MONTHLY REPORT
December 2015

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

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PMOC Contract No.: DTFT6014D00010
Task Order No. 5
Project No.: FTA-13-0294

Work Order Number: 001
OPs Referenced: 01 and 25
CLIN 0002B

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Time on project: *19 months*

EXECUTIVE SUMMARY

Project Description

The Central Subway Project (CSP) is constructing 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 light rail line along the densely populated 3rd Street corridor. It began revenue service 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 (SoMa), 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) will be procured for the CSP as part of a larger procurement that will replace the entire LRV fleet. Average weekday boardings are projected at 43,521 in 2030.

Project Status

The Full Funding Grant Agreement (FFGA) was signed on October 11, 2012. Design is complete, and the project has been under construction since February 2010. *At the end of November 2015, the project was 55.36% complete based on expenditures.* There was one active construction contract: 1300 Stations and Systems/Trackwork. The 1252 Contract for construction of the twin subway tunnels achieved final completion on May 15, 2015. *Determination of the final contract cost and financial close out of the 1252 Contract will occur in the near future.*

The 1300 Contract was 37.8% complete on the basis of incurred cost at the end of November 2015. Substantial completion is scheduled for February 2018, but the SFMTA *November* Monthly Progress Report states that the most current accepted contractor schedule update still indicates that the station construction work is nine months behind schedule, with completion forecast in November 2018. The contractor, Tutor Perini Corporation (TPC), has been directed to prepare a recovery schedule to show how the accumulated delays to the construction work can be recovered. SFMTA has not yet received the recovery schedule from TPC, but is pursuing discussions to recover some slippage through changes in the sequence of work and through focused management attention on the factors that are impacting the progress of the work**.** As a result of the forecast delay in the completion of station construction, the current program master schedule, which incorporates the contractor's schedule updates through *November 2015*, indicates that the Revenue Service Date (RSD) will be achieved in May 2019, five months later than the date required in the FFGA. The entire schedule contingency in the program master schedule has now been consumed by the delays to the station construction, and the project schedule now has negative float. Further delays to the station construction may push the forecast RSD even later.

In the opinion of the Project Management Oversight Contractor (PMOC), measures implemented to recover the accumulated delays to the station construction work are not yet showing results. The opportunities to recover the schedule delays will be more limited as time passes, so it is very important for SFMTA and the contractor to work collaboratively to identify and implement schedule containment strategies immediately. *The PMOC facilitated a schedule recovery workshop for the CSP on November 18 and 19, 2015. The workshop recommended that SFMTA work with the contractor to make corrections to the schedule logic and, if the contractor refuses to implement the corrections, SFMTA should make the corrections and maintain its own schedule tool. In addition to improvements to the schedule forecasting tool, the workshop identified potential schedule containment strategies that should be evaluated and further developed by SFMTA and the contractor.*

Table 1 - Core Accountability Items

Project Status:		**Original at FFGA:**	**Current Estimate:**
Cost	Cost Estimate	$1,578,300,000	$1,578,300,000
Contingency	Unallocated Contingency	$74,722,000	$24,519,456
	Total Contingency (Allocated Plus Unallocated, Including Approved Contract Changes)	$185,500,000	$84,322,397
Schedule	Revenue Service Date	12/26/2018	05/2019 (forecast)
Total Project Percent Complete	Based on Expenditures	*55.36%*	
	Based on Earned Value	57.93% (no change from previous month)	

Major Issues	**Status**	**Comments/Planned Action**
Schedule Contingency	Based on the status of construction reflected in the updated station construction schedule, there is negative schedule float of 5.0 months based on the available schedule data.	The minimum schedule contingency agreed to at this stage of the project is *6.0* months. The PMOC conducted schedule containment workshops on November 18 and 19, 2015. *The results of the workshop are summarized in this report.*

Major Issues	Status	Comments/Planned Action
Cost Contingency	The current Total Contingency is $84.3 million. The FTA recommends a minimum contingency level of $60 million.	The availability of excess cost contingency may make it possible to implement strategies to accelerate the construction work that could increase project cost.
Technical Capacity and Capability	All management positions in the organization are filled.	The PMOC is assessing the effectiveness of the SFMTA CSP team in managing the project through routine on-site monitoring.
Date of Next Quarterly Meeting:		*February 3, 2015*

Earned Value (EV): $*914,320,590*, *an increase of $9,497 from October. This low increase in earned value is due to continuing challenges with the project schedule and the earned value reporting methodology that is based on the schedule.*

Planned Value: *$1,142,070,298, an increase of $12.24 million from October*.

Actual Cost: $*873,794,546*, *an increase of $11.24 million from October*.

Cost Performance Index (CPI): *1.05.* 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). SFMTA believes that TPC is under-reporting actual costs, thereby resulting in an overstated CPI.

Schedule Performance Index (SPI): *0.80*. 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 declined slightly from the October reporting period, indicating that schedule recovery strategies to date have not had a positive impact on the progress of construction.*

Contingency

Cost Contingency

The total available contingency (approved contingency less approved contract changes) is $84,322,397, which is above the minimum required contingency of $60 million. Over $21,000,000 in allocated contingency was previously transferred out of the Tunnel project as a result of the successful, under-budget completion of this major element of work. Unallocated contingency is now $24.5 million. *SFMTA reported that the final outstanding payable amount for an access license to accommodate compensation grouting was determined by the courts and paid to the property owner at 19 Stockton Street. This should be the final cost incurred for right-of-way for the project, allowing the contingency remaining in the right-of-way cost category to be returned to unallocated contingency. As of the November 2016 reporting period, allocated contingency for right-of-way was over $5 million.* **In the opinion of the PMOC, the available**

cost contingency is sufficient to provide reasonable assurance of on-budget completion of the project. However, the accumulated delays to the construction raise the potential for contractor time impact claims and, to the extent that the delays are determined to be SFMTA's responsibility, associated extra costs. To date the contractor has not demonstrated that SFMTA has any responsibility for the delays.

Schedule Contingency

The Program Master Schedule for the Central Subway Project now shows negative buffer float and a forecast RSD five months later than required. An approved, updated 1300 Contract schedule is now available and has been incorporated into the master schedule, with the latest master schedule incorporating progress through *November 2015. SFMTA has requested the contractor to make changes in the schedule logic to more accurately reflect the planned work. As of the contractor's November 2015 schedule submittal, those changes in schedule logic have not been implemented.* SFMTA reports that the contractor's latest approved schedule update continues to indicate nine months of delay to the 1300 Contract. The agreed level of schedule contingency after demobilization of the tunnel work is 6.0 months. **In the opinion of the PMOC, SFMTA needs to identify at least 11 months of time savings for the remaining work in the CSP in order to have sufficient schedule float to provide reasonable assurance of on-time completion of the project.**

PMOC Observations, Opinions, and Concerns

The latest program master schedule forecasts that the RSD will be five months later than planned. In the opinion of the PMOC, significant improvements in work productivity *and or extended work shifts and additional crews* will need to occur in order for the accumulated delays to be sufficiently recovered to meet the required RSD of December 2018.

In the opinion of the PMOC, the first round of short-term schedule achievement milestones had mixed results and there appears to have been little impact on the forecast completion date for construction. Now that an adopted baseline schedule and accepted updates to the schedule are available, SFMTA is encouraged to work with the contractor to identify schedule recovery strategies. SFMTA is further encouraged to continue to improve the collaboration between the agency construction staff and the contractor so as to advance the construction work. *This collaboration includes the identification of* additional short-term and longer-term key performance targets that will help to advance critical path work based on the approved, fully-updated construction schedule.

In the opinion of the PMOC, SFMTA should work with the contractor to make changes to the project schedule logic in order to create an accurate and useful project planning tool. The CSP Schedule Workshop held in November 2015 concluded that if TPC is not willing or able to make the necessary improvements to the schedule, SFMTA should create and maintain its own schedule planning and monitoring tool. Table 9 in the main body of this report includes three action items related to the development of the schedule tool and preparation of a Recovery Schedule for the project. Furthermore, SFMTA should immediately address the apparent

problems with earned value estimation and reporting to provide an accurate reflection of construction progress.

In the opinion of the PMOC, SFMTA should monitor the schedule impact of the contractor's recent decision not to pursue the alternative construction sequence for the cross-cut cavern at CTS, which could lead to further delays to the project critical path. The contractor's baseline construction schedule assumed the alternate sequence and the sequence called for in the contract may require more time.

In accordance with FTA guidelines, a minimum of 6.0 months of schedule contingency is recommended at this phase of the project. At present there is negative float in the schedule, resulting in a late date for project completion. In the opinion of the PMOC, SFMTA needs to identify at least 11 months of time savings for the remaining work in the CSP in order to have sufficient schedule float to provide reasonable assurance of on-time completion of the project. The opportunities to recover the schedule delays will be more limited as time passes, so it is very important for SFMTA and the contractor to immediately work collaboratively to identify and implement schedule containment strategies.

In the opinion of the PMOC, the total cost contingency, including unallocated contingency and less identified trends, of *10.5%* of the potential remaining spending is sufficient to provide reasonable assurance of on-budget completion of the project. The available contingency is well above the recommended minimum of $60 million. However, if efforts to recover the accumulated schedule delays are unsuccessful and SFMTA is shown to be responsible for portions of the delay, there is a potential for increased project cost. To date the contractor has not demonstrated that SFMTA is responsible for any of the accumulated delays.

In the opinion of the PMOC, a number of very large potential changes to the 1300 Contract have arisen in the past month. These potential changes and the large number of previously identified pending contract changes could lead to significant increases in the cost of the 1300 Contract. The allocated contingency for the 1300 Contract, adjusted for potential changes to the contract, is only 0.5% of the remaining work. Unallocated contingency will likely need to be transferred to the 1300 Contract before work is complete.

The PMOC notes that as of the end of November 2015 no change orders had been executed for the 1300 Contract in many months and the backlog of pending change orders was quite large. *SFMTA reported that several contract modifications were executed in December 2015 and that a number of additional modifications should be executed in early 2016.*

In the opinion of the PMOC, the Risk Mitigation meeting continues to be an effective forum for identifying potential risks and developing mitigation measures to limit the impact of the risks. The development of an effective strategy to address risks related to the building construction adjacent to the YBM station is an excellent example of the benefits of the meeting. Senior project management and the station Resident Engineer (RE) worked together to identify an approach to limiting this risk during the meeting.

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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 contract relocated utilities within the footprint of the proposed YBM Station, and work is complete. All cost claims by the contractor have been settled.

Contract 1251 (UR #2). This contract relocated utility lines within the footprint of the proposed UMS Station and temporarily rerouted existing trolley coach lines around the construction zone. The work is complete. There is an outstanding cost claim by the contractor for this contract.

Contract 1252 Tunnel. This contract completed the construction of 1.5 miles of twin tunnels by tunnel boring machines and the tunnel portal and retrieval shaft. Final completion has been achieved, and final close out will occur soon.

SFMTA reported that a meeting with the contractor to agree on final close out terms was held on December 16, 2015. There were no major points of disagreement and SFMTA expects that the net cost change to the contract will be minor, as the cost increases for extra work and cost decreases for deleted work and contractor payments for construction-related damage are expected to be approximately equal.

Contract 1300 (Combination of UMS, CTS, YBM, and STS). This contract is constructing three underground stations, one surface station, all surface works required for the installation of LRT between 4th and King streets and the tunnel portal, and all LRT track and systems components.

As of the end of November 2015, the construction of the Stations and Surface, Track, and Systems contract was 37.8% complete on the basis of cost and 43.0% complete on the basis of completed construction. SFMTA believes that the reported cost to date is understated due to issues with the cost-loading of the contractor's schedule for completed tasks. *Earned value to date reported for the 1300 Contract was lower in November 2015 than October 2015 indicating that there are problems with both the cost and the earned value components of the project progress reporting system.* ***In the opinion of the PMOC, SFMTA should immediately address the problems with cost and earned value estimation and reporting to provide an accurate reflection of construction progress.***

Union Square/Market Street Station (UMS): *The roof deck of the Ellis Street Annex was completed.* The triangle formed by Market Street, the westbound lane of Ellis Street, and the western end of the Ellis Street Annex remained uncovered until *the interface between the new CSP structure and the existing Powell Street Station could be shown to be watertight. That work*

and subsequent backfilling and paving was expected to be completed in mid-December but extended into January due to continuing water leakage at the seismic joint between the new and old structures. Interior structural work on the areas of the Union Square Garage that remained closed to the public continued in December. Work at the main station box was suspended for the Holiday Moratorium. Submittals and Requests for Information (RFIs) related to the start-up of jet grouting and the completion of the station roof deck were processed in order to support the start of work in early January. SFMTA and the contractor worked to prepare for the construction of the roof deck at the O'Farrell Street intersection. In order to avoid concurrent impacts to eastbound and westbound bus traffic crossing Stockton Street, work to open up the Geary Street intersection will be completed prior to starting work that will cause major impacts to the O'Farrell Street intersection. At the North Concourse, final utility work and Muni power duct bank revisions were underway to support backfilling and restoration of Stockton Street and the Geary Street intersection. Stockton Street is expected to be backfilled and paved north of Geary Street in late January 2016.

Chinatown Station (CTS): *Level 3 struts in the headhouse were installed in December, with excavation toward level 4 starting late in December. Construction work on the composite walls that will help to support the cross-cut cavern from the headhouse to the station platforms continued in December. The contractor had planned to pursue an alternative construction sequence that included starting the drilling for the barrel vault at the top of the cavern prior to completion of all of the composite walls. However, the contractor decided not to pursue this construction sequence when SFMTA required the contractor's engineer to provide calculations demonstrating that the alternate sequence would not lead to settlement and possible damage to adjacent structures. Preparations were made for placement of Controlled Density Fill (CDF) in the tunnels to provide support while the cross-cut cavern from the headhouse to the platforms is completed. The CDF was expected to be pumped into the tunnels in January. Excavation and installation of temporary support for the North Access shaft started in December.* Temporary construction power was energized in December. ***In the opinion of the PMOC, the contractor's decision not to pursue the alternative construction sequence for the cross-cut cavern may result in further delays to the project critical path. The contractor's baseline construction schedule assumed the alternate sequence and the sequence called for in the contract may require more time.***

Yerba Buena/Moscone Station (YBM): Traffic continues to flow on the two traffic lanes on the east side of 4th Street while construction staging is occurring on the western two lanes of 4th Street. *Construction of a new building by another contractor continues at the northwest corner of Clementina Street and 4th Street*. Thus far, the construction of this building has been effectively coordinated with the ongoing station construction and has not caused any impacts to progress on the station work. *SFMTA is working to complete the remaining utility work in 4th Street before the private building contractor requires space for a construction lift along 4th Street. Excavation in the headhouse progressed to the fourth level of struts, which are scheduled to be placed in January. In the station box, the mezzanine level slab was completed in December.*

Excavation support for that slab will be removed and excavation will proceed to the fourth level of struts in January.

Surface, Track, and Systems (STS): Muni Traction Power duct bank (MRY), alternative water supply system (AWSS), street lighting, traffic signal, and sewer work continued. *The PMOC was informed that minor problems with the geometry of the curves connecting the T Line to the Embarcadero are still being evaluated. An additional problem with one of the track circuits in the crossing surfaced in December. There appears to be a partial short in the circuit, which is causing a voltage drop. SFMTA is able to use the track circuit for revenue service on the T Line by increasing the input voltage to the circuit. The contractor, designer, and SFMTA are working to establish the causes and necessary repairs for both issues.* The contractor continued preparations for work in the tunnel. *Cleaning of the tunnel continued and was expected to be completed in January. The contractor continued staging reinforcing steel inside the tunnel in preparation for placement of the track slab.*

In the opinion of the PMOC, the contractor and CSP staff members are now working cooperatively to advance progress on construction of the three CSP subway stations. However, there has been only minor recovery of the construction schedule from accumulated delays. SFMTA and the contractor established short-term performance milestones as a way to focus the combined efforts of the contractor and SFMTA project staff on advancing the work. The results for the first set of milestones were mixed, with several of the target dates being missed. *New milestones have been identified for critical path work at CTS. These milestones are discussed in the Schedule section of this report.* **The PMOC supports the establishment of interim performance milestones as a way to encourage effective team collaboration and *encourages SFMTA and the contractor to monitor the additional targets that have been established based on the critical path of the updated and approved construction schedule.***

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

Bay Area Rapid Transit (BART)

No updates to report.

Caltrans

No updates to report.

CPUC Communications

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/FTA Quarterly Progress Review Meetings (QPRMs). *SFMTA reported that all certifiable items related to the tunnel construction had been certified by the FLSC and accepted by SFMTA's Safety department. The FLSC will begin to address the certifiable items list for the Stations Contract at its next meeting.*

San Francisco Public Utilities Commission (SFPUC)

No updates to report.

San Francisco Department of Public Works (SFDPW)

No updates to report.

San Francisco Parks and Recreation Department

No updates to report.

Private Property Owners

For 19 Stockton Street (Armani Exchange Building), condemnation was filed in February 2013 for a license to install monitoring equipment and compensation grouting tubes. Pre-judgment possession was granted October 3, 2013, allowing the City access to install the monitoring equipment and compensation grout tubes at the property. A settlement conference was held in November 2014 in advance of the compensation trial, which was held as scheduled in December. *The judgment regarding the value of the license has been rendered and the determined value was paid to the property owner. This represents the final real estate transaction for the project. Since no further real estate costs should be incurred the remaining allocated contingency for real estate should be able to be returned to unallocated contingency for the project.*

The project has installed settlement monitoring equipment at sensitive buildings adjacent to the project. There are now 370 total licenses for monitoring equipment (ten were added to address the potential Pagoda retrieval shaft) and property agreements. *The monitoring equipment has been removed or transferred to the station contractor, along with the associated monitoring data.*

Vehicle Status of Design, Procurement, Testing, and Integration

Vehicle design is underway by Siemens Corporation for 4 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, with the first cars due to be delivered to SFMTA in 2016, well ahead of the CSP opening date. *The San Francisco County Transportation Authority (SFCTA) oversight manager for the CSP reported that he had visited the assembly plant and observed the prototype vehicle being assembled. That vehicle is scheduled for delivery to San Francisco in June 2016.*

Real Estate

All project right-of-way has been acquired, and all commercial and residential relocations are complete. *The final value judgment related to the acquisition of a license for monitoring and compensation grouting at 19 Stockton Street was rendered and the associated payment was made. This should be the final payment for real estate by the project.*

Labor Relations and Policies

Appendix G of the Project Monthly Report details the Small Business Enterprise (SBE) goals and actual participation on each contract. SFMTA contract goals range from 6 percent to 30 percent 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

No updates to report.

B. PROJECT MANAGEMENT PLAN AND SUB-PLAN IMPLEMENTATION

Project Management Plan (PMP)

The latest update of the PMP was received by the PMOC in early May 2015. This plan includes the initial draft of the Rail Activation Plan. *SFMTA plans to issue the next update of the PMP in April 2016.*

Environmental Assessment/Mitigation Plan/Archaeological Plans

The PMOC received the Third Quarter 2015 Mitigation Monitoring Reporting Program (MMRP) update from SFMTA on November 19, 2015. ***Based on its review of the Third Quarter MMRP*, the PMOC concludes that SFMTA is conducting monitoring in accordance with the established plan and that SFMTA is implementing appropriate mitigation actions when conditions that could lead to significant impacts are encountered.**

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 *and the last remaining real estate payment has been made.*

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

See section F.

Safety and Security Management Plan (SSMP)

See section G.

Risk and Contingency Management Plan (RCMP)

See section H.

C. PROJECT MANAGEMENT CAPABILITY AND CAPACITY

The PMOC received the latest update of the PMP in early May 2015. *An update is expected in April 2016.*

Agency Staff

Total project staff levels are close to the planned values. SFMTA reported that no positions are open and unfilled.

Contractor Staff

There were no significant changes in contractor project management staff.

D. PROJECT COST STATUS

Project Cost Control Systems

SFMTA continued its efforts 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. *Reports showing the status of contract changes are reviewed weekly at the status meetings for each of the work packages in the 1300 Contract.* **In the opinion of the PMOC, the trend and change management summary reports now being published by SFMTA improve the accuracy of forecasts of cost at completion and should help to expedite the completion of the contract modification process for justified contract changes.** ***However, as of the end of November no contract modifications had been executed for many months, although there were many pending modifications that were in process for an extended time.*** *Thus far, the slow progress of finalizing and executing CMods does not appear to be negatively affecting the progress of work or the business relationship between SFMTA and the contractor.*

Project Cost

Cost estimate: $1.5783 billion.

Total contingency: *$84.32 million* (minimum contingency is $60 million), *unchanged from October.*

Total net incurred costs: $873,794,546, an increase of $11.24 million from October (55.36% of the total project budget).

Current funding level: $1,179,794,000 (74.8% of the total project budget).

Earned Value (EV): *$914,320,590, essentially unchanged from October.*

Planned Value: *$1,142,070,298, an increase of $12.24 million from October.*

Cost Performance Index (CPI): *1.05*. SFMTA believes that TPC is under-reporting actual costs, thereby resulting in an overstated CPI.

CPI is a measure of cost efficiency on a project. It is the ratio of EV to actual cost value. A CPI equal to or greater than 1 indicates a cost under run 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.

An outstanding claim by the 1251 contractor of $3.8 million is still pending resolution. SFMTA is of the opinion that the claim on the 1251 Contract has less merit than the previously settled claim on the 1250 Contract. Potential costs for the 1251 Contract claim are not being carried in the project Trend Log.

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.

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

	1252 - Tunnel	1300 Stations, STS
Original Contract	233,584,015	839,676,396
Approved Contingency	2,484,953	20,000,000
Extra Budget for Non-Project Costs	6,173,508	
Approved Budget	236,068,968	859,676,396
Approved Changes	1,421,807	(1,016,585)
Current Contract (1252 does not include non-project costs)	235,005,822	838,659,811
Remaining Contingency	1,063,146	21,016,585
Potential Changes (Trends)	(77,798)	*18,310,210*
Potential Contract	234,928,024	*856,970,025*
Contingency Less Trends	1,140,944	*2,706,375*
Spent to Date	234,616,104	*325,088,490*
Potential Left to Spend	311,920	*531,881,535*
Contingency Less Trends as % of Potential Cost to Complete	365.8%	*0.5%*

[1] As reported in the *November* 2015 Central Subway Project Monthly Progress Report – SFMTA.

SFMTA previously transferred more than $21 million of remaining contingency that had been allocated to the 1252 Contract to unallocated contingency. The remaining contingency, less identified trends, represents 366% of the potential left to spend for Contract 1252 and *0.5%* of the potential left to spend for Contract 1300. The combined allocated contingency for all construction work less identified trends represents about *0.9%* of the potential remaining construction expenditure. **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 likely not sufficient to complete the contract, and the overall allocated contingency is inadequate for the percentage completion level of construction. However, there appears to be sufficient unallocated contingency and excess allocated contingency from other program components for successful completion of the program. However, increased cost claims from the 1300 contractor due to delays could consume some of the available contingency *to the extent that the contractor can demonstrate that SFMTA is responsible for the delays. Thus far, the contractor has not demonstrated that delays were caused by SFMTA or differing conditions.***

Table 3 shows the overall budget, trends, and contingency status for the entire Central Subway program. **As shown, the total contingency, including unallocated contingency and less identified trends, represents 10.4% of the potential remaining spending, which, in the opinion of the PMOC, is sufficient to provide reasonable assurance of on-budget completion of the project.**

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

	Total Construction	Right of Way	Vehicles	Professional Services	Unallocated Contingency	Total Program
Original Contract	1,130,842,772	36,511,799	24,108,712	310,518,041		1,501,981,324
Approved Contingency	30,301,196	1,000,000	2,276,941	18,221,079	10,019,456	61,818,672
Extra Budget for Non – Project Costs	6,173,508					
Approved Budget (w/o Extra Launch Shaft Cost)	1,161,143,968	37,511,799	26,385,653	328,739,120	10,019,456	1,563,799,996
Approved Changes	7,061,465	(4,265,478)	(10,799,712)			(8,003,725)
Current Contract	1,137,904,237	32,246,321	13,309,000	310,518,041	10,019,456	1,493,977,599
Remaining Contingency	23,239,731	5,265,478	13,076,653	18,221,079	24,519,456	84,322,397
Potential Changes (Trends)	*18,232,412*	-	-	-		*18,232,412*
Potential Contract	*1,156,136,653*	*32,246,321*	*13,309,000*	*310,518,041*		*1,512,210,015*

	Total Construction	Right of Way	Vehicles	Professional Services	Unallocated Contingency	Total Program
Contingency Less Trends	*5,007,319*	*5,265,478*	*13,076,653*	*18,221,079*	*24,519,456*	*66,089,985*
Spent to Date	*618,732,399*	*30,467,005*	*2,147,204*	*222,447,938*		*873,794,546*
Potential Left to Spend	*537,404,254*	*1,779,316*	*11,161,796*	*88,070,103*		*638,415,469*
Contingency Less Trends/Potential Left to Spend	*0.9%*	*295.9%*	*117.2%*	*20.7%*		*10.4%*

[2] As reported in the *November 2015* Central Subway Project Monthly Progress Report – SFMTA.

Change Order Control

SFMTA is still estimating that additional CMods with a net reduction in contract value of $77,798 will be executed as part of contract close out for the 1252 Contract. *SFMTA held a negotiating session with the 1252 contractor on December 16, 2015 in an effort to resolve the basis for closing out the contract. SFMTA reported that this meeting resulted in a basic agreement on the terms of the close out and that it is expected that the contract cost will not change substantially when the close out is completed. Cost increases for extra work are expected to be offset by cost decreases for deleted work and cost claims against the contractor. Contract close out is expected to be achieved soon.*

SFMTA is maintaining its management tools for tracking potential contract changes for the 1300 Contract. The latest summary report is titled, "CN1300 Trend Statistics" and is dated January 6, 2016. This report shows that 13 contract modifications have been executed for a net increase in the contract value of $86,421. Three contract modifications were executed after the November CSP Progress Report was published. ***In the opinion of the PMOC, contract modifications are still taking an inordinate amount of time to be executed.*** *Change Order Requests (generated by the contractor) that have been determined to have merit and Proposed Contract Changes (generated by SFMTA) have an expected value of $16,789,490 in increased contract value. An additional 228 items are being tracked in the Trend Log with a net value of $9.00 million in possible contract value increases.* Of these, 121 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 91 items have been voided and are carried at no cost. There are two notices of potential claims by the contractor and 14 items are "open" waiting for a determination of merit.

The most recent version of the complete Trend Statistics Summary for the 1300 Contract dated January 6, 2016 shows a total potential increase in contract cost of $25,903,916, including the $86.4 thousand in contract cost increases executed thus far. The total estimated cost impact of the identified trends increased by about $8.5 million from December to January. The following trend items with potential cost increases in excess of $250,000 are identified in the Trend Log:

1. Changes to traffic signals and street lights - $298,307

2. Change to grade 50 steel from specified grade 70 steel (due to availability and Buy America issues) - $595,197
3. Extra trucking costs for contaminated soil at CTS - $1,714,205
4. Harder rock than anticipated for CTS slurry wall excavation - $2,820,600
5. Delays to installation of tangent piles at UMS - $1,074,229 (reduced from previous estimate)
6. Changes to underpinning requirements for support of UMS Garage - $474,470
7. Changes in construction sequence for UMS Garage - $500,000
8. Obstructions to jet grout placement at UMS - $965,550
9. Additional instrumentation for detection of ground movement - $429,777
10. 12" water line conflict at UMS - $293,538
11. Changes in installation requirements for art glass at UMS - $681,978
12. Additional instrumentation for station construction - $429,777
13. New emergency stop switch for CSP operations - $315,001
14. Removal of temporary facilities from 1252 Contract in tunnel - $345,001
15. Hydrocarbons in excavated soil at CTS headhouse - $500,000
16. 12" water line conflict at YBM - $355,711
17. Additional traffic control requirements at 4th and King - $675,001
18. *Additional traffic control requirements for STS work package - $1,032,302*
19. Changes to AWSS layout at 4th and King - $295,269
20. Changes in requirements for pre-stressing permanent struts at UMS - $250,001
21. *Cost of changes to the design to Chinatown Station to accommodate the plaza requested by the community - $4,500,000 (costs will be paid by funds outside the program)*
22. *Additional construction joints in tunnel invert/track slabs - $2,061,699*

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

1. Deletion of compensation grouting bid items at YBM - ($1,833,869)
2. Deletion of the Air Replenishment System (ARS) - ($4,689,000)
3. Building cost savings from deletion of ARS - ($600,000)

In the opinion of the PMOC, a number of very large potential changes have arisen in the past month. These potential changes and the large number of previously identified pending contract changes could lead to significant increases in the cost of the 1300 Contract. The

allocated contingency, adjusted for potential changes to the Contract, is only 0.5% of the remaining work. Unallocated contingency will likely need to be transferred to the 1300 Contract before work is complete.

Funding and Expenditures

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

Table 4 - Project Funding

Source	Committed ($1,000)	Awarded ($1,000)
Federal		
New Starts	942,200	619,196
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

The contractor's November 2015 schedule update indicated that the construction work continued to be nine months behind schedule. The critical path for the construction work continues to flow through the construction of CTS. ***In the opinion of the PMOC, the pending change in the construction sequence for the barrel vault over the cross-cut cavern at CTS could result in a further extension of the construction duration.*** The projected RSD is still forecast for May 2019, five months later than planned. The most recent schedule update still shows that there is negative float on the project critical path and that time savings must be identified for the remaining work if the project is to be completed on time.

The PMOC facilitated a Schedule Workshop with SFMTA project management and project controls staff on November 18 and 19, 2015. The goal of the workshop was to identify strategies to help recover the accumulated delays to the Stations, Systems and Surface works contract and to achieve the revenue service date (RSD) required in the Full Funding Grant Agreement (FFGA) for the project. Objectives were to:

- *identify refinements to the schedule for the project that has been developed by the contractor, TPC in the Primavera P6 scheduling tool;*

- *identify changes in schedule logic that would save time;*
- *identify ways to streamline the construction process to speed up delivery of the project;*
- *identify ways to re-sequence the construction work to save time; and*
- *explore ways to reduce the time between substantial completion of the construction work and the RSD.*

An initial proposed action plan for developing the necessary tool 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 3-week look aheads 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 considers maintaining its own schedule in parallel with TPC and continues to work with TPC to accept the revisions through monthly schedule reconciliation meetings.

As of the November SFMTA Progress Report for CSP, SFMTA had completed items 1 through 3, but the contractor had not yet responded to SFMTA's schedule improvements and had not submitted a schedule update incorporating those improvements. SFMTA is planning to issue a letter to the contractor requesting that the schedule improvements be made and that a recovery schedule be developed in accordance with the requirements of the contract. SFMTA has set a date at the end of February 2016 to proceed with its own parallel schedule if the contractor does not comply with the direction in the letter.

As a means of encouraging better collaboration among the project participants, SFMTA and TPC identified several short-term performance targets that were considered to be crucial to the overall progress of the work. The parties believed that successful completion of the identified work according to the adopted schedule would reinforce the working relationships on the team and provide confidence that the team members could work cooperatively toward important schedule objectives. SFMTA had hoped that longer-term plans for schedule recovery could be developed based on the working relationships established through the focus on short-term performance

targets. The results of the focus on the short-term performance targets were mixed, with some milestones being achieved and others missed. Table 5 shows the final status of the initial set of identified milestones.

Table 5 - Status of Central Subway Station Construction Milestones[3]

Milestone	*Target Date*	*Status*
Complete submittal for Union Square Garage (UMS)	July 13, 2015	Completed on time
Complete station roof slab and related work at Geary intersection (UMS)	14 weeks	*Completed later than planned*
Complete station roof deck	November 26, 2015	*Approximately 2/3 of the deck was completed prior to the start of the holiday construction moratorium*
Restore traffic on Ellis Street by Labor Day (UMS)	Revised to Late October 2015	*Partially achieved in late November 2015*
Open all lanes on 4th and start excavation of station box (YBM)	September 7, 2015	Two lanes opened on east side, completed 9/13/15. *Traffic remains restricted to two lanes*
Open north side of 4th and King intersection to traffic ASAP	August 14, 2015	*Completed all trackwork in the intersection well ahead of the original schedule for this work*

[3] *SFMTA Management Meeting, 12/7/2015*

SFMTA and the contractor developed a new set of interim milestones to track progress on the critical path for the project, which flows through the excavation for CTS. Table 6 shows the new milestones and the current status for each. In future PMOC Monthly Status Reports, this table will replace Table 5.

Table 6 - Interim Milestones for CTS Construction Progress[4]

Milestone	*Target Date*	*Status*
Schedule meeting to resolve sequence and temp support	*December 9, 2015*	Completed on time
Sequential Excavation Method (SEM) Submittal approved	*December 18, 2015*	*Not completed, construction sequence to be revised*
Drill holes for CDF	*December 18, 2015*	*Completed late on January 5, 2016*
Complete barrel vault 1	*January 26, 2016*	*TBD*
Complete barrel vault 2	*February 23, 2016*	TBD

[4] *SFMTA Management Meeting, 1/4/2016*

Project Schedule Data

Earned Value (EV): $*914,320,590, unchanged from October.*

Planned Value: *$1,142,070,298, an increase of $12.24 million from October.*

Schedule Performance Index (SPI): 0.80. 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 declined slightly from the October 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 0.80 indicates that the project is significantly behind schedule

In the opinion of the PMOC, the incorporation of the updated TPC schedule into the calculation of earned value results in more reliable measures of schedule performance of the project. Based on the low value of the SPI, SFMTA should be working with the 1300 contractor to identify schedule containment strategies.

Table 7 shows the status of the schedule milestones established for the project.

Table 7 - 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), November 2018 (F)
RSD:	December 26, 2018 (P), May 2019 (F)

The current master schedule incorporating the approved 1300 Contract baseline schedule and updated actual progress through *November 2015* reflects negative buffer float and late completion of the project.

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 at this time of the

project is 6.0 months. As noted above, the current schedule reflects five months of negative buffer float. **In the opinion of the PMOC, time savings of approximately 11 months for the remaining work should be identified in order to offset the accumulated construction delays and establish an appropriate amount of schedule float.**

SFMTA reported that a project partnering session with TPC held in early July 2015 concentrated on the project schedule and ways to advance the construction work. The group's opinion was that if the project team could work together to meet mutually agreed short-term targets it would increase the overall confidence of the team in its ability to advance the project. SFMTA reported to the Dispute Review Board for the CSP in December 2015 that despite the setting of short-term performance targets and focusing on achievement of those targets, the team was still not working together as effectively as needed to recover the accumulated delays. SFMTA also reported to the PMOC that it continues to hold executive level partnering meetings with TPC and that the contractor is starting to engage in efforts to recover the schedule. **In the opinion of the PMOC, the first round of short-term milestones had mixed results and there appears to have been little impact on the forecast completion date for construction.** ***New milestones have been established to track progress on the critical path work of excavation at CTS. The initial results of these milestones have been mixed.*** **SFMTA is further encouraged to continue to improve the collaboration between the agency construction staff and the contractor so as to advance the construction work.**

Critical Path Summary *(Baseline Schedule)*

CTS Install Guidewalls, Slurry Walls, and Install Surface Deck
CTS Excavate Headhouse and Bracing
CTS Sequential Excavation Method and Install Supports
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 Complete
Safety and Security Certification / Pre-Revenue Activities
RSD on December 26, 2018 (currently forecast in *May 2019*)

The PMOC notes that the critical path was reported to have changed from CTS to UMS construction activities based on the schedule updates through February 2015. However, the sequence of work was revised for UMS, resulting in time savings that caused the critical path to revert to the CTS construction.

Three Month Look-ahead

The following activities are planned over the next three months:

1300 Contract

UMS

Complete utility connections and backfill the roof deck at the north concourse, allowing for Stockton Street to be re-opened north of Geary Street

Complete waterproofing the interface between the Powell Station and the Ellis Street Annex and complete the backfill and paving of Ellis Street

Continue Union Square Garage (USG) shear wall installation for permanent structural support for north concourse entrance

Install shoring in the tunnel and prepare the tunnel for break-in

Disassemble the Winter Walk and remobilize jet-grout operations and station box deck placement in January 2015

Complete the remaining sections of the station box roof deck and start excavation to platform level

CTS

Excavate below the level 3 struts and walers

Complete all composite wall sections over cross-cut cavern opening

Drill and install barrel vault pipe canopy to form top of cross-cut cavern

Drill core holes into tunnels and fill with CDF in the station area

Slip line brick sewer on Stockton Street

Install temporary struts to level 4

Excavate the north access shaft and install excavation support

Complete the permanent structure for the north access shaft

YBM

Continue headhouse excavation, install level 4 temporary bracing

Start excavation under the mezzanine to concourse level in the station box

Begin placement of concourse level slab

STS

Sewer installation and repair

Water line installation

Alternative Water Supply System (AWSS) installation

Muni ductbank installation

Installation of fiber optic cable by AT&T

Start installation of the tunnel invert slab

The PMOC expects to attend the following meetings:

Weekly Management (first Monday of each month)

Weekly Contract 1300 Construction Progress Meetings (first Tuesday and first Wednesday of the month)

Weekly Configuration Management Board (CMB) (first Wednesday of each month)

Monthly CSP Risk Management Meetings (first Thursday of each month)

CSP month-end meetings on February 2, 2016; March 1, 2016; *and April 5, 2016*

FTA/QPRM scheduled for February 3, 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 adverse to quality are corrected. *In the event that the contractor does not issue a CNCR, SFMTA may issue a Notice of Non-conformance (NCN) where non-conforming work is identified by SFMTA's quality assurance staff.*

The contractor's commitment to quality and the execution of the contractor's Quality Management Plan have been concerns of SFMTA for the 1300 Contract. SFMTA completed an audit of the TPC Quality Control system, including staff and procedures in May 2015. That audit was completed in early June, identifying six corrective actions to be taken by the contractor. *The findings of the audit have yet to be closed.*

Construction crew attention to quality remains an issue. The following quality issues and concerns for the 1300 Stations Contract were identified in the SFMTA *November* monthly report:

- Assurance that all RFIs, submittals, and USE-AS-IS and REPAIR dispositioned CNCRs related to a particular concrete placement, have been approved by the SFMTA Resident Engineers (REs). Practically, SFMTA REs have imposed a concrete placement hold point for all concrete placements to collectively ensure that the contractor has performed all work to the requirements of the Contract Documents, i.e., all RFIs, CNCRs, and submittals have been approved and acceptably executed.
- The possible impacts on quality of compressing the schedule for UMS work to accommodate the annual holiday construction moratorium.
- SFMTA's provision of advance notification to TPC/TPC QC, of in-process work that appears to be deficient or of questionable nature, is not mitigated/reconciled in a timely manner, if at all.
- Necessity of using both Reinforcing Steel Design Drawings and approved Reinforcing Steel Shop Drawings to inspect/accept rebar placement. The requirement to use approved shop drawings was identified as a preventative measure for improper/incomplete placement of reinforcing steel. It is common practice to assure that the latest approved submittals and shop drawings are available in the field, for use by both the construction crews and the QC inspectors, to assure proper installation of all constructed elements.
- *Approved submittals for UMS structural steel are awkward, at best, for TPC Production, TPC QC and RE's QA Inspectors to ensure that all work is performed as required by American Welding Society (AWS) D1.1 and the Contract Documents. TPC QC Engineers review TPC QC Certified Welding Inspector's (CWI) (Smith Emery provides the TPC QC Inspections) welding inspection documentation to verify that all welds are accounted for and accepted prior to concrete placement.*
- Maintenance of the procedure to facilitate the verification that welds to be embedded in concrete have been inspected and accepted or CNCRs generated and closed, prior to final sign-offs on each concrete placement. Smith Emery (TPC's QC representative) continues to update and refine their spreadsheet "tool" that is used by TPC QC to account for the acceptability and associated documentation by CWIs for all welded joints that are to be embedded in concrete.
- Document control issues within the CM13 software system.
- The large number of Field Notifications issued by SFMTA to TPC for work at UMS (notice that work does not conform to contract requirements and should have been identified through the CNCR process).

As of January 6, 2016, 146 CNCRs had been filed by TPC's Quality Manager (two more than in December), and 21 items remained open. The PMOC conducted a Quality Review of the CSP in September, and a draft report was delivered to FTA for review in late September. That report was finalized in early November 2015. The report identified recommended refinements to the organization charts and descriptions of certain staff positions' quality-related responsibilities to

clarify the quality assurance organization. The report also recommended that executive management support for the quality program be demonstrated through approval signatures on quality plans by TPC and SFMTA executive management. The PMOC's Quality Review of the project concluded that the SFMTA staff is implementing the SFMTA Quality Assurance (QA) Program as described in the SFMTA Quality Management Plan (QMP). The fundamental implementation of the SFMTA quality program and SFMTA management's support of the program were readily apparent during the PMOC's QA program review. *SFMTA's Quality Manager stated that the upcoming update of the PMP will include changes to the reporting structure and position descriptions reflecting the PMOC's comments from the Quality Review.*

G. SAFETY AND SECURITY

Safety and Security Management Plan (SSMP)

An updated SSMP Revision 2, dated February 2, 2014, was submitted to FTA on May 2, 2014. The SSMP outlines the plans needed prior to revenue operations. These plans include the Rail Activation Plan (RAP), the System Integration Test Plan, the Safety and Security Certification Plan (SSCP), and the Pre-Revenue Operations and Start-up Plan. SFMTA has completed the SSCP, which is being used to guide safety certification activities. The initial draft of the RAP was completed with the latest update of the PMP. The System Integration Test Plan and the Pre-Revenue Operations and Start-up Plan have not been completed and 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. *As of January 2016, all items related to the tunnel construction had been certified and accepted by SFMTA's safety staff. The certification work will begin to address the station construction items in January 2016.* The San Francisco Fire Department (SFFD) regularly attends the now combined Fire and Life Safety Committee (FLSC) and Safety and Security Certification Review Committee (SSCRC) meetings. The SFFD will continue to coordinate with the Stations Construction Project to identify issues of importance during construction.

Construction Safety

The project is maintaining an excellent safety record, with only one recordable and no lost time incidents. The performance metrics relating to accidents per working hour are well below the OSHA goals for similar construction. One incident occurred on the active construction contract in July. The current accident records for the 1300 Contract are shown in Table 8.

Table 8 - Construction Safety Data – Start of Contract Through October 2015

	No. of Incidents	Incident Rate	Goal
1300 Contract			
OSHA Recordable Accidents	*1*	*0.24*	<3.4
Job Transfer/Restricted Duty Incidents	*0*	*0*	NA
Lost Time Incidents	0	0	<1.6
Total Incidents	*1*	*0.24*	NA
Hours Worked	*843,629*		

H. 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. On October 11, 2013, the CSP provided an updated report with new schedule modeling and a recommendation to reduce the current FTA minimum schedule contingency of 8.0 months. The PMOC provided a review of this document to FTA on November 21, 2013 and could not recommend at that time that FTA accept any modification to schedule contingency minimum levels based on the current documentation provided. 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 from 8.0 months to 4.0 months. The updated risk assessment was conducted on the approved baseline schedule for the 1300 Contract without updates to reflect the current status of the construction work and the accumulated construction delays.

The PMOC cannot recommend any reduction in the minimum schedule contingency because the SFMTA's risk assessment update was not based on the actual current status of the 1300 Contract construction work. The Contract 1300 baseline schedule was adopted in early December 2014. Eleven schedule updates have been completed by the contractor and accepted by SFMTA and incorporated into the Master Program 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 assess the probability that the recovery schedule will result in the project meeting the required RSD. The timing of the risk assessment will be determined in the coming months.

At the January CSP Risk Management Meeting, the committee reviewed the status of the highest ranked risks in the risk register. The risk that the necessary track work at 4th and King could not be completed within the contractually-required work windows has been reduced to a very minor risk. The only remaining track to be installed is two short tangent sections at the northern side of the intersection. There is a very small risk that this work cannot be completed without significant impact to traffic. There is a risk that the required CPUC crossing permits cannot be obtained. Design issues for signals and signage remain to be resolved between SFMTA and PUC. A risk of

delays to the surface work due to late completion of fiber optic cutover work by AT&T remains. The risk of project delays due to coordination issues with the ongoing building construction at the former Olivet University site (at YBM station) was discussed at length. Mitigation measures included refusal to grant access to the 4th Street sidewalk area by the building contractor until all utility work in 4th Street is complete. Change order work requested by Moscone Center and utility companies is yet to be completed. SFMTA will endeavor to complete that work in the next three months, which should support the requirements of the building construction.

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

In the opinion of the PMOC, the Risk Mitigation meeting continues to be an effective forum for identifying potential risks and developing mitigation measures to limit the impact of the risks. The development of an effective strategy to address risks related to the building construction adjacent to the YBM station is an excellent example of the benefits of the meeting. Senior project management and the station RE worked together to identify an approach to limiting this risk during the meeting. The RE now has clear direction on how to proceed in working with TPC and the building contractor to minimize SFMTA's exposure to cost and delay claims. The PMOC will continue to monitor the Risk Mitigation meetings to assess the SFMTA's risk mitigation activities.

I. ACTION ITEMS

Table 9 on the following page shows the current action items for SFMTA.

Table 9
The PMOC's Central Subway Points of Action for SFMTA
(Note: All closed items are removed a month after being closed. Changes to open items since last update are indicated in BLUE.)

Category	NO.	ACTION	DATE OPENED	DUE DATE	DATE CLOSED	COMMENTS
S	**164**	Develop technically acceptable schedule tool in P6	12/10/15	02/29/16		SFMTA working with contractor to make schedule improvements
S	**165**	Develop recovery schedule	12/10/15	TBD		SFMTA to work with contractor on recovery strategies
S, RA	**166**	Update schedule risks based on recovery schedule	12/10/15	TBD		Once the schedule tool and recovery schedule are complete

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

APTA	American Public Transportation Association
ARS	Air Replenishment System
AWS	American Welding Society
AWSS	Alternative Water Supply System
BART	Bay Area Rapid Transit
BCE	Baseline Cost Estimate
BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CAR	Corrective Action Request
CDF	Controlled Density Fill
CFR	Code of Federal Regulations
CLIN	Contract Line Item Number
CM13	Contract Management 13
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
CWI	Certified Welding Inspector
DF	Designated Function
EV	Earned Value
FD	Final Design
FEIS	Final Environmental Impact Statement
FEIR	Final Environmental Impact Report
FFGA	Full Funding Grant Agreement
FLSC	Fire and Life Safety Committee
FMP	Fleet Management Plan
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
MRY	Muni Traction Power System
Muni	Common Public Reference to SFMTA
NCN	Notice of Non-conformance
NCR	Non-conformance Report
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
OHA	Operational Hazard Analysis
O&M	Operations & Maintenance
OP	Oversight Procedure
PCC	Proposed Contract Changes
PE	Preliminary Engineering
PHA	Preliminary Hazard Analysis
PMOC	Project Management Oversight Contractor
PMP	Project Management Plan
PTMISEA	Public Transportation Modernization, Improvement, and Service Enhancement Account
QA/QC	Quality Assurance/Quality Control
QMP	Quality Management Plan
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
SFCTA	San Francisco County Transportation Authority
SFDPW	San Francisco Department of Public Works
SFFD	San Francisco Fire Department
SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission
SIT	Systems Integration Test

SoMa	South of Market (Street)
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
UMS	Union Square/Market Street Station
UR	Utility Relocation
U.S.C.	United States Code
USG	Union Square Garage
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		
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Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
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		
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Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
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		
Has the grantee ensured the development of security design criteria?	Y		
Has the grantee ensured conformance with safety and security requirements in design?	Y		Certification checklists are developed and certified through monthly meetings.
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.*
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			
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Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
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 three 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		
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 develops 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		
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			
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Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
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:	*January 15, 2015*
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
05/2019	Revenue Operations Date at date of this report		

57.93% *Percent Complete Based on Progress* (*November 2015 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
$873.79 million	Amount of Expenditures at date of this report from Total Project Budget of $1,578 million
55.36%	Percent Complete based on Expenditures at date of this report
$24.52 million	Unallocated Contingency remaining
$84.32 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/MOS) November 2016	4Q16	60	60
5	Hold Point 5 – Complete CTS / Tunnels systems inst. April 2018	2Q18	25	25
RSD	PMOC / FTA RSD	4Q18		
CURRENT TOTAL CONTINGENCY $84.32 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.
FOLSOM
FUTURE TRANSBAY TERMINAL
Post St.
MONTGOMERY
UNION SQUARE/ MARKET STREET
J K L M N T
Market St.
1st St.
N
Mission St.
Howard St.
2nd St.
POWELL
Folsom St.
Harrison St.
BRANNAN
Golden Gate St.
4th St.
I-80
YERBA BUENA/ MOSCONE
5th St.
3rd St.
2ND ST. AND KING
CIVIC CENTER
7th St.
6th St.
4TH ST. AND BRANNAN
AT&T BALLPARK
King St.
4TH AND KING/BERRY N T
Bryant St.
Brannan St.
Caltrain
Townsend St.
MISSION ROCK
UCSF
UCSF MISSION BAY
LEGEND
T Third Phase 2
T Third Phase 1
Muni Metro
Caltrain
BART

APPENDIX D. TOP PROJECT RISKS

The Project Risk Register was updated in early 2015. The following risks were discussed at the August Risk Management Meeting.

Top Risks Discussed in the Previous Month:

#222 – Transfer of the ARGUS Monitoring Software that documents monitoring instrumentation. This risk is retired.

#226 – The risk that TPC would be unable to complete the work for the 4th and King shutdown as planned. It was reported that the majority of the work in the intersection was completed in November. There are short sections of tangent track remaining to be installed in the northern portion of the intersection for which there is minimal risk of traffic impacts.

#232 – This is the top rated risk and is related to TPC being behind schedule and potentially unable to recover. It was reported that a key component of the current schedule effort, being the roof deck completion at UMS, was continuing and that most of the intended deck sections would be completed before the moratorium except for one. This risk continues, and a short-term target of completing the barrel vault over the CTS cross-cut cavern by the end of February has been set.

#233 – Related to the quality of the shotcrete lining substitution proposed by TPC being inferior. SFMTA reported that continued pressure to resolve this issue is being applied through the submittals process.

#234 – This risk that the contractor's proposed alternative Sequential Excavation Method (SEM) excavation method would cause subsidence, was discussed and it was concluded that, as defined, the risk would largely disappear at this point, but it was left open for now. After analysis by the engineer the contractor's proposal was rejected, and the current specified design will be implemented. The contractor is preparing to work according to the contract with clarifications provided by SFMTA.

#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 helping, but timeliness continues to be an issue, even with mitigation strategies having been implemented.

#240 – This risk that unresolved assignment of schedule delay responsibility may lead to increased cost continues. SFMTA is preparing a letter to TPC addressing the issues with the schedule and directing TPC to prepare a recovery plan..

#243 (new) – Risk that the contractor becomes complacent in addressing third-party insurance claims, which could result in increased costs to the program.

#104 – Risk that required PUC approval of grade crossings is not obtained. SFMTA is working with CPUC on the remaining design issues, include traffic signals and signage.

103 – Risk that the required Caltrans encroachment permit(s) cannot be obtained. An extension of the interim permit was received 12/24/15. This permit expires 10/3/2016 and will need to be renewed at that time, so this risk continues.

204 – Risk that AT&T cutover work will be completed late and delay at-grade work in 4th Street. AT&T estimates that their work is 60 – 65% complete and that work will be completed in April 2016. SFMTA is arranging a senior-level meeting with AT&T to obtain commitment for on-time completion of this work.

242 (new) – The risk that contractor complacency in resolving third party damage claims will lead to added program costs. This risk has impacted costs for the tunnel contract already. The contractor delayed addressing claims of damage by third parties (despite the fact that such claims are usually covered by builder's risk insurance). SFMTA legal staff and other administrative costs are incurred in forcing the contractor to address the claims. This risk will continue through the duration of the project and the financial close out of the construction contracts. The committee judged that this risk had a high probability of occurrence, no schedule impact, and low cost impact.

Q – The risk of discrepancies between the contract drawings and as built conditions causing added costs and delays. This risk continues. New design details are being produced as needed in response to RFIs.

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 3 years in the future
Prepare Schedule for Testing	TBD	TBD	TBD	
Finalize Test Procedures	TBD	TBD	TBD	
Conduct System Integrated Testing with trains, including procedures and reports	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Complete Testing Reports	TBD	TBD	TBD	
Operating Plan, Rules, and Training				
Finalize Operating Plan	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Finalize / revise SOPs, manuals, and rulebook as applicable	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Operations Manuals	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Staffing and Operations Plan	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Training of O&M personnel	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Emergency response plan, training, and drills	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Vehicle Maintenance Plan, Equipment, Facilities, and Training				
Rail Fleet Management Plan	TBD	TBD	TBD	
Maintenance Schedules and Procedures	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Spare Parts Requirements	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Maintenance Manuals	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Maintenance Training	TBD	TBD	TBD	Project is in construction, with RSD 3 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**
Facility and Right-of-way Maintenance Plan, Equipment, Facilities, and Training				
Maintenance Schedules and Procedures	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Spare Parts Requirements	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Maintenance Manuals	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Maintenance Training	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Pre-Revenue Operations				
Finalize and/or update Rail Activation Plan (RAP) and/or Pre-Revenue Operations Plan	4/2/2015	TBD	TBD	Initial draft, including task identification complete. Schedule for updating and completing task descriptions TBD
Implement Rail Activation Committee	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Shadow operations	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Develop / revise SSPP & Security Plan (approved by SSO)	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
FTA Office of Safety & Security Readiness Review	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
PMOC OP-54 Readiness for Revenue Operations Review Report, Phase I	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Conduct Operational Hazard Analysis (OHA) and resolve other hazards / vulnerabilities	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Pre-Revenue Operations	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Public Outreach				
Develop Safety Outreach Plan	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Provide Community Outreach	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Grand Opening Plan	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Construction Close Out				
Close Out of Non-Conformance Reports	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Punch List Complete	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Certificates of Occupancy / Substantial Completion	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
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
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				Need dates
Review status of quality non-conformances	Ongoing	Ongoing	TBD	
Close Out of non-safety critical items	Ongoing	Ongoing	TBD	
Close Out of safety critical items	Ongoing	Ongoing	TBD	
Complete Safety & Security Certification Verification Report (SSCVR)	TBD	11/1/2018		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	12/10/2018		21 days before RSD - Check against latest regulations

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Third Party and Agency Agreements				
Third Party/Agency Agreements Necessary for Revenue Service	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Third Party/Agency Approvals Necessary for Revenue Service	TBD	TBD	TBD	Project is in construction, with RSD 3 years in the future
Revenue Service				
Target Revenue Service Date	-	5/31/2019		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 five percent of project cost at Entry into FD and three percent 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 percent 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 3-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.

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 September 2015.

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	87%
Schedule:	NTP issued January 2010. Substantial completion in June 2011.	
Issues or Concerns:	Final total cost claim by contractor has not been resolved.	

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	97%
Schedule:	NTP issued January 2011. Substantial completion in August 2012.	
Issues or Concerns:	Final total cost claim by contractor has not been resolved.	

Contract No.	**1252**	
Contract Description:	**Tunnels**	
Status:	*Final completion achieved. Financial close out underway.*	
Cost:	Original Contract Value	$233.58 million
	Approved Change Orders	$7.71 million
	Current Contract Value	$241.29 million
	Expended to Date	$234.62 million; $6.2 million is paid from non-project funds
	% Expended	97.2%
	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	$179,139
	Current Contract Value	$678,134
	Expended to Date	$638,278
	% Expended	94.1%
	SBE Participation	100%
Schedule:		
Issues or Concerns:	None.	

Contract No.	**1300**	
Contract Description:	**Three subway stations (YBM, UMS, and CTS) and STS**	
Status:	*Support of excavation work is complete. Placement of roof slabs is underway. Preparations underway for mass excavation.*	
Cost:	Original Contract Value	$839.68 million
	Approved Change Orders	-$1.42 million
	Current Contract Value	$838.24 million
	Expended to Date	$302.39 million
	% Expended	36.1%
	SBE Participation	15.1%
Schedule:	NTP issued June 17, 2013. Substantial Completion planned February 10, 2018 and forecast August 2018.	
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 ongoing for Contract 1252.	
Cost:	Original Contract Value	$5,795,000 (includes exercised options)
	Approved Change Orders	$1,697,245
	Current Contract Value	$7,492,245
	Expended to Date	$7,730,484
	% Expended	103.2%
	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	$30,104,946
	% Expended	82.4%
	SBE Participation	42.7%
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	$12,553,146
	% Expended	72.8%
	SBE Participation	28.3%
Schedule:		
Issues or Concerns:		

Contract No.	**CS-149**	
Contract Description:	**Central Subway Partnership (Project Manager/Construction Manager)**	
Status:	On-going.	
Cost:	Original Contract Value	$85,139,092
	Approved Change Orders	$0
	Current Contract Value	$85,139,092
	Expended to Date	$51,964,952
	% Expended	61.0%
	SBE Participation	35.5%
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	$8,575,771
	% Expended	50.1%
	SBE Participation	28.9%
Schedule:		
Issues or Concerns:		