MONTHLY MONITORING REPORT
March 2017

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

Draft Report Delivered to FTA on April 19, 2017
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PMOC Contract No.: DTFT6014D00010
Task Order No. 5
Project No.: FTA-13-0294

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

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Time on project: 2.5 years

EXECUTIVE SUMMARY

Project Description

The Central Subway Project (CSP) involves construction of a 1.7-mile extension of Muni's T Third Line along 4th Street and Stockton Street in downtown San Francisco. The CSP is Phase 2 of the San Francisco Municipal Transportation Agency's (SFMTA) T Third Light Rail Transit (LRT) Project. Phase 1 of the project constructed a 5.1-mile LRT line along the densely populated 3rd Street corridor. Revenue service commenced on the T Third Line in April 2007. 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 replace the entire LRV 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 February 2017, the project was 65.6% complete based on expenditures* and there was one active construction contract: 1300 Stations and Systems/Trackwork. *That contract was 52.5% complete on the basis of incurred cost at the end of February 2017. Substantial completion was originally scheduled for February 2018, but the latest master program schedule update forecasts substantial completion on May 9, 2019, a delay of 454 days (16 days later than January's forecast).* The contractor has submitted revised schedule updates through February 2017, which are under review by SFMTA. The master schedule information for the project is based on SFMTA's latest update of the construction schedule, which indicates a forecast Revenue Service Date (RSD) of *October 21, 2019. This is 294 days later than the required RSD* of December 31, 2018 in the Full Funding Grant Agreement (FFGA).

The Project Management Oversight Contractor (PMOC) notes that the forecast RSD moved 17 days later during February 2017, which represented a modest improvement compared to January, when 24 days of delay accrued. Construction progress on critical path work in February continued to be well below plan.

In the opinion of the PMOC the ongoing month-by-month extension of the projected RSD is detrimental to effective management of the project. When project team members see that target completion dates are consistently extended, the motivation to work towards the target dates is lost. Constantly moving targets for project or task completion are equivalent to having no schedule targets. SFMTA and the contractor are encouraged to develop a mutually agreed, achievable schedule for completion of the remaining work, including any realistic schedule recovery strategies and appropriate schedule float to absorb future delays that will inevitably occur. *The PMOC will convene a schedule workshop in June 2017 with the objective*

of identifying a range of achievable dates for completion of construction and for the start of revenue service. **An achievable substantial completion date for the 1300 Contract is likely several months later than the current forecast of October 2019.**

SFMTA reports that it has completed an update of the Rail Activation Plan (RAP) and will distribute the RAP in April. The RAP will be an important resource for the upcoming schedule workshop, as it will define the activities that must be completed prior to the start of revenue service.

Table 1 - Core Accountability Items

Project Status: *(as of February 28, 2017)*		**Original at FFGA:**	**Current Estimate:**
Cost	Cost Estimate	$1,578,300,000	$1,578,300,000
Contingency	Unallocated Contingency	$74,722,000	*$8,880,402 ($4.2 million higher than in January)*
	Total Contingency (Including Approved Contract Changes)	$185,500,000	*$75,790,430 ($2.1 million less than in January)*
Schedule	Revenue Service Date	12/26/2018	*10/21/2019* (SFMTA forecast)
Total Project Percent Complete	Based on Expenditures	*65.64%*	
	Based on Earned Value	*65.16%*	
Major Issues	**Status**	**Comments/Planned Action**	
Schedule Contingency	Based on the latest program master schedule, there is negative schedule float of approximately eight months.	The minimum schedule contingency agreed to at this stage of the project is 6.0 months. *The project is nearly 10 months behind schedule and it is likely that further delays will occur.*	
Cost Contingency	*The current Total Contingency is $75.8 million.* The Federal Transit Administration (FTA) recommends a minimum contingency level of $60 million.	Accumulating delays will likely lead to an increase in project soft costs that could consume some of the contingency but should not result in an overall cost overrun.	
Technical Capacity and Capability	*The Resident Engineer (RE) and Assistant RE for the UMS work package are leaving the project. SFMTA has identified a need for additional resources for processing contract changes.*	*Recruitment is underway for the open positions. Internal candidates may be available for some positions.*	
Date of Next Quarterly Meeting:		*May 4, 2017*	

Earned Value (EV): *$1,028,349,131, an increase of $5.44 million from January. Earned value for the month was far less than the planned increase in value. The earned value performance of the project is consistent with the reported schedule performance, confirming that the project is falling further behind schedule as time goes on.*

Planned Value (PV): *$1,336,440,370, a planned increase of $13.24 million from January.*

Actual Cost (AC): *$1,036,046,099, an increase of $10.05 million from January.*

Cost Performance Index (CPI): 1.00. A value greater than 1 means that value of the work completed is more than the cost of the work (under budget) and less than 1 means that the value of the work is less than the cost of the work (over budget). ***The PMOC notes that the cost of work performed in January was much higher than the increase in earned value. The PMOC will monitor cost and earned value to ascertain if this is a one-time event or a trend.***

Schedule Performance Index (SPI): 0.77. SPI greater than 1 is ahead of schedule and less than 1 is behind schedule. SFMTA has identified the minimum acceptable SPI to be 0.90.

Contingency

Cost Contingency

The total available contingency (approved contingency less approved contract changes) is $*75,790,430*, which is above the minimum required contingency of $60 million *and down about $2.1 million from January. A total of 64 contract modifications had been executed for the 1300 Contract with a total value of $7.09 million as of April 4, 2017. Unallocated contingency increased to $8.88 million due to a transfer of excess contingency from the real estate budget.* **In the opinion of the PMOC, SFMTA's cost forecasts should recognize the possibility of increased soft costs due to project delays. Despite the potential for higher soft costs, the available cost contingency appears to be sufficient to provide reasonable assurance of on-budget completion of the project. SFMTA and the contractor are encouraged to continue to identify additional schedule recovery strategies to reduce the potential for delay-related costs and to continue to work to resolve long-standing time impact claims.**

Schedule Contingency

All contingency in the schedule has been consumed and there is nearly 10 months of negative float. Further delays are likely because the contractor has not demonstrated that it can achieve the planned production rates for mining work for the CTS caverns. The PMOC will facilitate a schedule workshop in June 2017 with the objective of developing a range of dates for the probable actual construction completion and start of revenue service.

PMOC Observations, Opinions, and Concerns

The PMOC is concerned that construction progress on critical path work in February continued to be well below plan. The forecast completion date moved 17 days later, implying that actual progress was less than half of the planned progress. Achievement of the latest schedule goal for critical path work at CTS appears unlikely given performance to date. The PMOC also notes that

the cost of work performed in January was much higher than the increase in earned value. The PMOC will monitor cost and earned value to ascertain if this is a one-time event or a trend.

In the opinion of the PMOC, the ongoing month-by-month extension of the projected RSD is detrimental to effective management of the project because the project team does not have achievable schedule targets to manage to. SFMTA and the contractor are encouraged to develop an achievable schedule for completion of the remaining work that reflects reasonable production rates for critical path work based on the actual production rates being achieved, rather than the current assumption that the planned rates will be attained immediately and sustained throughout the project. The schedule should also incorporate appropriate schedule float to absorb the future delays that will inevitably occur.

SFMTA reported that the contractor has assigned a new management team for the mining work at CTS. SFMTA noted that production rates appear to be improving under the new team. The PMOC will assess the rate of mining advancement in the upcoming months to determine if SFMTA's observations are substantiated by measured progress.

The PMOC remains concerned that unresolved responsibility for the accumulated delays to date is hindering SFMTA and Tutor Perini Corporation (TPC) from working together to identify schedule mitigation measures. *The PMOC notes that SFMTA and TPC are now meeting weekly in an effort to resolve the contractor's claims related to schedule delays.*

The PMOC encourages SFMTA to complete its planning for the sequences of work that will allow building systems and transit systems testing to start to determine if it is possible to partially recover the accumulated delays to the project. A schedule workshop is planned for June 2017 to evaluate potential time saving measures and assess the likely range for the RSD of the project. *SFMTA's recently completed update of the RAP will be an important resource* for the schedule workshop.

Based on the latest information from the SFMTA's contract change and trend reports, the total cost contingency less identified trends of *10.3%* of the potential remaining spending is sufficient to provide reasonable confidence of on-budget completion of the project. The available contingency is well above the recommended minimum of $60 million. *However, SFMTA should revise its cost forecasting process to recognize the likely increases in project management cost associated with delays to the project completion date.*

TABLE OF CONTENTS

TABLE OF TABLES

APPENDICES

A. PROJECT STATUS

Full Funding Grant Agreement (FFGA)

The FFGA 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 and retrieval shaft. Final completion has been achieved, and financial close out should occur in 2017. The contractor needs to address any legitimate claims by the station contractor of extra costs due to non-conforming tunnel work. The tunnel contractor also must repair leaks in the tunnel and some of the cross passages before the contract can be closed out. Coordination of access to the tunnel for the leak repair work with ongoing station construction has been challenging. The leak repairs are scheduled to be completed once the contractor regains access to the tunnel locations. Instrumentation has been removed from the Bay Area Rapid Transit (BART) tunnels, and BART is in the process of accepting the work.

It appears likely that this contract will close out with a final cost less than $2 million over the original contract value, with change orders of less than 1% of the contract amount, which is very good cost control performance compared to typical infrastructure projects.

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 February 2017, the construction of the Stations and Surface, Track, and Systems Contract was 52.48% complete on the basis of cost and 54.32% complete based on the value of completed construction.*

Union Square/Market Street Station (UMS): The latest Big Hairy Audacious Goal (BHAG) for this work package is to complete excavation and placement of support of excavation for the station box by June 1, 2017. *This goal is 25 days earlier than the June 26, 2017 completion date for this work shown in the February 28, 2017 schedule update by San Francisco Municipal Transportation Agency (SFMTA).* ***The contractor appears to be falling behind the progress needed to achieve***

this BHAG. *Excavation to the bottom of the station invert was underway in late March. The contractor reported that break-in to the tunnel was planned to start the week of April 10.*

Final utility placements and installation of Overhead Contact System (OCS) poles continued at the triangle formed by Market Street, the westbound lane of Ellis Street, and the western end of the Ellis Street Annex. San Francisco Water Department (SFWD) and Pacific Gas & Electric (PG&E) coordination continued for the completion of water and gas lines in the area. Utility-related delays have delayed the completion of street paving from March to the week of April 17.

At the north concourse, a PG&E electrical vault and duct bank for the station permanent power are on hold. Minor work, including installation of a streetlight foundation and termination work for the Muni trolley bus power lines in the area, remains to be completed in this area. Subsurface work in the north concourse awaits completion of the soil nail walls for the fan room in the Union Square Garage work area.

In the Union Square Garage area, contaminated soil associated with the unanticipated fuel tanks at the bottom of the excavation continues to be removed. Soil nail walls for the fan room had reached level 4, with levels 4, 5, and 6 expected to be completed by April 28. The surface level slab in the garage area was completed and structural steel is being installed at the new station entrance in the garage area.

Chinatown Station (CTS): *Work on mining of the top left and top right side drifts of the platform cavern were completed on March 14. As of April 7, excavation of the bottom left and right side drifts was underway in both the northbound and southbound directions. The mining work has continued to take much longer than planned in the baseline schedule. SFMTA reported that the contractor has assigned a new staff member to manage the mining work at CTS and that the production rate for mining appears to have improved. The Project Management Oversight Contractor (PMOC) will monitor the actual production rates for the Sequential Excavation Method (SEM) work at CTS to verify whether measured progress confirms SFMTA's initial impressions.* The contractor is continuing to work two 12-hour shifts six days per week on the mining work at CTS in an attempt to mitigate the schedule impacts of the low production rate. *Changes to the work sequence for the SEM work to improve productivity are under evaluation.*

The current BHAG for completion of the mining for the platform cavern is June 15, 2017. ***This date is nine days later than the completion date shown in the latest SFMTA schedule update, implying that the Revenue Service Date (RSD) will move later by at least nine days. Based on the past three months of progress in mining for the platform cavern, it is unlikely that the latest BHAG for mining at CTS will be achieved. Achieving the milestone would require that the mining advance rate improve substantially starting in March and continuing through completion of the platform cavern.*** *There was only a modest improvement in the mining rate from January to February, with the actual rate continuing to be well below the planned rate.*

Yerba Buena/Moscone Station (YBM): The latest BHAG for YBM is to complete the station box invert slab on April 15 and the headhouse invert slab on April 30. *The 4-week look-ahead schedule*

dated March 27, 2017 indicates that the last invert slab pour for the station box is scheduled for April 25 and the final invert slab will be placed in the headhouse on May 9, about 10 days later than the BHAG target. ***In the opinion of the PMOC, the slight delay in completion of the YBM BHAGs will not influence the overall project schedule.***

Paving of the west side of 4th Street in the station area was completed in March. Completion of the sidewalks adjacent to the headhouse and at the construction site for the new hotel on the northwest corner of 4th Street and Clementina Street was scheduled for April 11. Remaining subsurface utility work along Clementina Street and subsequent restoration of that street is being coordinated with the planned opening of the hotel. The most recent projection for the opening date of the hotel was *July 2017*.

Finishing work continued on the mezzanine and concourse levels of the station. Topping slabs on both levels were originally scheduled to be poured in mid-March and are now planned for the week of April 17. Mechanical systems are being installed, along with fireproofing of the interior walls and other finishing work.

Surface, Track, and Systems (STS): The latest BHAGs for this work package include:

- complete all utility work and pavement restoration south of Bryant Street by May 31, 2017;
- complete all utility work and pavement restoration through the Bryant Street/4th Street intersection to the portal by July 15, 2017.

Utility conflicts continue to impact the completion of the street improvements that will allow work on the trackway in the center of 4th Street to commence. SFMTA has been managing the conflicts and the number of required utility relocations in declining. Water line work by SFWD remains to be completed at the intersections of 4th Street with Townsend and Brannan streets. All of this work was expected to be completed in early April, and SFMTA management was on call to encourage SFWD to complete its work. PG&E can complete relocations of gas lines at various locations along 4th Street after SFWD completes the water line work at Townsend Street. Completion of two large sewer mains between Welsh and Bryant streets is awaiting SFWD action to cut and cap an old waterline that ruptured while street excavation for the sewer lines was underway. New unidentified utilities were encountered in the northwest corner of the intersection of 4th and Townsend streets where a sewer culvert needs to be installed.

SFMTA and the contractor continue to evaluate solutions to problems with the sidewalk surface where new sidewalk panels installed by the contractor interface with the existing sidewalk panels. The contract work included replacement of the first row of sidewalk panes adjacent to the curb. Heave and settlement of the existing sidewalk panels results in areas where the new sidewalk is higher and other areas where the new sidewalk is lower than the adjacent sidewalk. Tripping hazards and drainage issues may exist where the elevation differences between old and new sidewalks are significant. In the opinion of the PMOC, SFMTA may be required in some areas to expand the coverage of sidewalk replacement to provide a smooth walking surface. *The costs for*

expanded sidewalk replacement may be recoverable from adjacent property owners, who are responsible for the cost of maintaining the sidewalks abutting their properties. Tutor Perini Corporation (TPC) has issued a Request for Information (RFI) regarding the potential for similar problems with the sidewalks on the opposite side of 4th Street. **There may be a lesson learned regarding the effective integration of new sidewalk and street work with existing facilities. The PMOC will explore this with SFMTA.**

The base slab for the trackway was poured in the open cut section of the transition from the surface running to tunnel section of the alignment on April 5. The plinth track slab in the cut and cover transition into the tunnel also was poured during the first weeks of April. Preparations were underway for placement of the transition slab between the cut and cover tunnel and the bored tunnel scheduled for April 18.

The contractor and SFMTA continued to investigate problems with the track switch machine and the track circuits at 4th and King streets.

Despite the focused attention of the Central Subway Project's (CSP) senior management team on achievement of the short term BHAGs, these goals have not *arrested the ongoing schedule slippage, and the projected RSD moved 17 days later in the latest reporting period.* As discussed in the Schedule section of this report, the trend of schedule slippage due to lower than planned production for the CTS SEM mining *continued in February with only a modest improvement over January's performance.* **Improved performance for the mining operation must be achieved *immediately* and sustained and additional time savings must be identified for all four lines of work that are driving the current RSD in order to *avoid further delays to the current forecast RSD of October 21, 2019.* In the opinion of the PMOC the required improvements in construction productivity will take several weeks to achieve, if they can be achieved at all. Until significant improvement is achieved, further delays to the RSD will accrue.**

In the opinion of the PMOC, the ongoing month-by-month extension of the projected RSD is detrimental to effective management of the project because the project team does not have achievable schedule targets to manage to. SFMTA and the contractor are encouraged to develop a mutually agreed and achievable schedule for completion of the remaining work including any realistic schedule recovery strategies and appropriate schedule float to absorb future delays that will inevitably occur. Such a schedule should be developed as soon as possible, taking advantage of experience with the effectiveness of measures to improve production rates for work on the critical path. *The PMOC will convene a schedule workshop in June 2017 with the objective of identifying a range of likely feasible construction completion dates and RSDs.*

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

Bay Area Rapid Transit

Monitoring equipment for the 1252 Contract has been removed from the BART tunnels. BART is processing approvals of the removal work *and related releases of SFMTA for liability,* which will close out the SFMTA-BART coordination for the tunnel contract.

California Department of Transportation (Caltrans)

An Encroachment Permit is needed to install electrical and traffic signal equipment at the I-280 off ramp. SFMTA is working to obtain the permit for the work, which is not on the critical path.

CPUC

The California Public Utilities Commission (CPUC) is participating in the various safety meetings, including the Safety and Security Certification Review Committee (SSCRC) and Fire and Life Safety Committee (FLSC) meetings. Representatives of the CPUC also regularly attend the SFMTA/Federal Transit Administration (FTA) Quarterly Progress Review Meetings (QPRMs). The FLSC has begun to address the certifiable items list for the Stations Contract. Rail crossing permits from CPUC are required for the at-grade portion of the project alignment. CPUC has provided the permits but they will need to be extended as the permits call for the crossings to be in operation before the scheduled completion of the CSP project.

San Francisco Public Utilities Commission (SFPUC)

Coordination is ongoing for the installation of new water and sewer facilities along 4th Street.

San Francisco Department of Public Works (SFDPW)

No updates to report.

San Francisco Parks and Recreation Department

No updates to report.

Private Property Owners

All real estate acquisitions have been completed. 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. These claims are being handled by the contractors' builder's insurance policies, 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

Vehicle design and fabrication is underway by Siemens Corporation for 4 Light Rail Vehicles (LRVs) for the Central Subway, 20 LRVs for near-term fleet expansion, and 151 LRVs for fleet replacement. Options for up to 85 additional vehicles are available for fleet expansion. The vehicle design and assembly process is reported to be on schedule. *Two cars have been delivered to SFMTA. Dynamic testing, including clearance tests on the existing Muni tracks is underway for the first car. Post-delivery acceptance tests for the second car are underway. Production of ten additional cars continues at the assembly plant.*

Real Estate

All project right-of-way has been acquired, and all commercial and residential relocations are complete. *SFMTA processed a budget revision to shift $5.26 million in contingency that had been carried for real estate into unallocated contingency.*

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 December 31, 2016. 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. In the case of the cooling equipment, 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 indicated that it intends to seek a waiver of Buy America requirements for this equipment, citing examples from other FTA-funded projects where waivers were granted by FTA for similar equipment. SFMTA is assembling information in advance of scheduling a meeting with FTA to discuss the proposed waiver request.

B. PROJECT MANAGEMENT PLAN AND SUB-PLAN IMPLEMENTATION

Project Management Plan (PMP)

SFMTA is expected to deliver an update of the PMP in early April 2017. The PMOC will review the revised PMP, focusing on the updated Rail Activation Plan (RAP) and the organizational reporting structure for the quality functions. The reporting relationships for the quality function have been revised due to the departure of SFMTA's Capital Programs and Construction Quality Manager.

Environmental Assessment/Mitigation Plan/Archaeological Plans

The PMOC received the Fourth Quarter 2016 Mitigation Monitoring Reporting Program (MMRP) update from SFMTA on February 17, 2017.

Real Estate Acquisition Management Plan (RAMP)

The RAMP Revision 5, dated September 26, 2013, was submitted to FTA on November 19, 2013. All required real estate for the project has been acquired 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

Several CSP project staff members continue to be focused on development of an as-built record of the construction for the 1300 *Contract. This effort requires support from the field management staff for each of the work packages. The updates have been completed for all stations through January 2017. Updates should soon be representative of the current status of construction.*

SFMTA reported that the Resident Engineer (RE) and Assistant Resident Engineer (ARE) for the UMS work package will be leaving the project. Recruitment for these positions is underway and internal candidates may be available to fill them. SFMTA also is recruiting for additional support in change order analysis and negotiation as well as filed inspector positions.

Several long-standing major change orders and time impact claims remain to be resolved, but SFMTA has completed discussions with the contractor on some of the oldest issues, including the impacts of a PG&E power pole on demolition work at the CTS headhouse. *SFMTA reported that it is now meeting with the contractor on a weekly basis to address delay claims, including any additional compensation that may be due to the contractor, beginning with the work at CTS that preceded the start of excavation.*

The PMOC notes that contract modifications for the 1300 Contract continue to be processed regularly, with four additional modifications issued in March. The PMOC will continue to monitor the SFMTA's progress in clearing the backlog of pending change orders. A new action item for SFMTA to include metrics for the amount of time needed to progress identified potential contract

changes and contractor change order requests through the various stages of resolution was identified.

Contractor Staff

SFMTA reported that TPC has assigned a new management team to the SEM mining work at CTS. There appears to have been some improvement in the rate of advance for the mining work, which has yet to be confirmed. The PMOC will monitor SFMTA's production graphs to determine if improved production rates are being achieved and sustained.

D. PROJECT COST STATUS

Project Cost Control Systems

SFMTA continued to maintain the Trend Log and logs of Change Order Requests (CORs) and Proposed Contract Changes (PCCs) 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 companion contract change management log includes items that have been determined to have merit and are progressing through negotiations toward a contract modification (CMod). SFMTA is working to improve the timeliness of processing determinations of merit as well as the progression of pending contract changes and completion of CMods by creating summary tables of the numbers of items that are in the various stages of processing. **In the opinion of the PMOC, the trend log tracking should include the amount of time that has passed from the initial identification of the trend, *and a new action item has been identified for SFMTA's response.*** The PMOC has observed some improvement in the progress of contract change processing reflecting the emphasis of the management team in reducing the backlog of contractor change requests. CSP senior managers review the status of pending changes with RE staff members for each work package every other week in an attempt to reduce this backlog and have set an objective of having fewer than 10 change requests that require merit determination. *Four new modifications to the contract were executed between March 8, 2017 and April 5, 2017.*

The most recent versions of the Trend Log and Trend Summary documents are dated April 5, 2017. A total of 64 contract modifications had been executed for the 1300 Contract as of that date. The total value of executed CMods was $7,085,814, which is an increase of $575,490 since March 8, 2017. Note that tables 2 and 3 reflect the project status as of the end of *January 2016* and show different values for approved contract changes.

Project Cost (*as of February 28, 2017*)

Cost estimate: $1.5783 billion.

Total contingency: *$75.79 million* (minimum contingency is $60 million), *a decrease of $2.13 million from January.*

Total net incurred costs: $*1,036,046,099, an increase of $10.05 million from January (65.64% of the total project budget)*.

Current funding level: $1,329,794,000 (84.3% of the total project budget).

Earned Value (EV): *$1,028,349,131, an increase of $5.44 million from January.*

Planned Value (PV): *$1,336,440,370, a planned increase of $13.25 million from January.*

Cost Performance Index (CPI): *1.00.*

CPI is a measure of cost efficiency on a project. It is the ratio of EV to AC value. A CPI equal to or greater than 1 indicates a cost underrun, and a value of less than 1 indicates 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. ***The PMOC notes that the cost of work performed in January was much higher than the increase in earned value. The PMOC will monitor cost and earned value to ascertain if this is a one-time event or a trend.***

Project Cost Trends

SFMTA tracks potential changes in project cost, calling these potential changes "trends." Trends include all potential changes in the contract 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 50% of the contractor's estimate of extra costs.

Table 2 summarizes the trends for the two construction contracts that have not attained financial close out. The remaining contingency, less identified trends, represents about *45%* of the potential left to spend for Contract 1252. *After potential changes are accounted for, there is now $8.53 million in contingency remaining for Contract 1300.* **The resulting contingency of *2.1*% of potential remaining spending after potential changes are accounted for is tight, but unallocated contingency and excess contingency for other elements of the program are likely sufficient to allow on-budget completion of the CSP**. *The combined allocated contingency for all construction work less identified trends is now $10.35 million or 2.5% of the potential remaining work.* **In the opinion of the PMOC, the allocated contingency for the 1252 Contract is greater than the amount required to assure final close out of the contract within the budget. The allocated contingency for the 1300 Contract is more in line with the likely contract cost given the pending contract changes, but there is a significant likelihood that additional contingency will need to be allocated to this contract prior to completion, as SFMTA has identified an additional *$25.8 million* in potential contract changes in its trend log.**

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	1,494,770	*6,382,419*
Current Contract (1252 does not include non-project costs)	235,078,785	*846,058,819*
Remaining Contingency	834,715	*33,617,581*
Potential Changes (Trends)	170,654	*25,086,768*
Estimate at Completion	235,249,439	*871,145,587*
Contingency Less Trends	664,061	*8,530,813*
Spent to Date	233,793,900	*461,690,897*
Potential Left to Spend	1,455,539	*409,454,690*
Contingency Less Trends as % of Potential Cost to Complete	45.6%	*2.1%*

[1] *As reported in the February 2017* Central Subway Project Monthly Progress Report – SFMTA and reformatted by the PMOC

Table 3 shows the overall budget, trends, and contingency status for the entire Central Subway program. **The total contingency, including unallocated contingency and subtracting identified trends, represents *10.3%* of the potential remaining spending, which, in the opinion of the PMOC, is sufficient to provide reasonable confidence in an on-budget completion of the project.**

Change Order Control

SFMTA continues to estimate that additional CMods with a net increase in contract value of $170,654 will be executed as part of contract close out for the 1252 Contract. Based on the expected final contract value, change orders for the base work are forecast to represent less than 1% of the original contract amount. This represents exceptionally good change order control compared to typical capital projects.

Table 3 - Budget and Contingency Status for Central Subway Project

SFMTA Central Subway Project, Budget, Costs and EAC by SCC January 31, 2017		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%**			**219,671,955**	**77%**	**65,555,924**			
10.02	Guideway: At Grade, Semi-exclusive	2,395,143	464,857	2,860,000	19%			145,000	5%	2,715,000			
10.06	Guideway: Underground cut and cover	74,407,195	(4,590,788)	69,816,407	-6%			61,878,677	89%	7,937,730			
10.07	Guideway: Underground tunnel	224,933,257	(23,592,511)	201,340,746	-10%			152,381,762	76%	48,958,984			
10.09	Track: Direct fixation	7,293,157	(532,068)	6,761,089	-7%			2,647,916	39%	4,113,173			
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%			2,618,600	59%	1,831,037			
20	**Stations, Stops, Terminals, Intermodal**	**432,698,735**	**155,679,628**	**588,378,363**	**36%**			**320,244,427**	**54%**	**268,133,936**			
20.01	At-grade station	774,913	6,827,944	7,602,857	881%			1,452,844	19%	6,150,013			
20.02	Aerial station, stop, shelter, mall, terminal, platform		3,176,603	3,176,603	NA			-	0%	3,176,603			
20.03	Underground station	412,084,888	143,812,178	555,897,066	35%			314,905,735	57%	240,991,331			
20.07	Elevators, escalators	19,838,934	1,862,903	21,701,837	9%			3,885,848	18%	17,815,989			
40	**Sitework and Special Conditions**	**232,551,627**	**(19,354,676)**	**213,196,951**	**-8%**			**193,156,050**	**91%**	**20,040,901**			
40.01	Demolition, clearing, earthwork	8,887,028	3,407,275	12,294,303	38%			11,854,204	96%	440,099			
40.02	Site utilities, utility relocation	29,562,587	29,928,124	59,490,711	101%			61,403,626	103%	(1,912,915)			
40.03	Haz. Material, contam'd soli removal, ground water treatment	2,957,442	4,494,779	7,452,221	152%			4,618,315	62%	2,833,906			
40.04	Environmental mitigation	3,146,216	(2,023,317)	1,122,899	-64%			624,100	56%	498,799			
40.05	Site structures, including retaining walls, sound walls	2,894,074	(187,643)	2,706,431	-6%			2,706,431	100%	-			
40.06	Pedestrian and bike access and accommodation, landscaping	14,393,910	(4,602,915)	9,790,995	-32%			2,384,076	24%	7,406			
40.07	Automobile, van, bus accessways, including roads and parking lots	11,919,550	(5,340,451)	6,579,099	-45%			3,234,614	49%	3,344			
40.08	Temporary facilities and other construction indirect costs	158,790,820	(45,030,528)	113,760,292	-28%			106,330,684	93%	7,429,6			
50	**Systems**	**108,429,774**	**(13,184,464)**	**95,245,310**	**-12%**			**23,182,037**	**24%**	**72,063,273**			
50.01	Train control and signals	37,447,116	(9,415,693)	28,031,423	-25%			7,264,219	26%	20,767,204			
50.02	Traffic signals and crossing protection	3,013,232	9,549,297	12,562,529	317%			9,116,474	73%	3,446,055			
50.03	Traction power supply	20,379,634	1,085,439	21,465,073	5%			5,264,911	25%	16,200,162			
50.04	Traction power distribution	16,239,951	(3,798,838)	12,441,113	-23%			1,365,429	11%	11,075,684			
50.05	Communications	28,545,305	(16,514,719)	12,030,586	-58%			171,003	1%	11,859,583			
50.06	Fare collection system and equipment	2,804,536	3,295,464	6,100,000	118%			-	0%	6,100,000			
50.07	Central Control		2,614,586	2,614,586	NA			1	0%	2,614,585			
Subtotal (10 - 50)		**1,089,606,217**	**92,442,286**	**1,182,048,503**	**8%**	**1,146,436,207**	**35,612,296**	**756,254,469**	**64%**	**425,794,034**	**415,439,161**	**1,171,693,630**	**10,354,873**
60	**ROW, Land, Existing Improvements**	**37,398,029**	**(5,151,708)**	**32,246,321**	**-14%**	**32,246,321**	**-**	**30,731,521**	**95%**	**1,514,800**	**1,514,800**	**32,246,321**	**-**
60.01	Purchase or lease of real estate	33,798,029	(3,732,219)	30,065,810	-11%	30,065,810	-	28,322,091	94%	1,743,719	1,514,800	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**	**2,147,782**	**8%**	**24,237,871**	**11,161,218**	**13,309,000**	**13,076,653**
70.01	Light Rail Vehicles	26,385,653	-	26,385,653	0%	13,309,000	13,076,653	2,147,782	8%	24,237,871	11,161,218	13,309,000	13,076,653
80	**Professional Services**	**361,568,360**	**(32,829,240)**	**328,739,120**	**-9%**	**310,518,041**	**18,221,079**	**246,912,327**	**75%**	**81,826,793**	**63,605,715**	**310,518,042**	**18,221,078**
80.01	Preliminary Engineering	46,317,094	**(114,420)**	46,202,674	0%	46,202,674	-	46,202,675	100%	(1)	-	46,202,675	(1)
80.02	Final Design	86,053,240	(24,734,909)	61,318,331	-29%	61,318,331	-	61,199,308	100%	119,023		61,322,751	(4,420)
80.03	Project Management for Design and Construction	191,025,800	(88,107,411)	102,918,389	-46%	89,012,544	13,905,845	66,605,256	65%	36,313,133	27,500,117	94,105,373	8,813,016
80.04	Construction Administration and Management	15,495,521	78,558,172	94,053,693	507%	91,096,881	2,956,812	61,428,279	65%	32,625,414	24,525,773	85,954,052	8,099,641
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	78,370	6,418,566	381,434
80.06	Legal, Permits, Review Fees by Other Agencies	7,242,340	970,264	8,212,604	13%	8,212,604	-	4,304,907	52%	3,907,697	3,494,221	7,799,128	413,476
80.07	Surveys, Testing, Investigation, Inspection	234,036	699,064	933,100	299%	933,100	-	831,706	89%	101,394	1,858	833,564	99,536
80.08	Start up	8,400,329	(100,000)	8,300,329	-1%	6,941,907	1,358,422	-	0%	8,300,329	7,881,932	7,881,932	418,397
Subtotal (10 - 80)		**1,514,958,258**	**54,461,339**	**1,569,419,597**	**4%**	**1,502,509,569**	**66,910,028**	**1,036,046,099**	**66%**	**533,373,498**	**491,720,894**	**1,527,766,993**	**41,652,604**
90	Unallocated Contingency	63,341,742	(54,461,340)	8,880,402	-86%		8,880,402		0%	8,880,402			8,880,402
Total Project Costs (10 - 100)		**1,578,300,000**	**(1)**	**1,578,299,999**	**0%**		**75,790,430**	**1,036,046,099**	**66%**	**542,253,900**	**491,720,894**	**1,527,766,993**	**50,533,006**

SCC Breakdown of Forecast Construction Costs Not Available

[2]Data reported in the *February 2017* Central Subway Project Monthly Progress Report – SFMTA and reformatted by the PMOC

SFMTA is maintaining its management tools for tracking potential contract changes for the 1300 Contract. *The latest summary report is titled "CN1300 Trend Summary" and is dated April 5, 2017. This report shows that 64 contract modifications have been approved (four additional CMods since March 8) for a net increase in the contract value of $7,085,814. CORs (generated by the contractor) that have been determined to have merit and PCCs (generated by SFMTA) have a combined expected value of $25,806,848 in increased contract value, an increase of $2.51 million since March 8. An additional 538 items are being tracked in the Trend Log with a net value of $21.36 million in possible contract value increases. Of these, 254 have been judged by SFMTA to be without merit, but are being carried at a reduced value in the trend to address potential future claims. A further 237 items have been voided and are carried at no cost. There are 33 items covered by certified claims and notices of potential claims by the contractor ($8.1 million total exposure), and 14 items are "open" or "new" and awaiting a determination of merit.*

The most recent version of the Trend Summary shows a total potential increase in contract cost of $54,255,746 including the $7.09 million in contract cost increases executed thus far. The total estimated cost impact of the identified trends increased by about $3.58 million from March 8, 2017 to April 5, 2017. The following trend items with potential cost increases in excess of $250,000 are identified in the Trend Log

1. TS and SL changes for STS - $298,307
2. Change to grade 50 steel from specified grade 70 steel (due to availability issues) - $572,884
3. Extra trucking costs for contaminated soil at CTS - $2,274,225
4. Harder rock than anticipated for CTS slurry wall excavation - $2,820,600
5. Delays to installation of tangent piles at UMS - $1,082,380
6. UMS Garage underpinning requirements - $732,157
7. *12-inch waterline at UMS, added scope - $336,359 (up from $335,468)*
8. Utility conflicts with sewer line installation at UMS - $744,465
9. Changes in construction sequence for UMS Garage - $500,000
10. UMS art glass installation requirements - $382,976
11. Obstructions to jet grout placement at UMS - $2,062,420
12. Change in track switch machine manufacturer at STS - $391,909
13. Additional monitoring instruments at CTS - $429,777
14. Extra work to prepare existing tunnel - $431,423
15. Additional traffic control requirements at 4th and King - $675,001
16. Incomplete interface design at STS - $300,001

17. Additional traffic control requirements for STS work package - $1,032,302
18. Cost of changes to the design of CTS to accommodate the plaza requested by the community - $4,618,428
19. Changes to utility design at YBM - $627,854
20. Provision of new 12-inch waterline at YBM - $256,730
21. Change in vent for emergency generator at all stations - $500,001
22. *Missing conduit between manholes at UMS - $250,001 (new on list due to increased cost)*
23. Contractor-claimed change in contract requirements for pre-loading permanent struts at UMS - $1,853,352
24. Soil nail and shotcrete wall changes in Union Square Garage - $896,524
25. Contractor claim that wayside signals are extra - $1,512,373
26. *Change in drain piping details at UMS - $332,252 (new)*
27. Temporary drainage at Union Square Garage ramps - $292,754
28. Change in automatic train control system for reverse running - $400,001
29. Design changes for UMS vertical drainage slots - $866,709
30. Costs associated with differing site conditions for Level 3 Duct Bank - $2,400,001
31. Escalator raceways at UMS - $492,065
32. Void in platform cavern excavation at CTS - $350,000
33. Time impacts due to power pole conflict during demolition at CTS - $3,516,164
34. *Time impacts from extended submittal reviews and substitution request procedures - $3,021,262 (new)*

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)

Funding and Expenditures

Federal, state, and local project funding and expenditures are shown in Table 4 with unchanged funding levels from the previous reporting period.

Table 4 - Project Funding

Source	Committed ($1,000)	Awarded ($1,000)

Source	Committed ($1,000)	Awarded ($1,000)
Federal		
New Starts	942,200	769,196
Congestion Mitigation	41,025	41,025
Federal Subtotal	983,225	660,221
State		
TCRP	14,000	14,000
State RIP	88,000	12,498
Prop. 1B / PTMISEA	307,792	307,792
Prop. 1A / HSR	61,308	61,308
State Subtotal	471,100	395,598
Local		
Prop. K Sales Tax	123,975	123,975
Local Subtotal	123,975	123,975
Project Total:	**1,578,300**	**1,179,794**

E. PROJECT SCHEDULE STATUS

SFMTA prepared a master program schedule update in March representing progress on the project through February 2016. SFMTA reported that the contractor had submitted schedule updates through February 2017, which are under review by the CSP schedule analysts. The schedule updates are being completed and re-submitted in accordance with the verbal opinion issued by the project Dispute Review Board (DRB) that TPC should implement SFMTA's comments in finalizing its schedule updates and that TPC should document any disputes with the comments in the schedule narrative. *Presuming that the latest TPC schedule updates are compliant with the contract and the DRB direction, ongoing schedule updates are expected to be available at the time of the contractor's pay requests. SFMTA should not have to create its own schedule updates going forward if the contractor's updates are acceptable.*

In the opinion of the PMOC, using the DRB was an effective means of achieving agreement between SFMTA and the contractor regarding schedule updates. The parties should continue to use the partnering process and the DRB as resources for resolving project issues. Resolution of the issues regarding contractor schedule updates is an important achievement that provides a firm basis for realistic and reliable project schedule evaluation. An agreed project schedule from the contractor will be critical to the evaluation and agreement on schedule recovery strategies.

The PMOC remains concerned that unresolved responsibility for the accumulated delays to date is hindering SFMTA and TPC from working together to identify schedule mitigation measures. SFMTA has initiated discussions with TPC regarding long-standing delay claims and has provided a formal proposal regarding the time allowance for one of the oldest claims (delayed removal of a power pole at CTS). *SFMTA and TPC are now holding weekly meetings to resolve the outstanding schedule delay issues.* **In the opinion of the PMOC, SFMTA should finalize the**

time impact allowances on the remaining contractor delay claims as soon as possible so that SFMTA and the contractor can focus on the current schedule issues. SFMTA and the contractor should make appropriate use of the partnering and DRB processes to facilitate resolution of any disputes regarding allowable time impacts.

The PMOC facilitated a schedule workshop with SFMTA project management and project controls staff on November 18 and 19, 2015. As a result of the workshop, an initial proposed action plan for developing the necessary tools from the current TPC schedule includes the following steps:

1. SFMTA makes adjustments to schedule logic in TPC schedule.
2. SFMTA evaluates the resulting schedule and finalizes the recommended logic changes.
3. SFMTA reviews the resulting schedule tool with TPC.
4. SFMTA and TPC agree on refinements.
5. Final schedule refinements made by TPC or SFMTA, and revised schedule accepted for ongoing use.
6. Routine schedule updates continue with the revised schedule. SFMTA continues to make its own updates based on four-week look-ahead schedules and actual progress as a check on TPC schedules. Monthly meetings held to resolve any differences.
7. SFMTA (and TPC) evaluate changes to work sequence, options for acceleration, and other strategies for schedule recovery. Mutually agreed recovery strategies implemented in revised schedule.

If TPC and SFMTA cannot agree on the schedule refinements (step 4), SFMTA develops its own schedule forecasting tool in parallel with TPC and continues to work with TPC to accept the revisions through monthly schedule reconciliation meetings. *As of the February 2017 SFMTA Progress Report for CSP, SFMTA had completed items 1 through 6, and the contractor had submitted revised schedule updates in conformance with the agreements reached through the DRB process. These schedule updates were under review by SFMTA at the publication date for this report.*

The February master program schedule update indicates that the projected RSD slipped 17 days during the month. The critical path for the construction work continues to flow through the construction of CTS, but analysis by the PMOC indicates that there are a total of four lines of work that are influencing the RSD for the project. *The projected RSD forecast is now October 21, 2019, more than nine months later than planned.* There is negative float on the project critical path, and further delays to the RSD are virtually certain based on the progress of work on the critical path.

The contractor has been working two 12-hour shifts and six days per week at CTS *in an attempt to reduce the impacts of lower than planned production rates for the ongoing SEM mining work for the platform cavern. The planned work productivity for the month of February was not achieved, causing the further slip in the projected RSD. SFMTA reported that the contractor has*

assigned a new management team for the SEM mining work at CTS and that it appears that the production rates have improved since this action by the contractor. The improved production rates have yet to be confirmed through an analysis of production rates. **It is unlikely that the planned mining rates can be achieved immediately, thus it is virtually certain that further delays to the RSD will accrue over the coming weeks. The current schedule shows that mining will continue into December 2017, assuming that the planned production rates were being achieved starting March 1. If *the planned rates are not achieved,* the 10 months of remaining mining could take many additional months, resulting in major additional delays.**

Table 5 shows the latest BHAGs and the current status for each work package in the 1300 Contract.

Table 5 - Interim BHAGs for CTS Construction Progress[1]

Milestone	Target Date	Actual Date	*Status*
Complete platform cavern excavation *Start crossover cavern excavation*	*June 15, 2017* *May 15, 2017*		*June date appears optimistic given current production rates.* *This is about six weeks earlier than estimated in the latest master program schedule and could result in significant time savings if achieved.*
Complete station box excavation *Complete utilities at Ellis* *Complete utilities at Geary* *Complete utilities at O'Farrell*	*June 1, 2017* *April 15, 2017* *June 30, 2017* *July 31, 2017*		*Latest 4-week look-ahead schedule indicate that the Ellis BHAG will be achieved.*
Complete invert slab for station box at YBM Complete invert slab for headhouse	*April 15, 2017 (revised from April 12, 2017)* *April 30, 2017*		*Latest 4-week look-ahead schedule shows May 2 completion.* *Latest 4-week look-ahead schedule shows May 4, 2017.*
Complete all utility work along 4th Street	*May 31, 2017 (delayed from March 31, 2017) south of Bryant* *July 15, 2017 (delayed from May 31) through 4th and Bryant intersection*		Ongoing utility conflicts impacting progress of the work.

[1] *Bi-weekly Meeting Agenda, Director of Transportation Update on CSP, March 2, 2017*

The PMOC convened a second schedule workshop for the project on June 22 and 23, 2016. The PMOC's analysis of the schedule indicates that four lines of work are driving the RSD:

- CTS work leading to tunnel electrical power and Advanced Train Control System (ATCS) testing;
- STS work (Radiax, Train Control and Software) leading to ATCS testing;
- CTS work leading to building start-up and testing; and

- UMS work leading to building start-up and testing.

Improvements must be made in the overall durations of each of these lines of work in order to move the RSD earlier than the current projection, presuming that the ongoing schedule slippage at CTS can be arrested. The workshop identified several strategies for improving the schedule for each line of work. These strategies are now under review by SFMTA. Additionally, the SFMTA scheduling team and the PMOC's scheduling experts reviewed the schedule benefits of the current schedule performance milestones. Due to the fact that multiple lines of work are driving the RSD, the impact of achieving the milestones would be limited. **Combined with the fact the many of the milestones have not been achieved, the PMOC's conclusion is that the practice of setting short term schedule performance targets has not been effective in achieving schedule recovery.**

In the opinion of the PMOC, although setting and working toward the short term milestones may be encouraging cooperation and collaboration between TPC and SFMTA in advancing the current work, this practice has not, and most likely will not, result in overall time savings or any improvement in the RSD for the project. A more comprehensive view of the lines of work that are driving the RSD must be taken by SFMTA and efforts must be made to improve the work sequence and advance elements of the testing and commissioning activities near the end of the project in order to improve the RSD. SFMTA should engage its Transit Division in planning the testing and commissioning work as soon as possible, since Transit Division staff will have key roles in these activities.

SFMTA agreed to several action items that will lead to an updated schedule and projection of likely RSD outcomes (see Table 8). The PMOC notes that SFMTA plans to complete an update of the RAP including a more detailed schedule of testing, commissioning, and start-up activities as part of the 2017 update of the PMP. *SFMTA expected to deliver the updated PMP in early April.* The potential for schedule recovery can be evaluated with more confidence once the RAP update is complete. At that time, the likely completion date for the mining at CTS may be able to be determined with more confidence as well. **Based on the timing for the RAP update, completion of SFMTA's as-built schedule updates and expected delivery of up-to-date, acceptable schedule updates from the contractor, the PMOC expects to hold another schedule recovery workshop in June 2017.**

Project Schedule Data

Earned Value (EV): $*1,028,349,131, an increase of $5.44 million from January.*

Planned Value (PV): *$1,336,440,370, a planned increase of $13.25 million from January.*

Schedule Performance Index (SPI): *0.77.* SPI greater than 1 is ahead of schedule and less than 1 is behind schedule. SFMTA has identified the minimum acceptable SPI to be 0.90; the current SPI indicates unacceptable schedule performance. The SPI remained unchanged from the previous reporting period.

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 indicates more work was completed than planned and a value of less than 1 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 0.77 indicates that the project is significantly behind schedule**.**

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

Table 6 - Schedule Milestones

	(P = Planned Date, A = Actual Date, F = Forecast Date)
Preliminary Engineering (PE):	Authorized in July 2002 (A)
Record of Decision:	Issued November 26, 2008 (A)
Final Design (FD):	Authorized in January 2010 (A)
FFGA Request:	Submitted September 2011 (A)
FFGA Executed:	October 11, 2012 (A)
Ground Breaking: (Utility Relocation Contract)	February 9, 2010 (A)
Tunnel excavation complete (hole through):	June 2, 2014 (SB); June 11, 2014 (NB) (A)
Cross passages complete:	December 20, 2014 (P); April 15, 2015 (A)
Tunneling substantial completion:	April 15, 2015 (A)
Station construction Notice to Proceed (NTP):	June 17, 2013 (A)
Station construction substantial completion:	February 24, 2018 (P); *May 9, 2019* (F)
RSD:	December 26, 2018 (P); *October 21, 2019* (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 on February 24 through 27, 2009. The FTA recommended schedule contingency for the current stage of the project is 6.0 months. As noted above, the current schedule reflects *more than nine months* of negative buffer float.

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 Mechanical, Electrical, and Plumbing (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 *October 21, 2019*)

Three Month Look-ahead

The following activities are planned over the next three months:

1300 Contract

UMS

Complete utility placement, backfill, and paving of Ellis Street

Install guardrails and prepare the new vehicle ramps at Union Square Garage for use by the public

Remove contaminated soil (from fuel tanks that have been removed) from the bottom of the north entrance and begin building up the north entrance structure

Place structural steel for the north entrance

Continue excavation and placement of struts and walers in the station box

Expose *and remove* the tunnel liner in the station box

Complete construction of access shaft at O'Farrell Street

Complete the invert in the Ellis Street Annex area

CTS

Continue excavation of the station platform caverns

Provide compensation grouting as needed

YBM

Complete invert slabs for the station box and headhouse

Continue interior wall construction and M/E/P rough-in at the mezzanine and concourse levels

Complete utilities in 4th Street above the station box and restore street pavement

STS

Sewer installation and repair

Waterline installation

Alternative Water Supply System (AWSS) installation

Muni ductbank installation

Continue street restoration and final paving

Start installation of tunnel lighting

Installation of overhead contact system support poles

Placement of tunnel walkways

Begin installation of track in the portal area

The PMOC expects to attend the following meetings:

- Weekly Management (*April 3, May 1, and June 5)*
- Weekly Contract 1300 Construction Progress Meetings (*first Tuesday and Wednesday of April, May, and June*)
- Weekly Configuration Management Board (CMB) (first Wednesday of *April, May, and June*)
- Monthly CSP Risk Management Meetings (first Thursday of *April, May, and June)*
- CSP month-end meetings on *April 4, May 2, and June 6*
- FTA/QPRM scheduled for *May 4, 2016*

F. QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC Plan Implementation

Contractor QC, as detailed in the Contract Technical Specification, is the means by which the contractor ensures that construction complies with the requirements of the contract. The contractor conducts at least three phases of control (Preparatory Phase, Initial Phase, and Follow-up Phase) to ensure that all work is carried out per the contract.

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.

Construction crew attention to quality has been consistent, with the occurrence of critical non-conforming work being infrequent. The quality concerns for the 1300 Stations Contract identified in the SFMTA *February* monthly report were unchanged from the previous month and included:

- As is typical to similar projects, work performed prior to receipt of approval status of required submittals/RFIs with/without knowledge of QC remains a potential area of concern.
- TPC's Record Document (as-built) development, including CNCRs and a timely record of work performed that is different than what is required by the latest approved Conformed Design Drawings needs improvement. Quality Assurance Surveillance QAS076 was conducted, posted to CM13, and provided to TPC for their action. The Quality Assurance Surveillance followed findings from a Quality Assurance Audit provided to TPC for corrective action in January of 2016. Lack of conformance to the requirements of the Record Document Specification Section 01 78 39 remains to be addressed.
- Adherence to the required process for identifying, documenting, and implementing requirements for support of excavation as the SEM work progresses at CTS. Daily meetings are held to review the planned work for the upcoming shifts to assure that the proper excavation support and sequencing are implemented. No specific issues with compliance with the required procedures were identified, but the issue was properly noted as critical to the safe progression of work at CTS.
- TPC has been reluctant to include documentation of the contractor's Quality Control process acceptance of completed work at UMS in monthly pay applications, resulting in extra effort being expended by the SFMTA RE staff to confirm that only acceptable work is included in the invoices.

As of April 3, 2017, 290 CNCRs had been filed by TPC's Quality Manager (7 more than in early February), 9 new items were under review, 33 other items had responses identified but not yet approved, the proposed responses to 10 items were disapproved, and 23 items had approved responses that were not yet implemented. In addition, 178 items were closed and 37 items had been voided. None of the open or disapproved items is delaying progress of the work.

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 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 with the next PMP update.

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 will begin to address the station construction items in 2016. The San Francisco Fire Department (SFFD) regularly attends the now combined FLSC and SSCRC meetings. The SFFD will continue to coordinate with the Stations Construction Project to identify issues of importance during construction.

Construction Safety

The 1300 Contract is maintaining an excellent safety record, with a total of six recordable and four lost time incidents since the project start. *No recordable incidents occurred in the month of February 2017.* The performance metrics relating to accidents per working hour are well below the OSHA goals for similar construction. The current accident records for the 1300 Contract are shown in Table 7.

Table 7 - Construction Safety Data

Through December 2016	No. of Incidents	Incident Rate[1]	Goal
1300 Contract			
OSHA Recordable Accidents	6	*0.60*	<3.4
Job Transfer/Restricted Duty Incidents	0	0	NA
Lost Time Incidents	1	*0.10*	<1.6
Total Incidents	7	*0.70*	NA
Hours Worked	*1,983,566*		

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

I. PROJECT RISK, RISK MANAGEMENT, AND RISK MITIGATION

RCMP Revision 3 was received by the PMOC on April 30, 2013. The outgoing PMOC provided its final Spot Report to FTA on July 19, 2013. SFMTA submitted a CSP "Contingency Management – Schedule 2012 Update" on May 22, 2013. SFMTA provided a further update of the schedule risk assessment in June 2015 that recommended a reduction of the minimum schedule contingency after demobilization of the tunnel work to 4.0 months. The updated risk assessment was conducted on the approved baseline schedule for the 1300 Contract without updates to reflect the then current status of the construction work and the accumulated construction delays.

The Contract 1300 baseline schedule was adopted in early December 2014. Schedule updates completed by the contractor have been rejected by SFMTA due to logic errors and have not been incorporated into the master program schedule. SFMTA has prepared its own revision of the construction schedule and is using updates to that schedule to maintain the master program schedule. SFMTA is continuing to refine the record of as-built construction activity incorporated in the master schedule. The schedule risk assessment update is now expected from the CSP after

the schedule tool in P6 is further enhanced and a recovery schedule is produced. The risk assessment would be conducted to determine a range of likely actual RSDs based on the updated schedule, possible recovery of accumulated delays, and remaining schedule risks. The timing of the risk assessment will be determined in the coming months.

The most recent Risk Mitigation Meeting attended by the PMOC was the April 2017 Risk Mitigation Meeting for the CSP, which included a review of the status of the top risks ranked "6" or above, of which 11 risks remain. The PMOC noted the following significant items of discussion:

- *The risk of damage to structures in the CTS construction area due to settlement and subsequent failure of utilities remains. SFWD still has not installed gate valves on the two major water mains that traverse the construction zone. These valves are intended to facilitate quick shut-off of water in the event that one of the water lines fails, thereby preventing collateral damage due to water intrusion. Once the valves have been installed, this risk can be re-evaluated and likely reduced.*
- *The risk of prolonged negotiations regarding contract change requests leading to poor relations between SFMTA and TPC resulting in delays and higher costs being addressed through partnering and scheduling negotiating sessions for contract modifications twice per week. It was noted that contract modifications are now being executed on a relatively regular basis.*
- *Two risks related to delays in testing, commissioning, and system start-up are being mitigated through preparation of a more detailed RAP and accompanying schedule of testing and start up activities. SFMTA plans to issue the updated RAP in April. Muni operations will be encouraged to review and provide comments on the RAP.*
- *The risk of being unable to recover schedule delays has occurred. All parties agree that the planned RSD of December 2018 will not be achieved. Mitigation strategies will now focus on establishing an achievable completion date for construction and RSD and then aggressively managing to achieve the revised dates. The revised RSD (expressed as a range of dates) will be identified through the PMOC-facilitated schedule workshop now expected to be conducted in June.*
- *One of the largest quality-related risks –that of the contractor's proposed use of shotcrete for the final lining of the CTS station caverns resulting in poor quality finishes –can be retired. The contractor now has agreed to use formed and poured concrete as called for in the contract documents.*
- *Another risk –risk of project delays and related cost increases due to archeological finds – also can be retired since the excavation at all stations has progressed well below the levels where artifacts can be expected.*

In the opinion of the PMOC, the risk mitigation meeting continues to be an effective forum for identifying threats to the success of the CSP and for developing mitigation measures to reduce

the threats. The project team continues to engage in meaningful discussions during the risk mitigation meetings that help focus attention on the most important issues that could affect project cost, quality, and the completion schedule.

A list of the top risks discussed at the April 2017 Risk Mitigation Meeting is included in Appendix D.

J. ACTION ITEMS

Table 8 on the following page shows the current action items for SFMTA.

Table 8 - SFMTA Action Items for Central Subway Project

Category	NO.	ACTION	DATE OPENED	DUE DATE	DATE CLOSED	COMMENTS
S	**165**	Develop recovery schedule	12/10/15	*7/15/17*		*Schedule workshop planned for June 2017. Recovery schedule to follow within 30 days.*
S, RA	**166**	Update schedule risks based on recovery schedule	12/10/15	*8/15/17*		*Assume that schedule risks are updated 30 days after completion of recovery schedule.*
S	**169**	Review and address logic errors and acceleration strategies in the schedule	6/23/16	*5/1/17*	Ongoing evaluation	*TPC has delivered revised schedule updates through February 2017, which are under review by SFMTA. If accepted, this item can be closed.*
S	**171**	Provide a range of dates for the Revenue Start Date	6/23/16	*8/15/17*		*The updated RSD should be identified based on the schedule risks identified in item 166.*
S	**173**	Integrate testing and commissioning tasks into master program schedule	12/6/2016	*5/15/2017*		Updated RAP with detailed schedule to be delivered in April 2017. Integration into master schedule to follow.
CH	***174***	*Revise contract change tracking process to include the amount of time that has passed since the trend was originally identified.*	*3/24/17*	*TBD*		*Revised action to measure the time needed to resolve contract changes.*

Category	NO.	ACTION	DATE OPENED	DUE DATE	DATE CLOSED	COMMENTS
CH, S	***175***	*SFMTA to implement a process to resolve time impact allowances on the remaining contractor delay claims as soon as possible so that SFMTA and the contractor can focus on the current schedule issues.*	*3/24/17*	*TBD*		

(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.

APPENDIX A. LIST OF ACRONYMS

AC	Actual Cost
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ARE	Assistant Resident Engineer
ARS	Air Replenishment System
ATCS	Advanced Train Control System
AWSS	Alternative Water Supply 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
CFR	Code of Federal Regulations
CLIN	Contract Line Item Number
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
MPS	Master Project Schedule
Muni	Common Public Reference to SFMTA
NCN	Non-conformance Notice
NCR	Non-conformance Report
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
O&M	Operations & Maintenance
OCS	Overhead Contact System
OHA	Operational Hazard Analysis
OP	Oversight Procedure
PCC	Proposed Contract Changes
PE	Preliminary Engineering
PG&E	Pacific Gas & Electric Co.
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
QPRM	Quarterly Progress Review Meeting
QTR	Quarter
RAMP	Real Estate Acquisition Management Plan
RAP	Rail Activation Plan
RCMP	Risk and Contingency Management Plan
RE	Resident Engineer
RFI	Request for Information
ROD	Record of Decision
RSD	Revenue Service Date
SBE	Small Business Enterprise
SCIL	Safety Certifiable Item List
SCP	Safety Certification Plan
SEIS	Supplemental Environmental Impact Statement
SEM	Sequential Excavation Method
SEPP	Security and Emergency Preparedness Plan
SFDPW	San Francisco Department of Public Works
SFFD	San Francisco Fire Department

SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission
SFWD	San Francisco Water Department
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
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
TPC	Tutor Perini Corporation
TSA	Transportation Security Administration
TVA	Threat and Vulnerability Analysis
U.S.C.	United States Code
UMS	Union Square/Market Street Station
VRF	Variable Refrigerant Flow
YBM	Yerba Buena/Moscone Center Station
YOE	Year of Expenditure

APPENDIX B. SAFETY AND SECURITY CHECKLIST

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

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Has the oversight agency reviewed and approved the grantee's SSPP as per Part 659.17?	Y		SFMTA currently operates its LRT system in compliance with an SSPP approved by the CPUC. These plans will be revised, as required, to incorporate the addition of the CSP during the late construction and early testing phase and submitted to the CPUC for approval prior to the planned start of revenue operations.
Has the oversight agency reviewed and approved the grantee's Security Plan or SEPP as per Part 659.21?	Y		See above.
Did the oversight agency participate in the last Quarterly Program Review Meeting?	Y		
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.
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.
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.

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**
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		
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.

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**
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 on the current construction contract (1300).
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 are developed and certified through monthly meetings. Design is complete and construction is underway.
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.
Has the grantee identified safety and security critical tests to be performed prior to passenger operations?	N		Currently being developed.

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 during testing, inspection, and start-up phases?	N		Project is in construction, with RSD more than 2.5 years 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.*
Has the grantee demonstrated through meetings or other methods, the integration of safety and security in the following: - Activation Plan and Procedures - Integrated Test Plan and Procedures - Operations and Maintenance Plan - Emergency Operations Plan	*In Process*		Currently being developed. An Integration Matrix has been implemented for all disciplines including safety and security concerns. Initial draft of the Rail Activation Plan has been completed.
Has the grantee issued final safety and security certification?	N		Project is in the construction phase.
Has the grantee issued the final safety and security verification report?	N		Project is in the construction phase.
Construction Safety			
Does the grantee have a documented/implemented Contractor Safety Program with which it expects contractors to comply?	Y		Health and Safety Construction Safety Standards Revision 3, June 27, 2012.

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**
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.
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 is needed.
Does the grantee conduct site audits of the contractor's performance versus required safety/security procedures?	Y		Safety walks are routinely conducted at each construction site.
Federal Railroad Administration			
If shared track: has grantee submitted its waiver request application to FRA? (Please identify specific regulations for which waivers are being requested.)	N/A		No shared track. No waivers are anticipated.
If shared corridor: has grantee specified specific measures to address shared corridor safety concerns?	N/A		
Is the CHA underway?	N/A		
Other FRA required Hazard Analysis – Fencing, etc.?	N/A		

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**
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:	*April 14, 2017*
Project Name:	Central Subway Project (CSP) New Starts Light Rail Transit
Grantee:	San Francisco Municipal Transportation Agency (SFMTA)
FTA Regional contact:	Mr. Jeffrey S. Davis
FTA Headquarters contact:	Ms. Kim Nguyen

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.
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
10/21/2019			Revenue Operations Date at date of this report

65.2% *Percent Complete Based on Progress* (*January 2017 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
$1,036.0 million	Amount of Expenditures at date of this report from Total Project Budget of $1,578 million
65.6%	Percent Complete based on Expenditures at date of this report
$8.88 million	Unallocated Contingency remaining
$75.79 million	Total Project Contingency (allocated and unallocated contingency as reported by CSP)
$60 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	4Q16	60	60
5	Hold Point 5 – Complete CTS / Tunnels systems inst. April 2018	2Q18	25	25
RSD	PMOC / FTA RSD	4Q19		
CURRENT TOTAL CONTINGENCY *$75.79 Million*				


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

APPENDIX D. TOP PROJECT RISKS

The Project Risk Register was updated in early 2015. All remaining project risks were discussed at the January 2017 risk mitigation meeting. Top risks were discussed at the February 2017 meeting as noted below. The PMOC did not attend the March 2017 risk mitigation meeting.

Top Risks Discussed in the Previous Month:

#52 – The risk of settlement of older utilities above the CTS cross-cut cavern and platform cavern excavations. The ground above and near the excavation is extensively instrumented, and daily meetings are being held to review the recorded data from the instruments. Gate valves have yet to be installed on the water lines above the excavation. These will allow immediate shut-off of water in the event of a failure in one of the lines or ground settlement that could damage the lines and cause a leak.

#205 – The risk that the prolonged process for approval and execution of CMods results in bad blood between SFMTA and the contractor. CMods are now being processed more quickly and the backlog of unresolved changes is being reduced. SFMTA continues to try and streamline the CMod process. *The parties are meeting twice weekly to advance negotiations.*

#229 – Risk that acceptance testing takes longer than planned, resulting in delays to the Revenue Service Date (RSD). A more detailed schedule for testing is included in the updated Rail Activation Plan (RAP).

#230 – Insufficient time for Muni operations involvement in commissioning results in delays and an impact to the RSD. Muni operations and management will be reviewing the RAP. CSP staff to confirm that commissioning schedule is sufficient and that Muni can provide required staff.

#232 – This is the top rated risk and is related to TPC being behind schedule and potentially unable to recover. This risk is increasing since delays have been accruing and the time available to recover is decreasing. Mitigation measures underway were discussed.

#233 – Related to the quality of the shotcrete lining substitution proposed by TPC being inferior. *This risk will be retired since the contractor has agreed to use installation methods in accordance with the contract.*

#234 – This risk that the contractor's proposed alternative Sequential Excavation Method (SEM) excavation method would cause subsidence will continue to be monitored until all SEM operations are completed. Closely related to risk #52. *Settlement that is occurring is within the expected range.*

#237 – Risk that non-conforming work is not identified by the contractor's QC program. The contractor's program of identifying and documenting non-conformances has been working well. Contractor's management is supporting the program. *The rating for this risk will be reduced.*

#238 – This risk is that the Quality Program may be ineffective in processing the nonconformance issues causing schedule impacts. The process of tracking and processing the Non-conformance Reports (NCRs) through improved tracking logs is continuing. The CNCR log is being updated as appropriate. CNCRs are being identified timely and processed appropriately. *The rating of this risk will be reduced.*

#240 – This risk that unresolved assignment of schedule delay responsibility may lead to increased cost continues. SFMTA and the contractor are working on schedule updates and on resolution of the causes for schedule delays that have occurred. Efforts continue to focus on how to reduce the accumulated delays. This risk is closely related to #232.

#36 – Risk of damage to adjacent buildings as a result of compensation grouting. This risk can be retired once excavation reaches the invert level at all stations.

#112 – Risk that a major safety event could halt work. This risk remains.

#247 – Risk that funding allocation for project is not received, resulting in delays. This risk remains.

#248 – Risk that the original project schedule was unachievable. This risk was determined to be duplicative of the other schedule risks and will be removed from the risk register.

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 *2+* years in the future.
Prepare Schedule for Testing	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Finalize Test Procedures	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Conduct System Integrated Testing with trains, including procedures and reports	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Complete Testing Reports	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Operating Plan, Rules, and Training				
Finalize Operating Plan	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Finalize/revise SOPs, manuals, and rulebook as applicable	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Operations Manuals	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Staffing and Operations Plan	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Training of O&M personnel	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Emergency response plan, training, and drills	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Vehicle Maintenance Plan, Equipment, Facilities, and Training				
Rail Fleet Management Plan	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**
Maintenance Schedules and Procedures	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Spare Parts Requirements	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Maintenance Manuals	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Maintenance Training	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Facility and Right-of-way Maintenance Plan, Equipment, Facilities, and Training				
Maintenance Schedules and Procedures	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Spare Parts Requirements	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Maintenance Manuals	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Maintenance Training	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Pre-Revenue Operations				
Finalize and/or update RAP and/or Pre-Revenue Operations Plan	4/2/2015	TBD	TBD	Initial draft, including task identification complete. *A revised draft with additional detail and a schedule for testing and pre-revenue activities is to be submitted with the 2017 update of the PMP.*
Implement Rail Activation Committee	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Shadow operations	TBD	TBD	TBD	Project is in construction, with RSD 2+ 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**
Develop/revise SSPP & Security Plan (approved by SSO)	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
FTA Office of Safety & Security Readiness Review	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
PMOC OP-54 Readiness for Revenue Operations Review Report, Phase I	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Conduct Operational Hazard Analysis (OHA) and resolve other hazards/ vulnerabilities	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Pre-Revenue Operations	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Public Outreach				
Develop Safety Outreach Plan	TBD	TBD	TBD	Project is in construction, with RSD *2*+ years in the future.
Provide Community Outreach	TBD	TBD	TBD	Project is in construction, with RSD *2*+ years in the future.
Grand Opening Plan	TBD	TBD	TBD	Project is in construction, with RSD *2*+ years in the future.
Construction Close Out				
Close Out of Non-Conformance Reports	Ongoing	*09/06/2019*	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	12/17/2018	*09/06/2019*	TBD	Punch list completion expected at final completion of 1300 Contract.
Certificates of Occupancy/Substantial Completion	TBD	*05/09/2019*	TBD	
Safety, Security, and Fire-life Safety Certifications				
Update/Finalize SSMP			2/18/2014	Revision 2 completed.
Finalize and/or update SCIL and SSCP			10/10/2008	Revision 0.

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
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	*09/06/2019*	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	*08/22/2019*		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	
State Safety Oversight (SSO) final certification/signature	TBD	*09/30/2019*		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 *2+* years in the future.
Third Party/Agency Approvals Necessary for Revenue Service	TBD	TBD	TBD	Project is in construction, with RSD *2+* 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**
Revenue Service				
Target Revenue Service Date	-	*10/21/2019*		Current forecast RSD. Recovery schedule to be prepared.
FFGA Revenue Service Date	-	12/31/2018		

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.

LL#	Date	Phase	Category	Subject	Lesson Learned
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 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.

LL#	Date	Phase	Category	Subject	Lesson Learned
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.
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	1-30-14	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	6-30-14	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.

LL#	Date	Phase	Category	Subject	Lesson Learned
17	4-10-15	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. When the safety and structural integrity of a construction site depends on maintain soil conditions with the use of mechanical systems, the site should be continuously staffed or monitoring devices at the site should be continuously monitored from a remote location to assure that the expected soil conditions are maintained.
18	4-10-15	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. The quick action to involve the appropriate parties resulted in satisfactory handling of the artifacts with minimal delays to the construction schedule.

LL#	Date	Phase	Category	Subject	Lesson Learned
19	5-11-15	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. In the future, the latest design information, including submittals and related designer notes, will be used to inspect reinforcing steel prior to concrete placement.
20	9-28-15	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 applications and 4-week look-ahead schedules from the contractor. Lesson learned – 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.

LL#	Date	Phase	Category	Subject	Lesson Learned
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 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. As a result of the pre-planning and assembly of the complex trackwork, the final assembly was completed without the need for field adjustments and in less time than planned. This was an effective approach to mitigate the risks associated with the installation of complex custom track components in an operating transit line.
22	3-1-17	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 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.

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 *December 2016.*

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

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

Contract No.	**1252**	
Contract Description:	**Tunnels**	
Status:	Final completion achieved. Financial close out underway.	
Cost:	Original Contract Value	$233.58 million
	Approved Change Orders	$8.26 million
	Current Contract Value	$241.84 million
	Expended to Date	$234.88 million; $6.2 million is paid from non-project funds
	% Expended	97.1%
	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	*$4.82 million*
	Current Contract Value	*$844.49 million*
	Expended to Date	*$448.22 million*
	% Expended	*53.1%*
	SBE Participation	*19.7%*
Schedule:	NTP issued June 17, 2013. Substantial Completion planned February 10, 2018 and *forecast May 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	$7,887,101
	% Expended	*99.3%*
	SBE Participation	29.7%
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	$35,059,252
	Approved Change Orders	$1,460,360
	Current Contract Value	$36,519,612
	Expended to Date	*$35,207,277*
	% Expended	*96.4%*
	SBE Participation	*37.5%*
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	$16,822,238
	Approved Change Orders	$312,814
	Current Contract Value	$17,232,252
	Expended to Date	*$25,832,169*
	% Expended	*149.9%*
	SBE Participation	*26.8%*
Schedule:		
Issues or Concerns:	*Contract is significantly over budget.*	

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	*$58,536,776*
	% Expended	*68.8%*
	SBE Participation	*39.7%*
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	*$9,602,526*
	% Expended	*56.1%*
	SBE Participation	*28.9%*
Schedule:		
Issues or Concerns:		