing and training as soon as possible. Completion of the plan for testing, commissioning, training, and start-up activities for the project is critical to maintaining the schedule.**

A new Quality Assurance Manager (QAM) has joined the CSP team due to the retirement of the incumbent. The QAM was familiarizing himself with the project and the Quality Program at the time of the PMOC's on site monitoring.

The PMOC remains concerned that the project Resident Engineers (REs) have been challenged to address the high volume of open contractor change requests requiring merit determination, completion of negotiations for merited changes, and completion of the necessary paperwork to execute changes that have been negotiated. *The pace of execution of Contract Modifications (CMods) has improved, with six new CMods issued in the past month.*

Contractor Staff

There were no changes in the contractor's management staff.

D. PROJECT COST STATUS

Project Cost Control Systems

SFMTA continued to maintain the Trend Log and logs of Change Order Requests (CORs), Proposed Contract Changes (PCC), NOPCs, and Certified Claims for Contract 1300 using CM13. The Trend Log includes all potential changes in contract value, including items that, in the opinion of the CSP staff, are not merited and new items for which merit has not been determined. The contract change management log includes CORs that have been determined to have merit as well as agency-initiated PCCs that are progressing through negotiations toward a CMod. The NOPC Log and the Claim Log include CORs rejected by SFMTA for which the contractor expects to submit or has submitted a claim.

The most recent versions of the Trend Log and Trend Summary documents are dated July 11, 2018. The Trend Summary indicates that 86 contract modifications had been executed for the 1300 Contract. The total value of executed CMods was $8,991,245 (an increase of $277,000 since June). The NOPC Log, dated July 11, 2018, indicates that there are now *107 potential claims (three additional since June). The Claim Log shows that 87 of these potential claims have been certified and submitted by the contractor. The submitted claims total $47.30 million in extra costs, which is slightly lower than in June.* ***Although the program cost exposure from contractor claims is significant, the available cost contingency appears adequate at the current stage of project completion.***

Note that Tables 2 and 3 reflect the project status as of the end of May 2018 as reported in SFMTA's latest Monthly Progress Report (MPR), and show substantially different values for potential contract changes because of the differing data dates and because pending contract changes in Tables 2 and 3 include only SFMTA-initiated PCCs and contractor CORs that have been determined to have merit. Claims and denied CORs are not included in the cost forecast in Tables 2 and 3.

Project Cost (*as of May 31, 2018*)

Cost estimate: $1.5783 billion.

Total contingency: $*73.72 million (minimum contingency is $25 million), $350,000 less than in April.*

Actual Cost (AC): *$1,217,832,759, an increase of $11.50 million from April (77.16% of the total project budget).*

Current funding level: $1,479,780,000 (93.6% of the total project budget).

Earned Value (EV): *$1,221,579,918, an increase of $7.60 million from April (77.40% of project value earned).*

Cost Performance Index (CPI): *1.00.*

CPI is a measure of cost efficiency on a project. It is the ratio of EV to AC. A CPI equal to or greater than 1.0 indicates a cost underrun, and a value of less than 1.0 indicates a trend towards a cost overrun. A value of 0.9 or greater is considered acceptable, considering the margin of error in estimating the value of completed work.

Project Cost Trends

SFMTA tracks potential changes in project cost, calling these potential changes "trends." Trends include all potential changes in a contract's value. As the status of an identified trend changes, it may become a contract modification, it may become an item that is paid on a force account basis, or it may be denied/closed with no impact to the project cost. Extra cost items identified by the 1300 contractor that CSP management concludes have no merit are carried in the total trend amount at a lower value than the contractor's estimate of extra costs, with the value reflecting SFMTA's assessment of the likelihood that the change would ultimately be approved through the contract dispute resolution process.

Table 2 summarizes the trends for the two construction contracts that have not attained financial close out. **It appears likely that additional contingency from Contract 1252 will be available for reallocation to unallocated contingency.**

In the May 2018 MPR, SFMTA estimates the total cost impact of potential changes to the 1300 Contract at $16.86 million, compared with $17.22 million in April, a decrease of about $360,000. After potential changes were accounted for, $14.42 million in allocated contingency remained for Contract 1300 at the end of April. **The resulting contingency of 5.7% of potential remaining cost on the 1300 Contract after potential changes are accounted for is likely insufficient, and additional contingency will probably need to be allocated to this contract prior to completion. The available unallocated contingency and excess contingency for other elements of the program are very likely sufficient to allow on-budget completion of the CSP**.

Table 3 shows the overall budget, trends, and contingency status for the entire Central Subway program. *The Budget Forecast Variance, which reflects the total remaining contingency after the cost of trends is accounted for, is 18.7% of the potential remaining spending.* **In the opinion of the PMOC, this contingency should be sufficient to provide a high level of confidence in an on-budget completion of the project, although increasing claims from the contractor are a concern.**

Table 2 - Contract, Budget, and Trends for Active Construction Projects[1]

	1252 – Tunnel	1300 Stations, STS
Original Contract	233,584,015	839,676,400
Approved Contingency	2,329,485	40,000,000
Extra Budget for Non-Project Costs	6,173,508	
Approved Budget	235,913,500	879,676,400
Approved Changes	1,363,054	*8,714,034*
Current Contract (1252 does not include non-project costs)	234,947,069	*848,390,434*
Remaining Contingency	966,431	*31,285,966*
Potential Changes (PCCs and merited CORs)	20,000	*16,861,618*
Estimate at Completion	234,967,069	*865,252,052*
Contingency Less Trends	946,431	*14,424,348*
Spent to Date	233,589,322	*611,468,073*
Potential Left to Spend	1,377,747	*253,783,979*
Contingency Less Trends as % of Potential Cost to Complete	68.7%	*5.7%*

[1] *As reported in the May 2018* Central Subway Project Monthly Progress Report – SFMTA (reformatted by the PMOC).

Table 3 - Budget and Contingency Status for Central Subway Project[2]

SFMTA Central Subway Project, Budget, Costs and EAC by SCC April 30, 2018		FFGA Budget	Budget Transfers	Current Budget = Committed	Change	Base Budget	Contingency	Expenditures to Date		Remaining Budget	Cost to Complete	Estimate at Completion	Budget Forecast Variance
		$	$	$	%	$	$	$	%	$	$	$	$
10	**Guideway and Track Elements**	**315,926,081**	**(30,698,202)**	**285,227,879**	**-10%**			**268,245,399**	94%	**16,982,480**			
10.02	Guideway: At Grade, Semi-exclusive	2,395,143	464,857	2,860,000	19%			1,937,500	68%	922,500			
10.06	Guideway: Underground cut and cover	74,407,195	(4,590,788)	69,816,407	-6%			63,663,292	91%	6,153,115			
10.07	Guideway: Underground tunnel	224,933,257	(23,592,511)	201,340,746	-10%			193,247,691	96%	8,093,055			
10.09	Track: Direct fixation	7,293,157	(532,068)	6,761,089	-7%			5,797,916	86%	963,173			
10.10	Track: Embedded	1,601,763	(1,601,763)	-	-100%			-	0%	-			
10.12	Track: Special	5,295,566	(845,929)	4,449,637	-16%			3,599,000	81%	850,637			
20	**Stations, Stops, Terminals, Intermodal**	**432,698,735**	**153,361,692**	**586,060,427**	**35%**			**401,240,841**	68%	**184,819,586**			
20.01	At-grade station	774,913	6,827,944	7,602,857	881%			2,763,152	36%	4,839,705			
20.02	Aerial station, stop, shelter, mall, terminal, platform		2,299,081	2,299,081	NA			-	0%	2,299,081			
20.03	Underground station	412,084,888	142,371,764	554,456,652	35%			390,123,542	70%	164,333,110			
20.07	Elevators, escalators	19,838,934	1,862,903	21,701,837	9%			8,354,147	38%	13,347,690			
40	**Sitework and Special Conditions**	**232,551,627**	**(17,501,184)**	**215,050,443**	**-8%**			**205,018,916**	**95%**	**10,031,527**			
40.01	Demolition, clearing, earthwork	8,887,028	3,468,587	12,355,615	39%			12,078,515	98%	277,100			
40.02	Site utilities, utility relocation	29,562,587	31,617,152	61,179,739	107%			67,908,761	111%	(6,729,022)			
40.03	Haz. Material, contam'd soli removal, ground water treatment	2,957,442	4,576,686	7,534,128	155%			5,648,644	75%	1,885,484			
40.04	Environmental mitigation	3,146,216	(2,023,317)	1,122,899	-64%			557,590	50%	565,309			
40.05	Site structures, including retaining walls, sound walls	2,894,074	(187,643)	2,706,431	-6%			2,706,431	100%	-			
40.06	Pedestrian and bike access and accommodation, landscaping	14,393,910	(4,602,915)	9,790,995	-32%			3,323,239	34%	6,467			
40.07	Automobile, van, bus accessways, including roads and parking lots	11,919,550	(5,340,451)	6,579,099	-45%			4,963,532	75%	1,6			
40.08	Temporary facilities and other construction indirect costs	158,790,820	(45,009,283)	113,781,537	-28%			107,832,204	95%	5,949			
50	**Systems**	**108,429,774**	**(12,845,521)**	**95,584,253**	**-12%**			**34,731,343**	**36%**	**60,852,91**			
50.01	Train control and signals	37,447,116	(9,319,177)	28,127,939	-25%			7,619,133	27%	20,508,806			
50.02	Traffic signals and crossing protection	3,013,232	9,791,724	12,804,956	325%			11,365,048	89%	1,439,908			
50.03	Traction power supply	20,379,634	1,085,439	21,465,073	5%			11,876,097	55%	9,588,976			
50.04	Traction power distribution	16,239,951	(3,798,838)	12,441,113	-23%			1,802,370	14%	10,638,743			
50.05	Communications	28,545,305	(16,514,719)	12,030,586	-58%			1,835,842	15%	10,194,744			
50.06	Fare collection system and equipment	2,804,536	3,295,464	6,100,000	118%			152,852	3%	5,947,148			
50.07	Central Control		2,614,586	2,614,586	NA			80,001	3%	2,534,585			
Subtotal (10 - 50)		**1,089,606,217**	**92,316,785**	**1,181,923,002**	**8%**	**1,148,510,605**	**33,412,397**	**909,236,499**	**77%**	**272,686,503**	**256,155,725**	**1,165,392,224**	**16,530,778**
60	**ROW, Land, Existing Improvements**	**37,398,029**	**(5,151,708)**	**32,246,321**	**-14%**	**32,246,321**	**-**	**30,648,969**	**95%**	**1,597,352**	**1,597,352**	**32,246,321**	**-**
60.01	Purchase or lease of real estate	33,798,029	(3,732,219)	30,065,810	-11%	30,065,810	-	28,239,539	94%	1,826,271	1,597,352	29,836,891	228,919
60.02	Relocation of existing households and businesses	3,600,000	(1,419,489)	2,180,511	-39%	2,180,511	-	2,409,430	110%	(228,919)	-	2,409,430	(228,919)
70	**Vehicles**	**26,385,653**	**-**	**26,385,653**	**0%**	**13,309,000**	**13,076,653**	**10,598,347**	**40%**	**15,787,306**	**2,710,653**	**13,309,000**	**13,076,653**
70.01	Light Rail Vehicles	26,385,653	-	26,385,653	0%	13,309,000	13,076,653	10,598,347	40%	15,787,306	2,710,653	13,309,000	13,076,653
80	**Professional Services**	**361,568,360**	**(32,829,239)**	**328,739,121**	**-9%**	**310,518,042**	**18,221,079**	**267,348,945**	**81%**	**61,390,176**	**43,169,097**	**310,518,042**	**18,221,079**
80.01	Preliminary Engineering	46,317,094	**(114,420)**	46,202,674	0%	46,202,674	-	46,202,675	100%	(1)	-	46,202,675	(1)
80.02	Final Design	86,053,240	(24,734,909)	61,318,331	-29%	61,318,331	-	61,199,308	100%	119,023		61,318,331	-
80.03	Project Management for Design and Construction	191,025,800	(88,107,410)	102,918,390	-46%	89,012,545	13,905,845	71,854,897	70%	31,063,493	22,252,713	94,107,610	8,810,780
80.04	Construction Administration and Management	15,495,521	78,558,172	94,053,693	507%	91,096,881	2,956,812	75,985,719	81%	18,067,974	10,016,096	86,001,815	8,051,878
80.05	Professional Liability and Other Non-Construction Insurance	6,800,000	-	6,800,000	0%	6,800,000	-	6,340,196	93%	459,804	78,823	6,419,019	380,981
80.06	Legal, Permits, Review Fees by Other Agencies	7,242,340	970,264	8,212,604	13%	8,212,604	-	4,908,321	60%	3,304,283	2,844,159	7,752,480	460,124
80.07	Surveys, Testing, Investigation, Inspection	234,036	699,064	933,100	299%	933,100	-	857,829	92%	75,271	22,993	880,822	52,278
80.08	Start up	8,400,329	(100,000)	8,300,329	-1%	6,941,907	1,358,422	-	0%	8,300,329	7,835,290	7,835,290	465,039
Subtotal (10 - 80)		**1,514,958,258**	**54,335,839**	**1,569,294,097**	**4%**	**1,504,583,968**	**64,710,129**	**1,217,832,760**	**78%**	**351,461,337**	**303,632,827**	**1,521,465,587**	**47,828,510**
90	Unallocated Contingency	63,341,742	(54,335,839)	9,005,903	-86%		9,005,903		0%	9,005,903			9,005,903
Total Project Costs (10 - 100)		**1,578,300,000**	**-**	**1,578,300,000**	**0%**		**73,716,032**	**1,217,832,760**	**77%**	**360,467,240**	**303,632,827**	**1,521,465,587**	**56,834,413**

SCC Breakdown of Forecast Construction Costs Not Available

[2] Data reported in the *May 2018* Central Subway Project Monthly Progress Report – SFMTA (reformatted by the PMOC).

Change Order Control

SFMTA is maintaining its management tools for tracking potential contract changes for the 1300 Contract. *The latest CN1300 Trend Summary is dated July 11, 2018. This report shows that 86 contract modifications have been approved for a net increase in the contract value of $8,991,245, which is an increase of $277,000 since June 13. CORs (generated by the contractor) that have been determined to have merit and PCCs (generated by SFMTA) have a combined potential cost impact of $16.00 million in increased contract value, slightly lower than on June 11. SFMTA expects to settle the outstanding CORs for less than the overall cost currently claimed by the contractor.* SFMTA also expects to receive $4.5 million in non-project funds to cover the cost of these pending contract changes. *The expected net impact of the CORs and PCCs on the potential project cost is $11.50 million.*

An additional 872 items are being tracked in the Trend Log. Of these, SFMTA judged 420 items to be without merit and denied them, many of which are included in contractor claims. A further 332 items have been voided and are carried at no cost. There are 104 items covered by certified claims and NOPCs by the contractor ($48.44 million total exposure), and 16 items are "open" or "new" and awaiting a determination of merit.

The potential exposure of the project to additional costs from the denied items, NOPCs, claims, and open items is $57.84 million, which, when added to the $11.50 million in increased project costs from merited contract changes, yields a possible exposure of the project to additional costs for the 1300 Contract of $69.34 million. This compares to the remaining contingency for the project of $*73.29* million. **In the opinion of the PMOC, the available cost contingency for the CSP remains sufficient to address potential cost increases, although the cost exposure from contractor claims is a concern.**

The Trend Log shows the following trend items with potential cost increases in excess of $250,000:

1. # 24 - Change to grade 50 steel from specified grade 70 steel (due to availability issues) - $572,884
2. # 36 - Extra trucking costs for contaminated soil at CTS - $2,274,225
3. # 39 - Harder rock than anticipated for CTS slurry wall excavation - $1,880,379
4. # 61 - Delays to installation of tangent piles at UMS - *$1,557,001, increased from $1,082,380*
5. # 160 - Conflicting duct bank at UMS - $581,837
6. # 176 - UMS Garage underpinning requirements - $732,157
7. # 192 - 12-inch waterline at UMS, added scope - $336,236
8. # 239 - Changes in construction sequence for UMS Garage - $500,000
9. # 246 - UMS art glass installation requirements - $690,017
10. # 272 - Obstructions to jet grout placement at UMS - $2,060,001

11. # 341 - Change in track switch machine manufacturer at STS - $347,670
12. # 399 - Additional monitoring instruments at CTS - $429,777
13. # 466 - Extra work to prepare existing tunnel - $431,423
14. # 498 - Additional traffic control requirements at 4th and King - $500,001
15. # 524 - Changed requirements for pre-loading of UMS concourse level struts - $1,319,593
16. # 526 - Incomplete interface design at STS - $300,001
17. # 528 - Additional traffic control requirements for STS work package - $1,032,302
18. # 537 - Cost of changes to the design of CTS to accommodate the plaza requested by the community - $4,500,001 (paid from non-project funds)
19. # 543 - Change in construction sequence at CTS - $250,001
20. #546 - Additional 12-inch water line work at YBM - $254,106
21. # 580 - Missing conduit between manholes at UMS - $250,001
22. # 636 - Changes in emergency vent design (all stations) - $500,001
23. # 644 - Contractor-claimed change in contract requirements for pre-loading permanent struts at UMS - $1,853,352
24. #657 - Elevator/escalator monitor at UMS - $1,001,907 (new)
25. #658 - Fire department monitor panel for UMS elevators - $355,287
26. #677 - Fire department monitor panel for CTS elevators - $376,899
27. # 695 - Change in scope for slip-lining of 78-inch sewer on 4th Street - $800,016
28. # 715 - Soil nail and shotcrete wall changes in Union Square Garage - $1,365,378
29. # 840 - Change in drain piping details at UMS - $332,252
30. # 892 - Temporary drainage to re-direct water off new ramps at UMS - $261,851
31. # 942 - Change in ATCS for reverse running - $400,000
32. # 968 - Design changes for UMS vertical drainage slots - $603,910
33. # 1022 - Claim for extra costs and time due to extremely hard ground claimed by TPC during the coring for the Sequential Excavation Method (SEM) mining work - $862,720
34. # 1032 - Escalator raceways at UMS - $492,065
35. # 1099 - Extra costs for SEM excavation at CTS due to tunnel segments being 5 feet long - $4,404,329
36. # 1117 - Extra costs due to concrete obstruction at CTS south platform cavern - $583,623
37. # 1175 - Time impacts due to power pole conflict during demolition at CTS - $3,516,164

38. # 1211 - Time impacts from extended submittal reviews and substitution request procedures - $3,021,262
39. # 1217 - Claimed delays to SEM work at the platform invert due to compensation grout exclusion zone requirements in the contract specifications - $900,889
40. # 1268 - Revised reinforcing steel for headhouse invert at CTS - $1,241,941
41. # 1299 - Claimed extra costs for a schedule delay to the train control subcontract - $2,000,001
42. # 1311- Claimed extra costs for delays to the CTS south platform center drift excavation due to restrictions caused by compensation grouting - $675,952
43. # 1352 - Acceleration costs for station box at UMS - $300,001
44. # 1373 - Extra costs for jet grouting complications at Macy's basement at UMS - $585,521
45. # 1378 - General claimed extra costs for SEM work at CTS - $5,457,322
46. #1406 - General claim at YBM - $604,697
47. # 1424 - Extra work due to changes in form-savers and couplers at roof to wall connection at YBM - $250,001
48. # 1479 - Large volume of water inflow at end of probe - $300,000
49. #1485 - Conflict between YBM headhouse column reinforcing steel and temporary struts - $498,187
50. # 1571 - Increase in allowance for Dispute Review Board (DRB) costs - $250,000
51. # 1606 - Claim of defective specifications at YBM - $7,509,028
52. # 1669 - Extra quantity of compensation grouting material all stations - $857,500
53. # 1670 - Differing site conditions at CTS - $1,000,001
54. #1689 - Costs to provide hardened rail - $3,147,867

The PMOC notes that there were no new trends with costs in excess of $250,000 in the current month.

In addition to these large potential cost increases, the Trend Log includes the following major cost savings:

1. Deletion of compensation grouting bid items at YBM - ($1,833,869)
2. Deletion of the Air Replenishment System (ARS) - ($4,689,000)
3. Replace specified Closed Circuit Television (CCTV) equipment with alternate for all stations - ($1,600,000)

Funding

Federal, state, and local project funding and expenditures are shown in Table 4. The awarded funding now represents 93.8% of the project budget.

Table 4 - Project Funding

Source	Committed ($1,000)	Awarded ($1,000)
Federal		
New Starts	942,200	919,182
Congestion Mitigation	41,025	41,025
Federal Subtotal	983,225	960,207
State		
TCRP	14,000	14,000
State RIP	88,000	12,498
Prop. 1B / PTMISEA	307,792	307,792
Prop. 1A / HSR	61,308	61,308
State Subtotal	471,100	395,598
Local		
Prop. K Sales Tax	123,975	123,975
Local Subtotal	123,975	123,975
Project Total:	**1,578,300**	**1,479,780**

E. PROJECT SCHEDULE STATUS

SFMTA prepared an update of the master program schedule in June representing progress on the project through May 2018. SFMTA continues to reject schedule updates from the contractor. SFMTA has directed the contractor to make corrections to the schedule logic, but the contractor has not complied with this direction. As a result, the schedule forecasts for the project are based on SFMTA's version of the schedule. *SFMTA also developed an ATCS schedule, including testing activities in June. This schedule has not been integrated into the overall program schedule.*

As of the end of May2018, the project was 384 days late, based on the projected RSD of January 14, 2020. The substantial completion date for the 1300 Contract is now forecast on July 26, 2019, which is 532 days later than the original date (February 9, 2018). *The latest schedule update indicates no change to the projected RSD from the previous schedule.* An established schedule BHAG to complete the CTS headhouse invert slab by March 31 was missed and was achieved in late June. **The delayed completion of this critical path work is the cause of the 53-day delay to the forecast RSD over the past two months.** The delay has been caused by the addition of waterproofing features at CTS to provide additional protection from water leaks and changes to the design of reinforcing steel in the CTS headhouse invert slab. The modified waterproofing system was motivated by the leaks experienced at YBM.

Major delay claims and NOPCs by TPC for CTS and the other work packages are pending resolution. SFMTA and TPC have been addressing the claims through the DRB process and executive level meetings. Thus far, resolution on the claims has not been reached. The contractor is pushing for a "global settlement" that awards it significant additional time and associated

extended overhead costs. SFMTA is insisting that the various claims be considered individually, with any merited time extensions and costs being included in contract modifications. **The PMOC supports the approach of considering each claim on its individual merits.**

The schedule for installation and testing of the ATCS is the subject of major delay claims, and it is uncertain how delays to the ATCS work could impact the project critical path. SFMTA received an updated schedule from the train control supplier and added other activities to produce a preliminary ATCS schedule. This schedule indicates that the ATCS work can be completed in October 2019, leaving about two months for SFMTA commissioning work prior to the January 14 forecast for RSD**. *This does not appear to be sufficient time to prepare for revenue operations after ATCS completion.***

The critical path for the construction work still flows through the CTS headhouse concrete work, electrical activities, STS start-up and testing, commissioning, and pre-revenue activities. Work at UMS is close to the critical path so that any delays at UMS or time-savings at CTS may cause a change in the critical path.

SFMTA and TPC have been establishing BHAGs as a way to focus the project team's attention on advancing project work and to encourage teamwork among SFMTA and TPC staff to removing barriers to completion of the work.

Table 5 shows the latest BHAGs and the status for each work package in the 1300 Contract. *New BHAGs were planned to be identified at a SFMTA/TPC partnering session on July 12, 2018.*

Table 5 - Interim BHAGs for Construction Progress

Milestone	Target Date	Actual Date	*Status*
CTS			
Complete headhouse invert	5/31/2018	*6/22/2018*	Delayed due to redesign
Complete cavern final lining	9/1/2018	TBD	Invert construction underway
Complete all concrete	12/31/2018	TBD	
UMS			
Complete roadway restoration:			
• O'Farrell/Stockton	6/1/2018	TBD	Delayed from 3/13/2018
• Ellis/Market	6/1/2018	TBD	Delayed from 3/1/2018
Closure of roof openings:			
• 1A	5/15/2018	TBD	Delayed from 5/1/2018
• 3B	8/1/2018	TBD	Utilities need to be completed
Complete all concrete	7/1/2018	TBD	
YBM			
All station finishes complete	9/21/2018	*TBD*	
Complete under-surface deck	5/3/2018	5/31/2018	
Water leak repairs completed	6/1/2018	*TBD*	*Repairs could extend into August*
Finish sewer main at Howard St.	6/15/2018	*TBD*	*Work progressing very slowly*

Milestone	Target Date	Actual Date	*Status*
STS			
Decision on intersection work plan	*5/1/2018*	*TBD*	*Delayed from 2/2018*
Track to CTS	*6/1/2018*	*TBD*	*SSD non-responsive*
Tunnel walkway to UMS	*4/14/2018*	*6/1/2018*	*Work stopped due to rail issues*

In the opinion of the PMOC, the BHAGs continue to be missed and are of questionable value in mitigating delays. The PMOC noted that BHAGs were discussed at all work package status meetings in early July.

The PMOC and SFMTA convened a schedule workshop on July 26 and 27, 2017 with the objective of agreeing on an approach to establishing a reliable forecast of the project RSD. The PMOC issued a report documenting the results of the workshop and identifying action items relative to the schedule. SFMTA and the PMOC reviewed the status of the action items on October 17, 2017. The remaining open action items include:

1. Review and confirm schedule for procurement of ATCS hardware, software, and testing. SFMTA is implementing contract actions that will give it more direct control over the ATCS work. *SFMTA received a detailed schedule for ATCS work from Thales.*
2. Conduct a risk assessment to identify a reasonable range for the RSD recognizing the schedule risks. The PMOC met with SFMTA to review the current status of the risk analysis. SFMTA completed refinements to the analysis and provided results of the work in April. SFMTA delivered a report on the schedule risk analysis to FTA on June 20, 2018. *The PMOC noted that the projected RSD in the risk report was several weeks earlier than the forecast date in the latest program schedule. The PMOC noted that this projection was unreasonable in the light of the current status of the project. SFMTA is now revising the risk-based RSD forecast to reflect the schedule delays that have occurred over the past two months.* ***In the opinion of the PMOC, until the contract modifications to remove the ATCS work from the 1300 Contract are complete, significant risks to the schedule are associated with the ATCS work. Until these risks are retired or better defined, it will be difficult to establish a reliable RSD.***

The PMOC supports SFMTA's planned approach to identifying a range for the RSD for the project.

Project Schedule Data

Earned Value (EV): *$1,221,579,918, an increase of $7.60 million from April.*

Planned Value (PV): *$1,520,462,191, a planned increase of $2.16 million from April.*

Going forward, the planned earned value for each month should be substantially lower because the baseline schedule projected Substantial Completion in February 2018. Actual earned value each month should generally exceed the planned earned value for the month for the remainder of the project.

Schedule Performance Index (SPI): 0.80. SPI is a measure of schedule efficiency on a project. It is the ratio of earned value to planned value. An SPI equal to or greater than 1.0 indicates more work was completed than planned and a value of less than 1.0 indicates less work was completed than planned. A value of equal to or greater than 0.9 reflects satisfactory performance, considering the margin of error in estimating both earned value and planned value. The current value of *0.80* indicates that the project is significantly behind schedule**.**

Table 6 shows the status of the schedule milestones established for the project.

Table 6 - Schedule Milestones

	(P = Planned Date, A = Actual Date, F = Forecast Date)
Preliminary Engineering (PE):	Authorized in July 2002 (A)
Record of Decision:	Issued November 26, 2008 (A)
Final Design (FD):	Authorized in January 2010 (A)
FFGA Request:	Submitted September 2011 (A)
FFGA Executed:	October 11, 2012 (A)
Ground Breaking: (Utility Relocation Contract)	February 9, 2010 (A)
Tunnel excavation complete (hole through):	June 2, 2014 (SB); June 11, 2014 (NB) (A)
Cross passages complete:	December 20, 2014 (P); April 15, 2015 (A)
Tunneling substantial completion:	April 15, 2015 (A)
Station construction Notice to Proceed (NTP):	June 17, 2013 (A)
Station construction substantial completion:	February 24, 2018 (P); July 26, 2019 (F)
RSD:	December 26, 2018 (P); January 14, 2020 (F)

Schedule Contingency Management criteria were developed from the FTA Risk Assessment prior to entry into Final Design (FD). Minimum schedule contingency levels at various project milestones or "Hold Points" were agreed to with SFMTA at Risk Workshop #4, held in 2009. The FTA recommended schedule contingency for the current stage of the project is 4.0 months. The current schedule reflects about 13 months of negative buffer float. Applying the recommended schedule float to SFMTA's current RSD forecast yields a RSD estimate of May 2020.

Critical Path Summary *(Baseline Schedule)*

CTS Install Guidewalls, Slurry Walls, and Install Surface Deck (complete)
CTS Excavate Headhouse and Bracing (complete)
CTS SEM and Install Supports (underway)
CTS Headhouse Structural Concrete/Remove Bracing
CTS Install M/E/P Equipment
CTS Start-up and Testing
CTS P-1254R Commissioning of Station
Safety and Security Certification/Pre-Revenue Activities
RSD on December 26, 2018 (currently forecast January 14, 2019)

Three Month Look-ahead

The following activities are planned over the next three months:

1300 Contract

UMS

- Complete utility placement, backfill, and paving at the Stockton Street intersections with O'Farrell Street and Ellis Street
- Continue exterior finishing work at the plaza level of the Union Square Garage and the north entrance
- *Construct finished walls and floors in the station box*
- *Complete the structural interface between the tunnels and the station box*
- Install M/E/P throughout the station
- Install the escalators in the south concourse

CTS

- Completion of the platform and concourse-level slabs in the headhouse
- Continue placement of final linings in the crossover and platform caverns
- Continue bottom-up construction of the headhouse interior walls and floors
- Re-start construction of final lining for emergency exit at north end of station

YBM

- Complete repairs of groundwater leaks in the headhouse at the invert level
- Install mechanical and electrical equipment at the invert level of the headhouse
- Install electrical equipment in the main electrical room and traction power room
- *Complete placement of the headhouse surface-level deck*
- Continue construction of stairs within the station box and emergency egress stairs
- Continue M/E/P rough-in and interior work on the mezzanine and concourse levels
- Continue finishes work at the platform level
- Complete utility work at 4th and Howard Street and 4th and Folsom Street intersections above the station box and start street restoration work
- Install escalators and elevators

STS

- Complete OCS pole installation

- Resolve requirements for traffic control and construction staging for completion of street restoration work along 4th Street south of I-80
- Complete street reconstruction at Brannan and King street intersections with 4th Street
- Obtain Encroachment Permit from Caltrans for construction in the I-80 ramp/Bryant Street area
- Complete street reconstruction, installation of trolley coach OCS, and traction power equipment at the 4th and Bryant intersection
- Order hardened rail for project use
- Plan for construction of the trackway and installation of track along 4th Street
- Install track from YBM through UMS and on toward CTS
- Construct tunnel walkways
- Continue construction of surface level station at Brannan Street
- De-assign ATCS subcontract work from the 1300 Contract and prepare detailed schedule for ATCS completion
- Continue installation of electrical conduits in tunnels
- Continue pulling traction power cables along 4th Street

The PMOC expects to attend the following meetings:

- *Weekly Management (August 6, September 4, and October 1, 2018)*
- *Weekly Contract 1300 Construction Progress Meetings (August 7/8, September 4/5, and October 2/3, 2018)*
- *Weekly Configuration Management Board (CMB) (August 8, September 5, and October 3 2018)*
- *CSP PMOC Status Meetings (August 7, September 4, and October 2, 2018)*
- *CSP Risk Management Meeting (August 7, September 5, and October 2, 2018)*
- *FTA/QPRM (August 8, 2018)*

F. QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC Plan Implementation

SFMTA's QAM retired from the project in May 2018. A replacement started working on the project in early July.

The 1300 contractor's staff includes a Contractor's Quality Manager (CQM), who reports to the Contractor's Management at an organization level superior to the contractor's Project Manager. The CQM is provided by a subcontractor. The reporting structure is to provide the CQM with direct access to the contractor's Principal Officers. A Contractor Non-conformance Report

(CNCR) Log for identifying, correcting, documenting, and controlling non-conformances is maintained by the contractor and reviewed at weekly status meetings for each work package. Subsequent work may not progress for work that is the subject of a Corrective Action Request (CAR) until conditions averse to quality are corrected. In the event that the contractor does not issue a CNCR, SFMTA may issue a Non-conformance Notice (NCN) where non-conforming work is identified by SFMTA's quality assurance staff.

The quality concerns for the 1300 Stations Contract identified in the SFMTA May monthly report included issues identified in the previous month. *A key activity for SFMTA is to determine the causes for acceptance of non-conforming rail during the submittal review process and at delivery of the rail to the project site.*

The PMOC continues to recommend that SFMTA complete its review of its QA procedures and process to determine how the non-conforming rail was accepted and installed for a significant portion of the alignment before the issue was identified. The PMOC also recommends that SFMTA assess its design control procedures to identify how to avoid conflicting requirements for specified materials in different portions of the specification.

The previous QAM was conducting a surveillance of quality control related to the water leaks that have appeared in the YBM station. The status of that surveillance has not been reported. ***The PMOC recommends that the new QAM follow up on the status of this audit.***

As of May 24, 2018, TPC's Quality Manager had filed 362 CNCRs (one new since the last report). Seven new items were under review, seven other items had responses identified but not yet approved, the proposed responses to 16 items were disapproved, and 26 items had approved responses that were not yet implemented. In addition, 267 items were closed (six more than on April 25) and 38 items had been voided. Up-to-date CNCR information was not available due to the new status of the QAM.

G. AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE

There are no ADA issues for the project at this time.

H. SAFETY AND SECURITY

Safety and Security Management Plan

An updated SSMP Revision 2, dated February 2, 2014, was submitted to FTA on May 2, 2014. The SSMP outlines the plans needed prior to revenue operations. These plans include the Rail Activation Plan (RAP), the System Integration Test Plan, the Safety and Security Certification Plan (SSCP), and the Pre-Revenue Operations and Start-up Plan. SFMTA has completed the SSCP, which is being used to guide safety certification activities. The initial draft of the RAP was completed with the latest update of the PMP. The System Integration Test Plan and the Pre-Revenue Operations and Start-up Plan are expected to be provided after SFMTA hires the Start-up and Testing Manager for the program.

Fire and Life Safety/Safety and Security Issues

The Construction Specification Conformance Checklists have been completed and approved for all construction packages. In September 2013, the CPUC staff began attending monthly as-built meetings to review the completed items. All items related to the tunnel construction have been certified and accepted by SFMTA's safety staff. The certification work was started to address the station construction items in 2016. *As of July 9, 2018, 259 of the 1660 items on the Safety and Security Conformance Checklist were approved and 25 items required follow-up responses from the SFMTA construction team. Four items were under review by the committee. The San Francisco Fire Department (SFFD) regularly attends the now combined FLSC and SSCRC meetings.*

Construction Safety

The 1300 Contract has been experiencing an increase in minor construction accidents recently. Two minor injury accidents occurred during May 2018. SFMTA is monitoring how TPC is implementing its Job Safety Analysis process to identify and mitigate sources of increased injury risk. There were seven first-aid incidents in the month of April 2018, one of which required medical treatment and was recordable. The performance metrics relating to accidents per working hour remain well below the OSHA goals for similar construction, despite the recent unfavorable trends. The current accident records for the 1300 Contract are shown in Table 7.

Table 7 - Construction Safety Data

Through May 2018	No. of Incidents	Incident Rate[1]	Goal
1300 Contract			
OSHA Recordable Accidents	10	*0.71*	<3.4
Job Transfer/Restricted Duty Incidents	0	0	NA
Lost Time Incidents	*2*	*0.14*	<1.6
Total Incidents	*12*	*0.86*	NA
Hours Worked	*2,802,214*		

[1]OSHA incident rate = incidents x 200,000/hours worked.

I. PROJECT RISK, RISK MANAGEMENT, AND RISK MITIGATION

SFMTA conducts monthly meetings to review the status of identified risks, monitor the implementation of mitigation measures, identify new risks, and evaluate the probability and potential impacts of existing and newly identified risks. The current major risks to the project address the potential for further delays to the construction of the stations, which cannot be mitigated or recovered, resulting in further delays to the RSD. At the Risk Mitigation meeting on July 10, 2018, these and other major remaining project risks were evaluated. The outcome of the risk meeting is documented in Appendix D..

The PMOC noted the following significant items of discussion at the July meeting:

- The PMOC noted that a new risk "YBM Water Leaks" has been added to the register and that this risk is the second highest rated risk after "Unresolved Assignment of Schedule Delay Responsibility may lead to increased program cost". The PMOC notes that it may

be appropriate to add a risk for potential water leaks at CTS, since the basic design of the headhouse is similar to that for YBM. SFMTA noted the actions it is taking to repair water leaks and to determine the underlying causes for the leaks. A consultant is conducting an independent evaluation of the design to assess whether inadequate waterproofing in the design could be responsible for the leaks. At present, the leaks are not holding up progress for installation of equipment at YBM.

- SFMTA noted that it is working to execute unilateral CMods to reflect the findings of the DRB regarding claims filed by TPC. In approximate terms, SFMTA is likely to agree with changes that will increase the TPC contract value by about $20 million, while TPC is seeking more than $50 million in increased direct costs and extended construction overhead. In the opinion of the PMOC, the final contract cost will most likely be the subject of mediation and/or litigation.
- As part of the review of risk 251 (risk that all work is not identified in the current construction schedule, resulting in delays), SFMTA noted that a detailed schedule of activities for the ATCS has been developed, and this detailed schedule did not result in the need for more time to complete the ATCS work.
- SFMTA noted that it continues to work to hire a Start-up and Testing Manager for the project. Muni Operations has identified two of its staff to work on start-up activities. The CSP Acting Program Director does not believe that these staff members have sufficient experience in start-up work. SFMTA is working to secure consultant support for the start-up work. In the opinion of the PMOC, the combination of experienced consultant support and current Muni Operations staff may represent a cost-effective approach to meeting the temporary requirement for testing and start-up expertise and the long-term need for ongoing operation of the service.
- The PMOC noted that recent issues with inadequate coordination of architectural features (either in design or in construction or both) have not been captured as potential future risks. **In the opinion of the PMOC, SFMTA should be using the issues at YBM with coordination of architectural features as an opportunity for lessons learned that can be applied to the other two underground stations.** The issues at YBM include coordination between finish ceiling support systems and smoke control features and problems with the finished floor elevations.

The PMOC encourages SFMTA to continue to identify new risks associated with the coordination of design and installation of upcoming building finishes and M/E/P work, as the major risks associated with civil work and related differing site conditions are being retired.

SFMTA has been applying updated schedule risks to a Monte Carlo analysis of the program schedule in order to establish a range of likely construction completion dates and revenue service dates. *SFMTA provided an updated report on the schedule risk assessment to FTA on June 20. However, the PMOC determined that the schedule risk analysis did not reflect the recent delays to critical path work and requested that SFMTA update the analysis. SFMTA is currently reviewing and updating the projection for RSD based on the current status of the project.* ***The PMOC***

recommends that the risk assessment and schedule forecast be further updated once the contract actions to separate the ATCS work from the 1300 Contract are complete. **Significant schedule risk is associated with the schedule for ATCS work, and this risk can be better evaluated once *the contract modifications are executed*.**

In the opinion of the PMOC, SFMTA is taking an appropriate approach to identifying and quantifying the potential impacts of the remaining schedule risks to the project. The outcome of the SFMTA risk assessment is expected to be a range of likely RSDs for the project.

J. ACTION ITEMS AND RECOMMENDATIONS

Table 8 on the following page shows the current action items for SFMTA. Table 9 provides a summary of the currently active PMOC recommendations. Closed recommendations are removed from the table one month after closure.

Table 8 - SFMTA Action Items for Central Subway Project

Category	NO.	ACTION	DATE OPENED	DUE DATE	DATE CLOSED	COMMENTS
S	**171**	Provide a range of dates for the Revenue Start Date	6/23/2016	6/1/2018	*TBD*	*SFMTA provided a report on June 20, 2018. However, SFMTA should further update the Monte Carlo analysis when the ATCS schedule is received from Thales.*
C	***178***	Recognize impact of schedule delays to project management costs	11/14/2017	2/1/2018	TBD	SFMTA has started the process to update its forecast for project management costs.

(Note: All closed items are removed a month after being closed. Changes to open items since last update are indicated in *italics.*)

Category Key:
C – Cost
FMP – Fleet Management Plan
IRP – Independent Review Panel
PMP –Project Management Plan
QA – Quality Assurance
RA – Risk
RE – Real Estate
S – Schedule
SC – Scope
SS – Safety
T – Tech. Cap. & Cap.
CH – Change Mgmt.

Table 9 – Active PMOC Recommendations

Number	Date Identified	Recommendation
1	12/27/2017	SFMTA and the contractor should continue to use the DRB process as a tool to resolve contract disputes.
2	12/27/2017	Required cost and schedule contingencies should be reevaluated when CTS excavation and placement of the invert slab of the headhouse is complete. *Headhouse invert slab was completed in June 2018. SFMTA is reevaluating its schedule risk assessment given the delayed completion of this critical path work.*
3	12/27/2017	The CSP Management Team should assess the impacts that schedule acceleration may be having on the quality program for the project and make any necessary adjustments needed to assure that quality is not compromised.
4	12/27/2017	The status of BHAGs should be discussed at each work package status meeting in order to improve the effectiveness of the goals in advancing critical project work. *The PMOC noted that BHAGs were discussed at each of the four work package status meetings*
5	12/27/2017	The trend log tracking should include the amount of time that has passed from the initial identification of the trend.
6	1/10/2018	SFMTA should immediately prepare and implement a plan for filling key positions, including the Program Director and Resident Engineer openings. The PMOC will monitor the agency's progress in recruitment and hiring of needed staff. RE positions filled. Program Manager and Start-up and Testing Manager remain open.
7	*1/10/2018*	SFMTA should evaluate the current and future staffing levels and expertise required to address outstanding contract issues while effectively managing ongoing construction and preparing for systems testing and start-up activities. The PMOC supports the concept of assigning a dedicated claims management team, which has been partially implemented.
8	*1/10/2018*	SFMTA should work with the City to address problems in contract management associated with the switch to a new financial management system. Some contract modifications have been executed. CLOSED.
9	1/10/2018	SFMTA should now focus on updating the risks and mitigation strategies to reflect the transition of the work from excavation and major structural supports to M/E/P and systems installation and testing. A specific risk of delays due to contractual issues with the ATCS system would appear to be a concern.

Number	Date Identified	Recommendation
10	2/23/2018	The PMOC recommends that SFMTA quickly resolve the ongoing contractual issues regarding the schedule for and management of the ATCS to avoid schedule delays. *SFMTA finalized contract language for Thales and TPC. Execution of amendments is pending contractor response to the proposed changes.*
11	2/23/2018	The PMOC recommends SFMTA immediately resolve differences of opinion regarding skills required for the Start-up and Testing Manager and fill this position. *SFMTA plans to obtain consulting support for the testing and start-up work while assigning two operations staff to the project.*
12	2/23/2018	The PMOC recommends that the potential risk of CPUC having insufficient staff to witness required tests be monitored in the risk register and mitigation strategies be developed. This risk is included and monitored at each risk mitigation meeting. CLOSED.
13	3/11/2018	SFMTA management should work with SSD and CSP management to assure that traffic control requirements appropriately balance the needs of the project and the traveling public. A partnering approach may be effective in addressing TCP issues. *The requirements for traffic control for street restoration at the remaining intersections along 4th Street were to be agreed at a meeting on July 13.*
14	*4/12/2018*	The PMOC recommends that the risk assessment and schedule forecast be updated *once the contract amendment to separate ATCS work from the 1300 Contract is executed.* Significant schedule risk is associated with the unknown schedule for ATCS work and this risk can be better evaluated *once the Thales contract has been modified.*
15	*5/17/2018*	The PMOC recommends that SFMTA quickly determine what course of action to take in response to the installation of standard, rather than hardened, rail for the project's trackwork. Replacement rail should be procured as soon as possible to minimize delays to the project. SFMTA has initiated rail procurement.

Number	Date Identified	Recommendation
16	*6/21/2018*	The PMOC recommends that SFMTA complete its review of its QA procedures and process to determine how the non-conforming rail was accepted and installed for a significant portion of the alignment before the issue was identified. The PMOC also recommends that SFMTA assess its design control procedures to identify how to avoid conflicting requirements for specified materials in different portions of the specification.
17	*7/18/2018*	*SFMTA is encouraged to work with the designer to expedite solutions to design issues identified by the contractor to avoid delays to the program critical path.*
18	*7/18/2018*	*The PMOC recommends that the new QAM follow up on the status of the quality audit for waterproofing installation at YBM.*

APPENDIX A. LIST OF ACRONYMS

AC	Actual Cost
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ARS	Air Replenishment System
ATCS	Automated Train Control System
BART	Bay Area Rapid Transit
BCE	Baseline Cost Estimate
BHAG	Big Hairy Audacious Goal
BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CAR	Corrective Action Request
CCTV	Closed Circuit Television
CFR	Code of Federal Regulations
CLIN	Contract Line Item Number
CM/GC	Construction Manager/General Contractor
CMB	Configuration Management Board
CMod	Contract Modification
CNCR	Contractor Non-Conformance Report
COR	Change Order Request
CPI	Cost Performance Index
CPUC	California Public Utilities Commission
CQM	Contractor's Quality Manager
CSP	Central Subway Project
CTS	Chinatown Station
DF	Designated Function
DRB	Dispute Review Board
EV	Earned Value
FD	Final Design
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FFGA	Full Funding Grant Agreement
FLSC	Fire and Life Safety Committee
FMP	Fleet Management Plan
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IRP	Independent Review Panel
LONP	Letter of No Prejudice
LRT	Light Rail Transit
LRV	Light Rail Vehicle

M/E/P	Mechanical, Electrical, and Plumbing
MMRP	Mitigation Monitoring Reporting Program
MOU	Memorandum of Understanding
MPR	Monthly Progress Report
MPS	Master Project Schedule
Muni	Common Public Reference to SFMTA
NCN	Non-conformance Notice
NCR	Non-conformance Report
NEPA	National Environmental Policy Act
NOPC	Notice of Potential Claim
NTP	Notice to Proceed
O&M	Operations & Maintenance
OCS	Overhead Contact System
OHA	Operational Hazard Analysis
OP	Oversight Procedure
PCC	Proposed Contract Changes
PE	Preliminary Engineering
PG&E	Pacific Gas and Electric Company
PHA	Preliminary Hazard Analysis
PMOC	Project Management Oversight Contractor
PMP	Project Management Plan
PTMISEA	Public Transportation Modernization, Improvement, and Service Enhancement Account
PV	Planned Value
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manager
QPRM	Quarterly Progress Review Meeting
QTR	Quarter
RAMP	Real Estate Acquisition Management Plan
RAP	Rail Activation Plan
RCMP	Risk and Contingency Management Plan
RE	Resident Engineer
RFI	Request for Information
ROD	Record of Decision
RSD	Revenue Service Date
SBE	Small Business Enterprise
SCIL	Safety Certifiable Item List
SCP	Safety Certification Plan
SEIS	Supplemental Environmental Impact Statement
SEM	Sequential Excavation Method

SEPP	Security and Emergency Preparedness Plan
SFDPW	San Francisco Department of Public Works
SFFD	San Francisco Fire Department
SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission
SIT	Systems Integration Test
SOP	Standard Operating Procedure
SPI	Schedule Performance Index
SSCP	Safety and Security Certification Plan
SSCRC	Safety and Security Certification Review Committee
SSCVR	Safety and Security Certification Verification Report
SSD	Sustainable Streets Division
SSMP	Safety and Security Management Plan
SSO	State Safety Oversight
SSP	System Security Plan
SSPP	System Safety Program Plan
STS	Surface, Track, and Systems
TBD	To Be Determined
TBM	Tunnel Boring Machine
TCP	Traffic Control Plan
TPC	Tutor Perini Corporation
TSA	Transportation Security Administration
TVA	Threat and Vulnerability Analysis
U.S.C.	United States Code
UMS	Union Square/Market Street Station
VRF	Variable Refrigerant Flow
YBM	Yerba Buena/Moscone Center Station
YOE	Year of Expenditure

APPENDIX B. SAFETY AND SECURITY CHECKLIST

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Safety and Security Management Plan	**2014**	**2011**	Revision 1 Update submitted to FTA 02/25/2011. Not submitted to FRA. Revision 2 submitted to FTA on May 2, 2014.
Safety and Security Certification Plan (SSCP)	**2011**		SSCP was revised 10/2011. Revision 1 was developed in November 2011. Not submitted to FRA.
System Safety Program Plan (SSPP)	**2009**	**2009**	SSPP dated 03/13/2009 submitted to FTA 07/31/2009. Not submitted to FRA.
System Security Plan (SSP) or Security and Emergency Preparedness Plan (SEPP)	**2009**		Not submitted to FTA. Not submitted to FRA.
Construction Safety and Security Plan	**2012**		Health and Safety. Construction Safety Standards Revision 3, June 27, 2012.
Safety and Security Authority	*Y/N*		**Notes/Status**
Is the grantee subject to 49 CFR Part 659 state safety oversight requirements?	Y		
Has the state designated an oversight agency as per Part 659.9?	Y		California Public Utilities Commission (CPUC) Consumer Protection & Safety Division 505 Van Ness Avenue San Francisco, CA 94102 (415) 703-1017 phone (415) 703-1758 fax Point of contact: Arun Mehta

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Has the oversight agency reviewed and approved the grantee's SSPP as per Part 659.17?	Y		SFMTA currently operates its LRT system in compliance with an SSPP approved by the CPUC. These plans will be revised, as required, to incorporate the addition of the CSP during the late construction and early testing phase and submitted to the CPUC for approval prior to the planned start of revenue operations.
Has the oversight agency reviewed and approved the grantee's Security Plan or SEPP as per Part 659.21?	Y		See above.
Did the oversight agency participate in the last Quarterly Program Review Meeting?	N		
Has the grantee submitted its safety certification plan (SCP) to the oversight agency?	Y		SFMTA submitted the SSCP to CPUC staff for review and Commission approval during the preliminary engineering phase. The plan was approved in March 2009. The SSCP revised in November 2011 was submitted to the CPUC and was approved. CPUC attends monthly certification review meetings conducted by SFMTA.
Has the grantee implemented security directives issues by the Department Homeland Security, Transportation Security Administration?	N/A		Currently, there are no TSA directives or programs applicable to the project. If any arise during the course of the project, the activities to comply will be developed and shown on a revision of the project safety and security activities schedule.

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
SSMP Monitoring			
Is the SSMP project-specific, clearly demonstrating the scope of safety and security activities for this project?	Y		The PMOC reviewed the CSP SSMP and provided a spot report to FTA in May 2011. FTA approved the CSP SSMP on May 16, 2011. A follow-up Adherence Audit was conducted September 14-16, 2011. The audit found that CSP is conducting its activities in accordance with the SSMP.
Grantee reviews the SSMP and related project plans to determine if updates are necessary?	Y		SSMP Revision 2 was submitted to FTA on May 2, 2014.
Does the grantee implement a process through which the Designated Function (DF) for Safety and DF for Security are integrated into the overall project management team? Please specify.	Y		Safety and security are under the direction of the SFMTA Safety and Security Manager and supplemented by Project Management/Construction Management consultant staff, including a Safety and Security Certification professional who has been dedicated to supervise project Safety and Security Certification.
Does the grantee maintain a regularly scheduled report on the status of safety and security activities?	Y		Safety and security certification status and activities are reported in the weekly construction progress meetings and the CSP Monthly Progress Report.
Has the grantee established staffing requirements, procedures, and authority for safety and security activities throughout all project phases?	Y		
Does the grantee update the safety and security responsibility matrix/organizational chart as necessary?	Y		The PMOC found the revised matrix in the SSMP, Rev. 1, 02/08/11, to be compliant.
Has the grantee allocated sufficient resources to oversee or carry out safety and security activities?	Y		

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Has the grantee developed hazard and vulnerability analysis techniques, including specific types of analysis to be performed during different project phases?	Y		CSP has prepared a Preliminary Hazard Analysis Report, Rev. 0, April 23, 2009. Corrective actions and analysis for different project phases have been identified in the report.
Does the grantee implement regularly scheduled meetings to track to resolution any identified hazards and/or vulnerabilities?	Y		
Does the grantee monitor the progress of safety and security activities throughout all project phases? Please describe briefly.	Y		Safety and Security is an ongoing agenda item for the current construction contract (1300) work package status meetings. The status of safety and security certifications is reviewed at weekly project management meetings.
Does the grantee ensure the conduct of preliminary hazard and vulnerability analyses? Please specify analyses conducted.	Y		
Has the grantee ensured the development of safety design criteria?	Y		Design is complete and construction is underway.
Has the grantee ensured the development of security design criteria?	Y		Design is complete and construction is underway.
Has the grantee ensured conformance with safety and security requirements in design?	Y		Certification checklists have been developed. Certification is achieved through monthly meetings. Design is complete and construction is underway.

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Has the grantee verified conformance with safety and security requirements in equipment and materials procurement?	Y		Safety and Security Conformance checklists have been prepared for each of the construction contracts. All certifiable elements of the Tunnel work have been certified and accepted by SFMTA Safety. Certification reviews are underway for the stations contract.
Has the grantee verified construction specification conformance?	Y		This is on-going as construction progresses and verified through the Safety and Security Certification process
Has the grantee identified safety and security critical tests to be performed prior to passenger operations?	N		Currently being developed.
Has the grantee verified conformance with safety and security requirements during testing, inspection, and start-up phases?	N		*Project is in construction, with RSD about 17 months in the future.*
Does the grantee evaluate change orders, design waivers, or test variances for potential hazards and/or vulnerabilities?	Y		
Has the grantee ensured the performance of safety and security analyses for proposed work-arounds?	N/A		Currently no work-arounds have been identified.

Central Subway Project Overview			
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Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Has the grantee demonstrated through meetings or other methods, the integration of safety and security in the following: ☐ Activation Plan and Procedures ☐ Integrated Test Plan and Procedures ☐ Operations and Maintenance Plan ☐ Emergency Operations Plan	In Process		Second draft of Rail Activation Plan has been completed. An Integration Matrix has been implemented for all disciplines including safety and security concerns. *Grantee intends to hire a Start-up and Testing Manager who will develop the plans and procedures. This hire is becoming a critical activity.*
Has the grantee issued final safety and security certification?	N		Project is in the construction phase.
Has the grantee issued the final safety and security verification report?	N		Project is in the construction phase.
Construction Safety			
Does the grantee have a documented/implemented Contractor Safety Program with which it expects contractors to comply?	Y		Health and Safety Construction Safety Standards Revision 3, June 27, 2012.
Does the grantee's contractor(s) have a documented companywide safety and security program plan?	Y		
Does the grantee's contractor(s) have a site-specific safety and security program plan?	Y		The remaining active contractor has a plan. Contract documents require that the contractor follows an Environmental Health and Safety Program, specific to the contract work.
Provide the grantee's OSHA statistics compared to the national average for the same type of work?	Y		Provided in the Central Subway Monthly Progress Report.

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Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
If the comparison is not favorable, what actions are being taken by the grantee to improve its safety record?	N/A		Statistics are favorable. No action needed.
Does the grantee conduct site audits of the contractor's performance versus required safety/security procedures?	Y		Safety walks are routinely conducted at each construction site.
Federal Railroad Administration			
If shared track: has grantee submitted its waiver request application to FRA? (Please identify specific regulations for which waivers are being requested.)	N/A		No shared track. No waivers are anticipated.
If shared corridor: has grantee specified specific measures to address shared corridor safety concerns?	N/A		
Is the CHA underway?	N/A		
Other FRA required Hazard Analysis – Fencing, etc.?	N/A		
Does the project have Quiet Zones?	N		
Does FRA attend the Quarterly Review Meetings?	N		

N/A = Not applicable.

APPENDIX C. PROJECT MAP AND OVERVIEW

CENTRAL SUBWAY PROJECT: Project Overview and Map

Date:	*July 17, 2018*
Project Name:	Central Subway Project (CSP) New Starts Light Rail Transit
Grantee:	San Francisco Municipal Transportation Agency (SFMTA)
FTA Regional contact:	Mr. Jeffrey S. Davis
FTA Headquarters contact:	Mr. Andre Anderson

Scope

Description:	The CSP will extend the Third Street Light Rail line from the Caltrain station at Fourth and King streets to Chinatown. It was incorporated in the FEIS/FEIR on the Third Street Light Rail project published in December 1998, but FTA did not include the CSP in the Record of Decision (ROD) issued in March 1999. A ROD for the CSP, however, was issued by FTA on November 26, 2008, and the U.S. Department of Transportation and FTA determined that the requirements of the National Environmental Policy Act (NEPA) of 1969 were satisfied for the CSP. The environmental record for the CSP is included in the Final Supplemental Environmental Impact Statement (SEIS), Volume II, dated July 11, 2008 and the Final SEIS, Volume I, dated September 23, 2008. These documents present the detailed statement required by NEPA and U.S.C. 5324 (b). SFMTA requested authority to enter Preliminary Engineering (PE) in March 2002 and submitted a Project Management Plan (PMP) in June 2002. FTA approved entry into PE in July 2002. Approval to enter Final Design (FD) was granted by FTA on January 7, 2010. The Full Funding Grant Agreement (FFGA) was signed on October 11, 2012.
Guideway:	The length of the CSP will be 1.7 miles of double-tracked line.
Stations:	The CSP includes three subway stations and one surface station.
Additional Facilities:	The CSP does not include any ancillary facilities.
Vehicles:	The CSP Service Plan dated October 2009 clarified that four vehicles will be required. Vehicle manufacturing is underway and SFMTA has identified the four vehicles that will be considered to have been partially funded with CSP grant funds.
Ridership:	43,521 Average Weekday Boardings are projected in 2030.

Schedule

07/02	Approval Entry to PE	2016	Estimated Rev Ops at Entry to PE
01/10	Approval Entry to FD	2018	Estimated Rev Ops at Entry to FD
10/11/12	FFGA	2018	Estimated Rev Ops at FFGA
01/14/2020			Revenue Operations Date at date of this report

77.4% *Percent Complete Based on Progress* (*April 2018 data*)

Cost

$764 million	Total Project Cost ($YOE) at Approval Entry to PE
$1,578 million	Total Project Cost ($YOE) at Approval Entry to FD
$1,578 million	Total Project Cost ($YOE) at FFGA signed
$TBD million	Total Project Cost ($YOE) at Revenue Operations
$1,578 million	Total Project Cost ($YOE) at date of this report including $0.00 in Finance Charges
$1,217.8 million	Amount of Expenditures at date of this report from Total Project Budget of $1,578 million
77.2%	Percent Complete based on Expenditures at date of this report
$9.00 million	Unallocated Contingency remaining
$73.72 million	Total Project Contingency (allocated and unallocated contingency as reported by CSP)
$25 million	Minimum Total Project Contingency revised on September 5, 2012 PMOC review of Contingency Management Plan

	AT HOLD POINTS	QTR	Minimum Contingency Levels	Revised Levels
1A	Hold Point 1a – Tunnels 100% designed February 2011 (Actual)	1Q11	280	280
1B	Hold Point 1b – CTS 100% designed June 2012 (Actual)	4Q11	250	240
1C	Hold Point 1c – 40% Bid (Tunnel and CTS)	2Q12	225	200
1D	Hold Point 1d – FFGA Award October 2012 (Actual)	3Q12	-	180
2	Hold Point 2 – Commence CTS / UMS construction (Actual June 17, 2013)	2Q13	160	160
3	Hold Point 3 – Demobilize Tunnels (Actual April 15, 2015)	2Q15	140	140
4	Hold Point 4 – Stations to platform levels (CTS / YBM) November 2016	*2Q18*	60	60
5	Hold Point 5 – Complete CTS / Tunnels systems inst. April 2018	*2Q19*	25	25
RSD	PMOC / FTA RSD	4Q19		
CURRENT TOTAL CONTINGENCY $73.72 Million				


central T subway
Lombard St.
COIT TOWER
Columbus Ave.
Washington Square Park
Union St.
TUNNEL ONLY - NO SERVICE
Broadway
Broadway Tunnel
The Embarcadero
Washington St.
Ferry Building
T CHINATOWN
Stockton St.
Kearny St.
Montgomery St.
Battery St.
EMBARCADERO
California St.
Leavenworth St.
Bush St.
Post St.
FUTURE TRANSBAY TERMINAL
FOLSOM
MONTGOMERY
UNION SQUARE/ MARKET STREET
J K L M N T
Market St.
Mission St.
1st St.
N
POWELL
Howard St.
Folsom St.
2nd St.
Harrison St.
BRANNAN
Golden Gate St.
4th St.
I-80
YERBA BUENA/ MOSCONE
5th St.
3rd St.
2ND ST. AND KING
CIVIC CENTER
7th St.
6th St.
4TH ST. AND BRANNAN
King St.
AT&T BALLPARK
4TH AND KING/BERRY N T
Bryant St.
Brannan St.
Townsend St.
Caltrain
MISSION ROCK
UCSF
UCSF MISSION BAY
LEGEND
T Third Phase 2
T Third Phase 1
Muni Metro
Caltrain
BART

APPENDIX D. TOP PROJECT RISKS

Top risks were discussed at the July 2018 risk meeting as noted below.

Top Risks Discussed in the Previous Month:

Risk 240 – Unresolved assignment of responsibility for schedule delays may lead to increased costs for the program. This risk continues to be a concern. *TCP has issued numerous claims, which are being addressed through the DRB. TCP has been unwilling to accept some of the DRB conclusions.*

***Risk 255 (new)** – Water leaks at YBM. Water leaks continue at YBM despite ongoing repair activities. Most of the leaks are at the interface between the station box and the headhouse. Thus far, the schedule impacts of the leaks have been minor, but SFMTA expects to be liable for the costs of the repairs. SFMTA has initiated a third party evaluation of the reasons for the leaks and is also studying alternative methods of mitigating the impacts of the leaks.* At CTS the waterproofing system was modified to provide additional ability to respond in the event that leaks occur. The modifications have delayed work on the critical path and will have cost impacts as well.

Risk 251 – Activities required to complete the project scope are not identified in the schedule, resulting in the time required to complete the project being longer than currently forecast. *The ATCS contractor provided a detailed schedule for its work, which did not result in additional time beyond what was included in the simplified schedule. This risk will continue to be monitored. .* SFMTA's schedule updates are capturing differences between the activities in the baseline schedule and the work actually being completed.

Risk 234 and 52 – Unacceptable settlement occurs due to SEM mining at CTS, causing damage to buildings or utilities. *All SEM mining work is complete and placement of the final linings for the CTS platform and crossover caverns is underway.* These risks can when sufficient time has passed to allow the surrounding ground to respond to the excavation. Thus far, compensation grouting has been effective in returning the adjacent buildings to elevations that are within the established tolerances. SFMTA will monitor the behavior of the ground over and near the excavation and will retire this risk when it is determined that further settlement is unlikely.

Risk 253 – Insufficient resources are available to complete the work as planned. Thus far, crew shortages have not been experienced.

Risk 238 – Quality program is ineffective in processing non-conformance items causing schedule impacts. The SFMTA QAM conducted a review of potential causes of water leaks at YBM and concluded that there is no evidence of a failure in the QA/QC process. *There is a concern that TPC is refusing to issue CNCRs when non-conforming work is identified. This or a similar risk was realized when it was discovered that non-conforming rail for the project had been approved through the submittal process, delivered to the project and installed over portions of the alignment. SFMTA has directed TPC to replace the rail and has started the process to independently order replacement rail directly from a supplier. The overall schedule impact of the rail issue is unknown at this time.*

Risk 205 – Prolonged time to execute contract modifications may lead to poor relations between the REs and the contractor. This risk continues to be a concern. *A few additional CMods have been issued over the past two months. SFMTA continues to focus on speeding up the process of evaluating the justification for CMods and completing the negotiation process on price and time impacts with TPC.*

Risk 229 and 230 – Risk that contractor and SFMTA systems testing and commissioning will take longer than currently planned. *SFMTA has delivered to the PMOC a more detailed schedule for ATCS, which includes the contractor's system tests. SFMTA still needs to complete a more detailed commissioning schedule that includes identification of required testing and the responsibilities for witnessing and approving the tests. SFMTA is working to bring on a Testing and Commissioning Manager to lead this effort and is coordinating with Muni's operations department on the job description and hiring process, which has taken much longer than planned. SFMTA is now considering obtaining consultant support for the testing and commissioning process in addition to the services of staff assigned from SFMTA Operations.*

Risk 254 – CPUC has insufficient staff to witness required testing. *This risk of delays due to insufficient CPUC staffing continues to be a concern. SFMTA has identified having CPUC audit tests conducted by others as a possible mitigation measure.* SFMTA is working with CPUC to advance the certification process that must be completed in advance of testing.

Risk 95 – *Contractor (or key subcontractor) default during construction impacts the schedule. Defaults have occurred but have yet to impact the program schedule. Conquest is currently a concern due to the potential financial impacts of the procurement and installation of non-conforming rail for the project. Smaller subcontractors also may at risk, but a larger concern is the lack of overall capacity due to the high volume of construction work underway in the San Francisco market.*

Risk 99 – *Breakdown in relationships between SFMTA and contractors during construction results in increased claims and delays to the overall construction schedule. This risk is being realized, with TPC issuing 86 claims to date.*

The PMOC recommends that SFMTA focus on updating the risks and mitigation strategies to reflect the transition of the work from excavation and major structural supports to M/E/P and systems installation and testing. A specific risk of delays due to contractual issues with the ATCS system would also appear to be a concern.

APPENDIX E. ROADMAP TO REVENUE OPERATIONS

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Testing				
Finalize/update Systems Integration Test (SIT) Plan	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Prepare Schedule for Testing (update)	6/1/2018	10/1/2018	TBD	Initial testing, commissioning, and start-up schedule has been completed. An updated Rail Activation Plan with more detailed testing plans and schedules will be prepared once the Start-up and Testing Manager is onboard.
Finalize Test Procedures	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Conduct System Integrated Testing with trains, including procedures and reports	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Complete Testing Reports	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Operating Plan, Rules, and Training				
Finalize Operating Plan	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future. *SFMTA's latest two-year operating budget includes start-up of CSP.*
Finalize/revise SOPs, manuals, and rulebook as applicable	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Operations Manuals	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Staffing and Operations Plan	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Training of O&M personnel	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Emergency response plan, training, and drills	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Vehicle Maintenance Plan, Equipment, Facilities, and Training				
Rail Fleet Management Plan	5/1/2018	8/3/2018	8/3/2018	
Maintenance Schedules and Procedures	NA	NA	NA	The LRV fleet is being replaced and expanded through a separate project. The four vehicles required for CSP have been delivered. Maintenance related items are being provided by the supplier.
Spare Parts Requirements	NA	NA	NA	The LRV fleet is being replaced and expanded through a separate project. The four vehicles required for CSP have been delivered. Maintenance related items are being provided by the supplier.
Maintenance Manuals	NA	NA	NA	The LRV fleet is being replaced and expanded through a separate project. The four vehicles required for CSP have been delivered. Maintenance related items are being provided by the supplier.
Maintenance Training	NA	NA	NA	The LRV fleet is being replaced and expanded through a separate project. The four vehicles required for CSP have been delivered. Maintenance related items are being provided by the supplier..
Facility and Right-of-way Maintenance Plan, Equipment, Facilities, and Training				
Maintenance Schedules and Procedures	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Spare Parts Requirements	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Maintenance Manuals	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Maintenance Training	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Pre-Revenue Operations				
Finalize and/or update RAP and/or Pre-Revenue Operations Plan	4/2/2015	4/2017	4/27/2017	The second draft with additional detail and a schedule for testing and pre-revenue activities was submitted with the 2017 update of the PMP. An updated plan will be prepared when a Start-up and Testing Manager is hired.
Implement Rail Activation Committee	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Shadow operations	NA	NA	NA	Project will be operated by the established MUNI operations division.
Develop/revise SSPP & Security Plan (approved by State Safety Oversight (SSO))	*Ongoing*	10/31/2015	10/31/2015	CPUC triennial review conducted in October 2015 concluded that SFMTA "has a comprehensive System Safety Program Plan (SSPP) and has made significant progress in executing that plan."
FTA Office of Safety & Security Readiness Review	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
PMOC OP-54 Readiness for Revenue Operations Review Report, Phase I	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Conduct Operational Hazard Analysis (OHA) and resolve other hazards/ vulnerabilities	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Pre-Revenue Operations	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Public Outreach				
Develop Safety Outreach Plan	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Provide Community Outreach	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Grand Opening Plan	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Construction Close Out				
Close Out of Non-Conformance Reports	Ongoing	*12/29/2019*	TBD	NCRs are tracked and closed prior to follow-on work. Final closure of NCRs expected as of final completion date of 1300 Contract.
Punch List Complete	*7/26/2019*	*12/29/2019*	TBD	Punch list completion expected at final completion of 1300 Contract.
Certificates of Occupancy/Substantial Completion	TBD	07/26/2019	TBD	
Safety, Security, and Fire-life Safety Certifications				
Update/Finalize SSMP			2/18/2014	Revision 2 completed.
Finalize and/or update Safety Certifiable Item List (SCIL) and SSCP			10/10/2008	Revision 0.
Implement Safety and Security Certification Committee			8/1/2010	Committee meets monthly to review certifiable items.
Implement Fire Life Safety Committee			8/1/2010	
Preliminary Hazard Analysis (PHA)				Need dates.
Threat and Vulnerability Analysis (TVA)				Need dates.
Design Criteria Reflecting Safety and Security Requirements	NA	NA	NA	Design is complete and construction is underway.
Review status of quality non-conformances	Ongoing	*12/29/2019*	TBD	
Close Out of non-safety critical items	Ongoing	Ongoing	TBD	
Close Out of safety critical items	Ongoing	Ongoing	TBD	
Complete Safety & Security Certification Verification Report (SSCVR)	TBD	*11/15/2019*		60 days before RSD - Check against latest regulations.
Document Workarounds/Open Items List	TBD	TBD	TBD	
Verify emergency drills, tabletops, training, etc. are completed	TBD	TBD	TBD	

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
SSO final certification/signature	TBD	*12/24/2019*		21 days before RSD - Check against latest regulations.
Third Party and Agency Agreements				
Third Party/Agency Agreements Necessary for Revenue Service	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Third Party/Agency Approvals Necessary for Revenue Service	TBD	TBD	TBD	Project is in construction, with RSD *about 1.5* years in the future.
Revenue Service				
Target Revenue Service Date	-	01/14/2019		Current forecast RSD.
FFGA Revenue Service Date	-	12/23/2018		

APPENDIX F. LESSONS LEARNED

LL#	Date	Phase	Category	Subject	Lesson Learned
1	09-30-10	FD	Management	Consultant Contracts	The project must have a full understanding of the agency and other approving governmental authorities to avoid delay of contract approval and consequential delay of the Master Project Schedule (MPS).
2	09-30-10	FD	Cost	Staffing Plan	The project staffing plan needs to be formulated during PE and updated at least quarterly during FD to manage Standard Cost Category 80 costs and monitor design production.
3	09-30-10	FD	Scope	Letter of No Prejudice (LONP)	A defined scope of grantee and PMOC responsibilities needs to be provided for content and acceptability of LONP requests.
4	09-30-10	FD	Management	SSMP	FD consultants should be trained, shortly after mobilization, in the format and their responsibility regarding the System Safety Consultant.
5	10-30-10	FD	Cost	Baseline Cost Estimate (BCE) Update	The BCE should be updated with current costs as soon as they are known by the project to allow mitigation of cost contingency usage.
6	02-21-12	FD	Management	Program Controls	Program Controls system/software selected for use for the duration of the project should be in place and functional prior to approval to enter FD. Doing so will avoid a transition during FD that could create a lag in timely reporting of cost and schedule status.
7	02-21-12	FD	Management	Risk Mitigation	Oversight Procedure (OP) 40 needs to be revised to establish minimum requirements for secondary mitigation at different phases of the project, similar to those for cost and schedule contingency. The PMOC recommends 5% of project cost at Entry into FD and 3% at execution of an FFGA.
8	02-21-12	FD	Scope	Third Party Agreements	All third party agreements need to be identified as soon as possible, but no later than 65% design completion. This includes leases, both temporary and permanent; MOUs; and licenses, specifically for preconstruction property surveys and settlement monitoring instruments (especially important for underground construction). These third party agreements need to be secured no

LL#	Date	Phase	Category	Subject	Lesson Learned
					later than the advertisement date of the construction that they affect. Third party agreements need to be tracked by the project continuously, reported monthly, and updated in a third party agreement matrix submitted quarterly to FTA.
9	02-21-12	FD	Cost	Cost Estimating Procedures	During the preliminary design phase, the project should establish the cost estimating procedures, format, and software to be used by all estimating entities for the entire duration of the project.
10	02-21-12	FD	Cost	Allocated Cost Contingency	In the BCE submitted to FTA for Entry into FD, the project should identify percentages of allocated cost contingency contained in the BCE that are apportioned for design risk, market risk, and construction risk.
11	02-28-12	FD	QA	Design Management Action Log	Design Management should develop a matrix as a tracking tool to document, track, and close out known elements that are missing from design submission packages.
12	08-15-12	FD	Environmental Mitigations	MMRP	Numerous mitigations identified in the MMRP are to be handled by incorporating specific design details and/or statements in the contract drawings and technical specifications. The grantee should note on the MMRP the relevant drawings and/or technical specifications.
13	08-31-12	FD	Management	Risk Contingency Levels and Hold Points	It became apparent, during the monitoring of the cost contingency drawdown curve for the project that the contingency levels and hold points no longer represented the current stage of project development and risk reduction/contingency usage related to project development. The project advanced through 100% project design; however, the project did not receive credit for the cost contingency usage established by the risk model. The PMOC recognized this deficiency and participated with the grantee in developing a cost contingency drawdown that reflects current project development and reduced risk.

LL#	Date	Phase	Category	Subject	Lesson Learned
14	06-30-13	Const.	Management	Change Order Process	Perform an audit of the project's procedures related to Change Orders and processing. The project should train staff and inform contractor of their obligations in the process.
15	01-30-14	Const.	Management	Independent Review Panel (IRP) Decision-makers	At the request of SFMTA, the American Public Transportation Association (APTA) formed a panel of geotechnical and tunnel experts to perform a peer review of the BART Undercrossing. Prior to crossing under the BART tunnels, the Independent Review Panel (IRP), contractor, SFMTA, and BART representatives convened at predetermined tunnel boring machine (TBM) locations to discuss the TBM progress and determine whether the tunneling should proceed. It is critical that decision makers from each organization attend these meetings. It was noted that BART Senior Management did not attend and instead deferred decisions to lower level staff.
16	06-30-14	Const.	Bid documents	Pre-Classification for Soil and Groundwater Disposal	Soils and groundwater generated from construction activities should be pre-classified with appropriate sampling and testing required by potential disposal facilities. Coordinate with the disposal facilities to get materials accepted.
17	04-10-15	Const.	Quality Control/Safety	Monitoring of Soil Conditions during Underground Construction	There was a breach of the excavation of frozen ground during construction of a cross passage between the twin bored tunnels followed by water and soil flowing into the tunnels, resulting in subsidence of the ground above and damage to underground utilities. Apparently the flow of materials into the tunnels went on for quite some time before the problem was detected and actions could be taken to arrest the flow. The construction site was not staffed when the breach started and there was no external warning system in place to notify the contractor or the agency of the condition. Lesson: When the safety and structural integrity of a construction site depends on maintaining soil conditions with the use of mechanical systems, the site should be continuously staffed or monitoring

LL#	Date	Phase	Category	Subject	Lesson Learned
					devices at the site should be continuously monitored from a remote location to assure that the expected soil conditions are maintained.
18	04-10-15	Const.	Environmental	Archeological Data Recovery Protocols	Sensitive archeological materials were uncovered during the excavation of the roof area at YBM. The Program Manager took immediate action to notify the appropriate state officials and implemented protocols for protection of the materials. The most likely descendent of the remains was quickly identified and a representative was engaged and brought to the site to supervise the ongoing excavation. Lesson: Pre-planning and quick action to involve the appropriate parties resulted in satisfactory handling of the artifacts with minimal delays to the construction schedule.
19	05-11-15	Const.	Quality Control	Use of Latest Design Information for Field Inspection	After two roof pours were completed, it was discovered that required reinforcing steel was missing. Changes to the arrangement of the reinforcing steels were made as part of the submittal review and response process. Notes from the designer were included on the approved shop drawings but not in the contract design drawings. Field inspectors were using only the design drawings to confirm the proper installation of reinforcing steel prior to concrete placement. Lesson: A process should be established to assure that the latest design information, including submittals and related designer notes, is available in the field and used to inspect reinforcing steel prior to concrete placement.
20	09-28-15	Const.	Schedule	Maintenance of Updated Construction Schedule and Master Program Schedule	SFMTA was unable to obtain an acceptable baseline schedule from the station construction contractor for over a year. Then, SFMTA could not obtain acceptable updated status schedules from the contractor for another 8 months. As a result, the construction status and completion date could not be accurately determined for the first 20 months of the contract. This made schedule control impossible. SFMTA finally created its own schedule updates for the first 12 months of the construction contract using the pay

LL#	Date	Phase	Category	Subject	Lesson Learned
					applications and 4-week look-ahead schedules from the contractor. Lesson: Owners should aggressively assert the need for accurate schedule updates from contractors and should withhold payment if such updates are included in the contract terms or specifications and are not forthcoming. If schedule updates are not received within the first few months of the project, the owner should create its own updates for the purpose of progress monitoring and schedule control.
21	11-30-15	Const.	Construction Planning	Installation of Special Trackwork in Operating Systems	SFMTA needed to install special trackwork to provide the connection to the new alignment for the Central Subway portion the T Third LRT line. The original plan was to install the special trackwork at the intersection in eight extended weekend shutdowns. Working with the contractor, the plan was revised to accomplish the necessary trackwork installations in two shutdowns. After considering the outcome of the first shutdown, where a portion of the special trackwork did not fit properly and needed adjustment during the shutdown, SFMTA decided to pre-assemble the second, more complex, special trackwork assembly at an off-site facility. The assembly was completed and the resulting track was surveyed to confirm the geometry and to assure that the assembly would fit into the existing field conditions. While conducting the assembly and disassembly of the track components, the contractor identified an approach that would reduce the time required to reassemble the trackwork in the field. Lesson: Effective pre-planning and mock-up assembly of complex trackwork, may allow the final assembly to be completed without the need for field adjustments and in less time than planned. This approach can mitigate the risks associated with the installation of complex custom track components in an operating transit line.
22	03-01-17	Const.	Legal/Claims	Preparation for Mediation	A contractor for advance utility relocation issued a multi-million-dollar claim for extra costs due to delays and unforeseen conditions. SFMTA

LL#	Date	Phase	Category	Subject	Lesson Learned
					believed the claim had no justification. After several years, the claim was referred for mediation prior to going to trial. The contractor made a very compelling presentation regarding the extra costs. However, due to careful preparation by SFMTA management, the agency was able to provide specific and detailed rebuttals to the contractor's major arguments. The mediation resulted in a settlement for less than 15% of the original claim amount. SFMTA chose to accept the settlement amount, recognizing that the costs to pursue the claim in court would likely exceed the settlement value. Lesson: Careful record keeping and preparation for dispute resolution can limit agency exposure to costs related to claims.
23	01-10-18	Design and Procure-ment	Claims	Quality Control of As-built Data for Procurement	The Central Subway had three major construction phases: Utility Relocation, Tunneling, and Stations/Track/Systems. Inaccurate as-built information from earlier construction phases has led to claims for differing site conditions during the construction of Stations/Track/Systems phase. For example, during the final design phase for the tunnel work, SFMTA agreed to a proposed change to tunnel segments defined in the preliminary engineering phase. The length of tunnel segments was changed from 4 feet to 5 feet except in areas with tight curves. The approved change in segment length was not captured in the final design documents for the stations contract, even though the change in tunnel design was made prior to completion of the station contract documents. When the stations contractor encountered 5-foot-long segments while mining for the platform and crossover caverns at the Chinatown Station, he issued a change order request to account for extra costs due to the need to change the excavation approach to handle the longer tunnel segments. The current claimed extra cost is $4.4 million. Lesson: Procedures should be established to ensure that approved design changes during construction of early phases of complex projects are accurately reflected in contract

LL#	Date	Phase	Category	Subject	Lesson Learned
					documents for follow-on construction phases. PMOC oversight should confirm that procedures are in place to capture changes in design during construction and to assure that changes are reflected in follow-on construction contract procurement documents.
24	*06-18-18*	*Design, Construction*	*Quality Management*	*QC of Contract Specifications and Material Acceptance*	*The Rail Procurement section of the specification called for hardened rail throughout the project. The Trackwork section of the specification allowed standard rail under all but special conditions. The contractor procured standard rail despite SFMTA's intent to use hardened rail. The standard rail was accepted on delivery and was installed over a significant portion of the alignment before the issue was identified. A dispute has arisen, with SFMTA referring to the Rail spec and directing replacement of all rail, and the contractor referring to the Trackwork spec and asserting that the rail meets contract requirements. Lesson: Design control and quality management procedures are needed to eliminate duplication in the contract specifications and assure that any duplicative requirements are consistent across sections of the specification. Quality control and assurance procedures need to be improved to assure that non-conforming materials are not accepted on delivery.*

APPENDIX G. CONTRACT STATUS

The following sections provide the status of ongoing contracts associated with the CSP. Note that the DBE participation percentages are updated by SFMTA on a quarterly basis. The current values are through March 31, 2017.

Contract No.	***1250***	
Contract Description:	**UR #1 (YBM)**	
Status:	Completed June 2011.	
Cost:	Original Contract Value	$9,273,939
	Approved Change Orders	$2,694,211
	Current Contract Value	$11,968,150
	Expended to Date	$11,968,150
	% Expended	100%
	SBE Participation	97%
Schedule:	NTP issued January 2010. Substantial completion in June 2011.	
Issues or Concerns:		

Contract No.	**1251**	
Contract Description:	**UR #2 (UMS)**	
Status:	Work is complete.	
Cost:	Original Contract Value	$16,832,550
	Approved Change Orders	$3,962,031
	Current Contract Value	$20,794,581
	Expended to Date	$20,794,581
	% Expended	100%
	SBE Participation	87%
Schedule:	NTP issued January 2011. Substantial completion in August 2012.	
Issues or Concerns:	Final total cost claim by contractor has been settled.	

Contract No.	**1252**	
Contract Description:	**Tunnels**	
Status:	Final completion achieved. Financial close out underway.	
Cost:	Original Contract Value	$233.58 million
	Approved Change Orders	$7.83 million
	Current Contract Value	$241.41 million
	Expended to Date	$233.59 million; $6.2 million is paid from non-project funds
	% Expended	96.8%
	SBE Participation	5.8%
Schedule:	Final completion achieved May 15, 2015.	
Issues or Concerns:	None.	

Contract No.	**1277**	
Contract Description:	**Pagoda Palace Demolition**	
Status:	Construction is complete; contract is in close out.	
Cost:	Original Contract Value	$498,995
	Approved Change Orders	$149,981
	Current Contract Value	$648,976
	Expended to Date	$648,976
	% Expended	100%
	SBE Participation	100%
Schedule:		
Issues or Concerns:	None.	

Contract No.	**1300**	
Contract Description:	**Three subway stations (YBM, UMS, and CTS) and STS**	
Status:	Mass excavation complete at one station and well underway at two other stations.	
Cost:	Original Contract Value	$839.68 million
	Approved Change Orders	$8.36 million
	Current Contract Value	$848.04 million
	Expended to Date	$600.80 million
	% Expended	70.8%
	SBE Participation	20.7%
Schedule:	NTP issued June 17, 2013. Substantial Completion planned February 2018 and forecast *July 2019.*	
Issues or Concerns:	The work on this contract is behind schedule.	

Contract No.	**CS-155-1**	
Contract Description:	**Design Package 1 for Contracts 1250, 1251, and 1252. PB/Telemon**	
Status:	Design is complete. Construction support is nearly complete for Contract 1252.	
Cost:	Original Contract Value	$5,795,000 (includes exercised options)
	Approved Change Orders	$2,145,159
	Current Contract Value	$7,940,159
	Expended to Date	$7,904,713
	% Expended	99.6%
	SBE Participation	30.2%
Schedule:		
Issues or Concerns:		

Contract No.	**CS-155-2**	
Contract Description:	**Design Package 2 for UMS, CTS, and YBM. CSDG prime**	
Status:	Designs are complete for all of the station contracts. Construction support of Contract 1300 is underway.	
Cost:	Original Contract Value	$39,949,948
	Approved Change Orders	$1,626,722
	Current Contract Value	$41,576,670
	Expended to Date	$40,73,275
	% Expended	98.0%
	SBE Participation	31.6%
Schedule:		
Issues or Concerns:		

Contract No.	**CS-155-3**	
Contract Description:	**Design Package 3 for STS. HNTB-B&C Prime**	
Status:	Design is complete. Construction support of Contract 1300 is underway.	
Cost:	Original Contract Value	$16,864,250
	Approved Change Orders	$368,002
	Current Contract Value	$17,232,252
	Expended to Date	$14,990,741
	% Expended	87.0%
	SBE Participation	25.1%
Schedule:		
Issues or Concerns:		

Contract No.	**CS-149**	
Contract Description:	**Central Subway Partnership (Project Manager/Construction Manager)**	
Status:	On-going.	
Cost:	Original Contract Value	$85,139,092
	Approved Change Orders	$0
	Current Contract Value	$85,139,092
	Expended to Date	$67,013,727
	% Expended	78.7%
	SBE Participation	32.4%
Schedule:		
Issues or Concerns:		

Contract No.	**CS 156**	
Contract Description:	**Project Controls Consultant**	
Status:	On-going.	
Cost:	Base Contract Value	$17,112,873
	Approved Change Orders	$0
	Current Contract Value	$17,112,873
	Expended to Date	$9,944,599
	% Expended	58.1%
	SBE Participation	29.5%
Schedule:		
Issues or Concerns:		