# MONTHLY MONITORING REPORT
## *July 2018*

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

Draft Report Delivered to FTA on August 22, 2018
Final Report Delivered to FTA on August 29, 2018

*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 beneath 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 June 2018, the project was 77.6% complete based on expenditures.* The one active construction contract: 1300 Stations and Systems/Trackwork being executed by Tutor-Perini Corporation (TPC), *was 70.1% 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.*

SFMTA determined that rail supplied by TPC's subcontractor does not meet contract requirements and continues to direct TPC to take action to replace the non-conforming rail. *As a delay mitigation measure, SFMTA is procuring rail that can be used to replace the non-conforming rail. Bids were received on July 31, and award of a contract was pending at the publication date for this report. SFMTA does not expect the replacement of installed rail to cause additional delays to the overall program. This should be confirmed through a schedule risk assessment.*

*SFMTA is initiating contract modifications for Automated Train Control System (ATCS) and radio system work to remove portions of the scope of work from the TPC contract. SFMTA will directly control contracts for the suppliers of these systems to mitigate potential delay claims from TPC and to afford better control of design and integration activities. SFMTA reported that it was close to agreement on contract terms with the ATCS supplier and that it planned to issue a contract modification to TPC removing portions of the ATCS scope in early August. Contract actions for the radio system will follow those for ATCS.*

*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. A decision is now expected on September 1.*

**Table 1 - Core Accountability Items**

| **Project Status:** *(as reported in SFMTA's June 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 | *$73,438,822* |
| **Schedule** | Revenue Service Date (RSD) | 12/26/2018 | 1/14/2020 (SFMTA forecast) |
| **Total Project Percent Complete** | Based on Expenditures | *77.60%* | |
| | Based on Earned Value | *77.66%* | |
| **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 *prior to the next QPRM.* | |
| Cost Contingency | Total Contingency is *$73.44 million – 18.4% of the value of remaining work.* | The contingency appears adequate for the current level of project completion, although increasing contractor claims are a concern. | |
| Technical Capacity and Capability | Program Director and Start-up and Testing Manager positions open. | *SFMTA recruitment is continuing. SFMTA to seek consultant support for start-up and testing.* | |
| **Date of Next Quarterly Meeting:** | | *November 14, 2018* | |

Earned Value (EV): *$1,225,685,997, an increase of $4.10 million from May.*

Planned Value (PV): *$1,523,430,647, a planned increase of $2.97 million from May.*

Actual Cost (AC): *$1,224,802,229, an increase of $6.97 million from May.*

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

Schedule Performance Index (SPI): *0.81*, 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 August 8, 2018 was $73,438,822, 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 $70.92 million, which is $2.52*

*million less than the available contingency. The Project Management Oversight Contractor (PMOC) notes that the cost exposure from claims declined slightly in the past month. Additional unallocated contingency of $1.4 million should be available as a result of the final close-out price for the Tunnel Contract.*

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. *In the opinion of the Project Management Oversight Contractor (PMOC), the Revenue Service Date (RSD) may be further delayed as a result of slower than planned progress on structural work at the CTS headhouse, which is on the program critical path.* Contract amendments to the Thales and TPC contracts regarding this work remain to be executed. 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, Recommendations 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 and the radio system. *Until the contract modifications to remove elements of the ATCS and radio system work from the 1300 Contract are complete, significant risks to the schedule are associated with these components of the project. Once the ATCS and radio contract actions are completed, the PMOC plans to conduct a comprehensive schedule review for the project.*

*The PMOC notes that the time required for SFMTA to make decisions regarding project issues needs improvement. Resolution of issues, such as negotiation of contract changes and decisions on how to contract for ATCS and radio work on the project, are taking far too long. With about one year remaining until the forecast substantial completion of the TPC contract, decisions will need to be made rapidly and solutions implemented quickly to avoid further delays to the completion date for the project.*

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 inconsistent 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. The PMOC also 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 confirming the time required to prepare the project for revenue service.*

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## APPENDICES

# 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. *At the August Quarterly Progress Review Meeting (QPRM), San Francisco Municipal Transportation Agency (SFMTA) presented the final cost data for the contract. Not including costs of extra work paid from non-project sources, the final cost of the Central Subway tunneling work is $233,511,253, compared to the most current estimate at completion of $234,967,069. When SFMTA reconciles the final contract cost with the program budget, about $1.4 million in additional unallocated contingency should be available as a result of the final cost of the tunneling work being well below the current allocated budget for the work.*

***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 June 2018, the construction of the Stations and Surface, Track, and Systems (STS) Contract was 70.14% complete based on cost and 71.72% 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 defined at a partnering meeting between Tutor Perini Corporation (TPC) and SFMTA held on July 12, 2018*. The following paragraphs describe ongoing work for each construction package.

Union Square/Market Street Station (UMS*): Stair 7 in the UMS Garage area and framing for the glass roof above are scheduled to be completed August 17. Interior walls are being constructed in*

*the north concourse area, and factory testing of the fans to be placed in the north concourse is underway. In the station box, work is underway for platform level walls and the ring beams at the interfaces between the box and the tunnels to the north and south of the station. Removal of the last of the temporary struts used for excavation support is also underway. Emergency stairs 3 and 4 are scheduled for completion in mid-August, followed by final street restoration work at all four corners of the O'Farrell/Stockton Street intersection. Work on stairs 5 and 6 connecting the platform to the concourse is underway. Final street and sidewalk finishing at the Ellis/Market/Stockton intersection still has not been completed pending resolution of repairs to one of the sidewalk ramps and approval of the design for pedestrian signals. Construction of two support struts for the escalator opening in the south concourse is now scheduled to be complete in early September.*

Chinatown Station (CTS): *Work to install vaults for electrical power supply is being delayed pending development of an acceptable plan for maintaining traffic and pedestrian movements at the surface. Work on the platform level slab is underway and now scheduled for completion August 16. Placement of columns and removal of temporary struts will follow, with pouring of the concourse level slab now expected to start in early September.* ***There appears to be a two to four week delay in the progress of work in the headhouse, which is on the program critical path. In the opinion of the Project Management Oversight Contractor (PMOC), the Revenue Service Date (RSD) may be further delayed as a result of slower than planned progress on structural work at the CTS headhouse.***

*Waterproofing of the arches of the north and south platform caverns is complete. Concrete pours for the crossover cavern arch started on July 31 and are scheduled to continue every two to three days through August 22. The final pour for the invert of the south platform cavern is scheduled for August 16, and the first pour for the arch roof of the platform cavern is scheduled on August 23.*

Yerba Buena/Moscone Station (YBM): Utility work continues to progress slowly at the intersections of 4th Street with Howard Street and Folsom Street. *The third phase of the installation of a large sewer force main started August 9, with completion now targeted for September 1. Utility work and installation of electrical power supply vaults was nearing completion at the intersection of 4th and Folsom streets. The surface level deck above the headhouse is scheduled to be poured on August 22.*

*Water leak repairs at the station and headhouse invert level are continuing, with no end date currently in the schedule.* **The 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.** *Mechanical, Electrical, and Plumbing (M/E/P), interior walls, stairs, escalators, and elevators are being installed throughout the station.*

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. *Requirements for traffic control for street restoration and rail placement are still undecided, despite an executive level meeting between CSP management and Sustainable Streets Division*

*(SSD) management that 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 reported that the terms were "95%" agreed, with schedule-related issues remaining to be resolved. SFMTA planned to issue a Contract Modification (CMod) to TPC during the week of August 6 to remove portions of the ATCS scope. SFMTA has prepared a detailed schedule of ATCS activities based on Thales input, but this schedule still 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 may be 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.**

*SFMTA also plans to remove portions of the radio system scope of work, including design and integration activities, from the TPC contract. The supplier for system-wide radio upgrades, Harris, will be contracted to provide radio system design and integration.* **The PMOC continues to recommend that SFMTA quickly resolve the ongoing contractual issues regarding the schedule for and management of the ATCS *and radio system* 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 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)*

No updates to report.

### *California Department of Transportation (Caltrans)*

SFMTA needs an Encroachment Permit to install electrical and traffic signal equipment at the I-80 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) QPRMs, although they were not present at the May 9, 2018 or August 8, 2018 meetings. 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.

### *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 *June 30, 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. A review of the PMP by the PMOC has not been requested by FTA.

### 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's review of the report indicates that SFMTA continues to meet its commitments for monitoring and mitigation of project impacts.*

### 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. Albert Hoe, the Deputy Program Director was appointed as the Acting Program Director. *Recruiting for this key project staff position is continuing. SFMTA reported that hiring staff from outside the San Francisco Bay Area is challenging due to cost of living issues.* **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. *SFMTA reported that it was close to hiring a claims management specialist for the project.*

### 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 August 8, 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 (unchanged from July). The NOPC Log, dated August 8, 2018,* indicates that there are now *115 potential claims (eight additional since July). The Claim Log shows that 89 of these potential claims have been certified and submitted by the contractor. The submitted claims total $47.20 million in extra costs, which is slightly lower than in July.* **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 June 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 June 30, 2018*)

Cost estimate: $1.5783 billion.

Total contingency: $*73.44 million (minimum contingency is $25 million), $280,000 less than in May.*

Actual Cost (AC): *$1,224,802,229, an increase of $6.96 million from May (77.60% of the total project budget).*

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

Earned Value (EV): *$1,225,685,997, an increase of $4.11 million from May (77.66% 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. *Note that Tables 2 and 3 do not reflect the final negotiated value of the 1252 Contract as presented at the August QPRM.* ***Based on the final contract value, it appears that about $1.4 million in allocated contingency for the 1252 Contract will not be used and can be returned to the project budget as unallocated contingency.***

*In the June 2018 MPR, SFMTA estimates the total cost impact of potential changes to the 1300 Contract at $18.40 million, compared with $16.86 million in June, an increase of about $1.54 million. After potential changes were accounted for, $14.42 million in allocated contingency remained for Contract 1300 at the end of June.* **The resulting contingency of 5.0% 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 18.4% of the potential remaining spending.* **In the opinion of the PMOC, this contingency is 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 June 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 June 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%** | | | **268,762,852** | 94% | **16,465,027** | | | |
| 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% | | | 193,765,144 | 96% | 7,575,602 | | | |
| 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** | **153,084,482** | **585,783,217** | **35%** | | | **405,545,268** | 69% | **180,237,949** | | | |
| 20.01 | At-grade station | 774,913 | 6,827,944 | 7,602,857 | 881% | | | 2,834,112 | 37% | 4,768,745 | | | |
| 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 | 142,094,554 | 554,179,442 | 34% | | | 393,970,006 | 71% | 160,209,436 | | | |
| 20.07 | Elevators, escalators | 19,838,934 | 1,862,903 | 21,701,837 | 9% | | | 8,741,150 | 40% | 12,960,687 | | | |
| **40** | **Sitework and Special Conditions** | **232,551,627** | **(17,223,974)** | **215,327,653** | **-7%** | | | **205,600,794** | **95%** | **9,726,859** | | | |
| 40.01 | Demolition, clearing, earthwork | 8,887,028 | 3,495,857 | 12,382,885 | 39% | | | 12,078,515 | 98% | 304,370 | | | |
| 40.02 | Site utilities, utility relocation | 29,562,587 | 31,865,195 | 61,427,782 | 108% | | | 68,040,889 | 111% | (6,613,107) | | | |
| 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 | (185,746) | 2,708,328 | -6% | | | 2,706,431 | 100% | 1,89 | | | |
| 40.06 | Pedestrian and bike access and accommodation, landscaping | 14,393,910 | (4,602,915) | 9,790,995 | -32% | | | 3,341,470 | 34% | 6,44 | | | |
| 40.07 | Automobile, van, bus accessways, including roads and parking lots | 11,919,550 | (5,340,451) | 6,579,099 | -45% | | | 5,113,532 | 78% | 1,465 | | | |
| 40.08 | Temporary facilities and other construction indirect costs | 158,790,820 | (45,009,283) | 113,781,537 | -28% | | | 108,113,723 | 95% | 5,667,81 | | | |
| **50** | **Systems** | **108,429,774** | **(12,845,521)** | **95,584,253** | **-12%** | | | **34,891,583** | **37%** | **60,692,670** | | | |
| 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% | | | 11,375,747 | 89% | 1,429,209 | | | |
| 50.03 | Traction power supply | 20,379,634 | 1,085,439 | 21,465,073 | 5% | | | 11,958,675 | 56% | 9,506,398 | | | |
| 50.04 | Traction power distribution | 16,239,951 | (3,798,838) | 12,441,113 | -23% | | | 1,826,948 | 15% | 10,614,165 | | | |
| 50.05 | Communications | 28,545,305 | (16,514,719) | 12,030,586 | -58% | | | 1,868,227 | 16% | 10,162,359 | | | |
| 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 | | | 90,001 | 3% | 2,524,585 | | | |
| **Subtotal (10 - 50)** | | **1,089,606,217** | **92,316,785** | **1,181,923,002** | **8%** | **1,148,787,815** | **33,135,187** | **914,800,497** | **77%** | **267,122,505** | **252,404,964** | **1,167,205,461** | **14,717,541** |
| **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** | **268,754,417** | **82%** | **59,984,704** | **41,763,625** | **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 | - | 61,184,158 | 100% | 134,173 | | 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 | 72,019,665 | 70% | 30,898,725 | 22,087,945 | 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 | 77,194,573 | 82% | 16,859,120 | 8,807,242 | 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 | - | 4,955,321 | 60% | 3,257,283 | 2,797,159 | 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%** | **1,504,861,178** | **64,432,919** | **1,224,802,230** | **78%** | **344,491,867** | **298,476,594** | **1,523,278,824** | **46,015,273** |
| 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%** | | **73,438,822** | **1,224,802,230** | **78%** | **353,497,770** | **298,476,594** | **1,523,278,824** | **55,021,176** |

SCC Breakdown of Forecast Construction Costs Not Available

[2] Data reported in the *June 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 August 8, 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 unchanged from July. *CORs (generated by the contractor) that have been determined to have merit and PCCs (generated by SFMTA) have a combined potential cost impact of $17.96 million in increased contract value, about $2 million higher than in July.* 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 some of these pending contract changes. *The expected net impact of the CORs and PCCs on the project cost is an increase of $13.46 million.*

*An additional 903 items are being tracked in the Trend Log. Of these, SFMTA judged 429 items to be without merit and denied them. Many of these denied trend items are included in contractor claims. A further 348 items have been voided and are carried at no cost. There are 111 items covered by certified claims and NOPCs by the contractor ($48.37 million total exposure),* and 15 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 $57.46 million, which, when added to the $13.46 million in increased project costs from merited contract changes, yields a possible exposure of the project to additional costs for the 1300 Contract of $70.92 million.* This compares to the remaining contingency for the project of $*73.44* million, *as reported in SFMTA's June MPR. An additional $1.4 million in contingency will be available from the 1252 Contract based on the final contract value.* **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
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 - *$399,000, reduced from $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. *# 1390 - Extra costs to haul excavation spoils to Ox Mountain disposal site - $1,500,000 - new*
47. # 1406 - General claim at YBM - $604,697
48. # 1424 - Extra work due to changes in form-savers and couplers at roof to wall connection at YBM - $250,001
49. # 1479 - Large volume of water inflow at end of probe - $300,000
50. # 1485 - Conflict between YBM headhouse column reinforcing steel and temporary struts - $498,187
51. # 1571 - Increase in allowance for Dispute Review Board (DRB) costs - $250,000
52. # 1606 - Claim of defective specifications at YBM - $7,509,028
53. # 1669 - Extra quantity of compensation grouting material all stations - $857,500
54. # 1670 - Differing site conditions at CTS - $1,000,001
55. # 1689 - Costs to provide hardened rail - $3,147,867
56. *# 1711 – Extra costs for claimed change in connection requirements for communication cables at YBM - $301,719 - new*

***The PMOC notes that there were two new trends with costs in excess of $250,000 in the current month, totaling $1.8 million.***

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** | | |
| *MTA* | *0* | *475* |
| *Prop. K Sales Tax* | *123,975* | *137,727* |
| *Local Subtotal* | *123,975* | *138,202* |
| **Project Total:** | **1,578,300** | ***1,494,007*** |

## E. PROJECT SCHEDULE STATUS

*SFMTA prepared an update of the master program schedule in July representing progress on the project through June 30, 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 June 2018, 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.

*TPC has issued claims and NOPCs for various issues leading to delays to construction. SFMTA has issued CMods that allow 18 additional days of construction. SFMTA reported in August that it was preparing to issue CMod 87 that will allow an additional 82 days of construction, with 67 of those days including extended contractor overhead. The 100 days of additional construction duration included in the executed and pending CMods yields a revised substantial completion date*

*for the 1300 Contract of May 20, 2018. The additional time from May 20, 2018 to the forecast substantial completion date of July 26, 2019 is the subject of disputes and claims, which are being addressed through a DRB.*

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 identified at a SFMTA/TPC partnering session on July 12, 2018 and presented at the August QPRM.*

**Table 5 - Interim BHAGs for Construction Progress**

| Milestone | Target Date | Actual Date | *Status* |
|---|---|---|---|
| ***CTS*** | | | |
| Complete cavern final lining | *10/1/2018* | TBD | *Delayed from 9/1/2018* |
| Complete all concrete | 12/31/2018 | TBD | |
| **UMS** | | | |
| Complete roadway restoration: | | | |
| • O'Farrell/Stockton | *10/1/2018* | TBD | *Delayed from 6/1/2018* |
| • Ellis to O'Farrell | *11/1/2018* | TBD | *Delayed from 6/1/2018* |
| Closure of roof openings: | | | |
| • 1A | *10/1/2018* | TBD | *Delayed from 5/15/2018* |
| • 3B | *9/1/2018* | TBD | *Delayed from 8/1/2018* |
| **YBM** | | | |
| All station finishes complete | 9/21/2018 | *TBD* | |
| Water leak repairs completed | 10/1/2018 | *TBD* | *Delayed from 6/1/2018* |
| *Skylight installed at headhouse* | *12/31/2018* | *TBD* | |

| Milestone | Target Date | Actual Date | *Status* |
|---|---|---|---|
| **STS** | | | |
| *Decision on intersection work plan* | *9/1/2018* | *TBD* | *Delayed from 5/1/2018* |
| *All surface work complete* | *1/1/2019* | *TBD* | |
| *Surface signal design complete* | *11/1/2018* | *TBD* | |
| *Trackwork installed to CTS* | *10/31/2018* | *TBD* | *Replacement track needed* |

TBD = To Be Determined

**In the opinion of the PMOC, the BHAGs continue to be missed and are of questionable value in mitigating delays.**

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. This schedule needs to be finalized once the Thales contract actions are complete, and the detailed ATCS schedule needs to be integrated into the program schedule.*
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. *SFMTA is in the process of updating its risk assessment and plans to make a formal request to extend the RSD in the grant prior to December 2018.*

**In the opinion of the PMOC, until the contract modifications to remove the ATCS and radio system 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.**

## Project Schedule Data (as of June 30, 2018)

Earned Value (EV): *$1,225,685,997, an increase of $4.10 million from May.*

Planned Value (PV): *$1,523,430,647, a planned increase of $2.97 million from May.*

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): 0.81. 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:<br>(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
- *Close the access openings in Stockton 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 stairs throughout the station*
- Install the escalators in the south concourse

*CTS*

- Completion of concourse-level slab in the headhouse
- *Complete placement of final linings in the crosscut, 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 throughout station*
- Continue construction of stairs within the station box and emergency egress stairs
- *Continue finishes work throughout the station*
- 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 to CTS*
- Construct tunnel walkways
- Continue construction of surface level station at Brannan Street
- De-assign ATCS subcontract work from the 1300 Contract *and finalize detailed schedule for ATCS completion*
- *De-assign Radio System subcontract work from the 1300 Contract*
- 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 (October 1, November 12, and December 10, 2018)*
- *Weekly Contract 1300 Construction Progress Meetings (October 2/3, November 13/14, and December 11/12, 2018)*
- *Weekly Configuration Management Board (CMB) (October 3, November 14, and December 13, 2018)*
- *CSP PMOC Status Meetings (October 2, November 13, and December 11, 2018)*
- *CSP Risk Management Meeting (To Be Determined (TBD))*
- *FTA/QPRM (November 14, 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 June 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 RE for the STS work package noted at a weekly management meeting that subcontractors had been performing work without proper work plans and without required QC oversight from the contractor's QC team.* ***In the opinion of the PMOC, this is a serious breach of contract requirements for which SFMTA should take immediate action to prevent further occurrences.***

**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 July 31, 2018, TPC's Quality Manager had filed 378 CNCRs (16 new since early May). Eight new items were under review, 15 other items had responses identified but not yet approved, the proposed responses to 19 items were disapproved, and 24 items had approved responses that were not yet implemented. In addition, 272 items were closed (five more than in May) and 40 items had been voided.*

## 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 August 6, 2018, 264 of the 1660 items on the Safety and Security Conformance Checklist were approved and 31 items required follow-up responses from the SFMTA construction team. Twelve 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 experienced one minor reportable accident in June.* The performance metrics relating to accidents per working hour remain well below the OSHA goals for similar construction, despite the recent unfavorable trends. *Current construction safety records for the 1300 Contract were not available due to a reporting error by the contractor. The most recent available statistics 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 Risk Mitigation Meeting was not held in August due to staff absences.*

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 contract actions are complete. |
| ***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 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. |
| 9 | 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. *Execution of amendments is still pending.* |

| Number | Date Identified | Recommendation |
|---|---|---|
| 10 | 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. The assignments have yet to be implemented.* |
| 11 | 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. However the plan is still not in place and the current target date is September 1, 2018.* |
| *12* | *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. |
| *13* | *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 should order the rail in August 2018.* |
| *14* | *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. |
| *15* | 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. |
| *16* | 7/18/2018 | The PMOC recommends that the new QAM follow up on the status of the quality audit for waterproofing installation at YBM. |

| Number | Date Identified | Recommendation |
|---|---|---|
| *17* | *8/6/2018* | *The PMOC recommends that SFMTA take immediate action to prevent further occurrences of contractor or subcontractor crews preforming work without proper QC oversight.* |

# 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 Change |
| PE | Preliminary Engineering |
| 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 |
| 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.<br>Not submitted to FRA. |
| System Security Plan (SSP) or Security and Emergency Preparedness Plan (SEPP) | **2009** | | Not submitted to FTA.<br>Not submitted to FRA. |
| Construction Safety and Security Plan | **2012** | | Health and Safety.<br>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)<br>Consumer Protection & Safety Division<br>505 Van Ness Avenue<br>San Francisco, CA 94102<br>(415) 703-1017 phone<br>(415) 703-1758 fax<br>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** | | | |
|---|---|---|---|
| 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 demonstrated through meetings or other methods, the integration of safety and security in the following:<br>☐ Activation Plan and Procedures<br>☐ Integrated Test Plan and Procedures<br>☐ Operations and Maintenance Plan<br>☐ 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<br>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. |

| **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** |
| 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.<br>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. Bernardo Bustamante |
| 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

*77.7%* *Percent Complete Based on Progress* (*June 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
AT&T BALLPARK
King St.
4TH AND KING/BERRY N T
Bryant St.
Brannan St.
Caltrain
Townsend St.
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. The August risk meeting was canceled.

**Top Risks Discussed at Most Recent Meeting:**

**Risk 240** – Unresolved assignment of responsibility for schedule delays may lead to increased costs for the program. This risk continues to be a concern. TPC has issued numerous claims, which are being addressed through the DRB. TPC 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 be retired 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' default also may be a 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. *This item is becoming critical.* |
| 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. *This item is becoming critical.* |
| 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. *This item is becoming critical.* |
| 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 June 30, 2018.

| ***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 |
| | Final 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 | *$3,836,531* |
| | Final Contract Value | *$20,699,081* |
| | Expended to Date | $20,794,581 |
| | % Expended | 100% |
| | SBE Participation | 87.4% |
| **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. *Final contract cost to be lower than reported here.* | |
| **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 | *$8.99 million* |
| | Current Contract Value | *$848.67 million* |
| | Expended to Date | *$620.09 million* |
| | % Expended | *73.1%* |
| | SBE Participation | *21.3%* |
| **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 | *$7,950,658* |
| | Current Contract Value | *$47,900,606* |
| | Expended to Date | *$41,490,486* |
| | % Expended | *86.6%* |
| | 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 | *$1,637,474* |
| | Current Contract Value | *$18,501,724* |
| | Expended to Date | *$15,140,016* |
| | % Expended | *81.8%* |
| | SBE Participation | *25.8%* |
| **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 | *$9,996,954* |
| | % Expended | *58.4%* |
| | SBE Participation | *30.0%* |
| **Schedule:** | | |
| **Issues or Concerns:** | | |