

## Risk Mitigation Meeting Minutes #49

DATE: October 04, 2013  
 MEETING DATE: **August 29, 2013**  
 LOCATION: 821 Howard Street, 2<sup>nd</sup> Floor – Main Conference Room  
 TIME: 10:00am  
 ATTENDEES: John Funghi, Eric Stassevitch, Alex Clifford, Vivian Chow, Beverly Ward, David Broussard, Bradley Lebovitz, Jeffrey Davis  
 COPIES TO: Attendees: Albert Hoe, Richard Redmond, Roger Nguyen, Mark Benson, Jane Wang, Mark Latch, Sanford Pong, Aileen Read, Chuck Morganson, Luis Zurinaga, James Sampson, David Kuehn  
 File: M544.1.5.0820  
 REFERENCE Project No. M544.1, Contract No. 149 Task 1-4.01  
 Program/Construction Management  
 SUBJECT: **Risk Management – Risk Mitigation Meeting  
 Risk Mitigation Report No. 49**

### RECORD OF MEETING

ITEM #	DISCUSSION	ACTION BY DUE DATE
1 -	<p>The Risk Manager opened the meeting summarizing the reasons for the Risk Refresh as described in Risk Refresh Part 1 – The Proposed revisions to Schedule Contingency Management currently under review by the FTA, requires additional supporting risk analysis to demonstrate the confidence in the proposed changes to the schedule contingency drawdown curve. The Program’s Risk profile changed in September 2012 due to changes in the Program’s contract delivery strategy. The Risk Manager is currently conducting an in house 2013 Risk Refresh to further analyze and document the impact of the new risk profile on the cost and schedule of the Program. One element of the Risk Refresh is the Schedule Assessment; to be discussed in further detail at today’s Risk Refresh Part 2.</p> <p>The Risk Refresh contains a comprehensive review of all aspects of the Program, and the focus of today’s meeting is only on the Schedule Assessment and Risk Modeling performed on the current Program Master Schedule. The schedule assessment utilized the Schedule Risk Analysis outlined in FTA OP 40. The Risk Manager presented an overview of the process demonstrating thru graphical presentations the inputs required into the risk analysis program. The resulting output histogram and the monte carlo analysis were presented and discussed. The risk analysis indicated an 80%-95% confidence level in completing the Program on time utilizing just the standard default software settings for a first run analysis. The Program Master schedule utilized updated contract 1252 schedule and contract 1300 bid schedule critical path items,</p>	

ITEM #	DISCUSSION	ACTION BY DUE DATE
	<p>removing the buffer float, to create a summary level schedule.</p> <p>The Risk Manager provided further explanation of the process, stating the default settings of the risk analysis software are; minimum duration of (0.75), most likely duration of (1.00), and max duration of (1.25). Further refinement of the input is possible by closely examining the durations of key activities; adjustments on each level of the overall activity can then be made if the particular risks justify duration adjustments. One example of this refinement is the head house at YBM: Currently one schedule activity bar represents this work in the summary schedule. If the excavation activity portion of the head house construction contains substantial risk, then the risk analysis could break out the basic activities of the head house construction; setting for the excavation activity could be broken out and assigned specific probabilities such as minimum duration (1.00); most likely duration (1.15); and maximum duration (1.30).</p> <p>The Risk Manager presented assumptions made in the analysis. In particular, input on specific risks that would affect key activities and the respective probabilities utilized in the analysis.</p> <p>In response to comments on the analysis presented in Part 1, several different versions of the risk analysis were performed, adjusting schedule summary activities to current known risks and assigning probabilistic outcomes to activity durations commensurate with the risk.</p> <p>A summary of the numerous different scenarios was presented together with explanations of what was varied with each run on the Monte Carlo analysis. The scattering of resulting data points was examined very closely with the meeting participants to demonstrate that overall the data points are still falling within the range of having a very high (85%-95%) probability of completing the project by the current Revenue Service Date of Dec. 26, 2018. This provides a very high level of confidence that the current level of contingency is adequate for work proceeding forward and justifies changes to previous minimum contingency levels.</p> <p>The outliers were also examined with the worst case being completion of the project in Aug 2019. The particular parameters that were changed to produce this result were explained and the collective thought from the group in attendance was that although possible, the likelihood of the duration changes made to produce the worst case, where highly unlikely. Recognizing that there is a very remote chance that the scenario would occur; mitigation measures would be implemented far in advance to avoid the calamity envisioned in the analysis scenario.</p> <p>The results of the Risk Refresh effort related to schedule assessment will be included in the next revision of the draft Schedule Contingency Management report currently under review by the FTA.</p>	


**ACTION ITEMS –**

ITEM #	MTG DATE	Task #	DESCRIPTION	BIC	DUE DATE	STATUS
1	12/13/12		Risk 7 – Cost for significant	J. Wang	09/12/13	Open

			settlement grout			
4	12/13/12		<b>Risk 72 – 4<sup>th</sup> &amp; King (SSWP)</b>	S. Pong C. Morganson	09/12/13	Open
1	08/13/13		Expand/Confirm CN1300 Startup activities	PM/CM	08/27/13	Open
1	08/13/13		Examine additional schedule activities	PCC	08/27/13	Open
1	08/13/13		Schedule duration that are in the Master Schedule	PCC	08/27/13	Open

Meeting adjourned at 11:00am

These meeting minutes have been prepared by B. Ward and reviewed by E. Stassevitch, and are the preparer's interpretation of discussions that took place. If the reader's interpretation differs, please contact the author in writing within four (4) days of receipt of these minutes.

Signed:  [initials of preparer & reviewer] Date: 04 Oct 13 [Date review completed.]

## Meeting Agenda

**Project No. M544.1, Contract No. CS-149**  
**Program/Construction Management**  
**Risk Mitigation Management Meeting No. 49**

**August 29, 2013**

**10:00am – 11:00am**

Central Subway Project Office

821 Howard St. 2<sup>nd</sup> Floor

Main Conference Room

**Attendees:**

Mark Benson		Richard Redmond		Roger Nguyen	
Vivian Chow		Albert Hoe		Eric Stassevitch	
Alex Clifford		Mark Latch		Beverly Ward	
John Funghi		Brad Lebovitz		Luis Zurinaga	

**1. Risk Refresh 2013 - Part 2 – Schedule Contingency Assessment**

- **Overview of Risk Refresh Process**
- **Current Status of Project**
- **Schedule Contingency**

**2. Schedule Assessment**

- **Risk Analysis Input**
- **Summary Schedule Development**
- **Minimum; Most Likely; Maximum**
- **Current Risk Summary**

**3. Next Steps**

## Meeting Attendance Sheet

Project No. M544.1, Contract No. CS-149  
 Program/Construction Management  
 Risk Management Meeting No. 49  
 August 29, 2013  
 10:00 a.m. – 11:00 a.m.  
 Central Subway Project Office  
 821 Howard Street, 2<sup>nd</sup> Floor  
 Main Conference Room

*Deliver Meeting Attendance Sheet with original signatures/initials to Document Control.*

NAME	AFFILIATION	PHONE	E-MAIL (for minutes)	INITIALS
Mark Benson	CSP	415-701-5295	<a href="mailto:Mark.Benson@sfmta.com">Mark.Benson@sfmta.com</a>	
Vivian Chow	SFMTA	415 701-5264	<a href="mailto:Vivian.chow.@sfmta.com">Vivian.chow.@sfmta.com</a>	vchaw
Alex Clifford	CSP	415 701- 5275	<a href="mailto:Alex.clifford@sfmta.com">Alex.clifford@sfmta.com</a>	A
John Funghi	SFMTA	415-701-4299	<a href="mailto:john.funghi@sfmta.com">john.funghi@sfmta.com</a>	JF
Albert Hoe	SFMTA	415-701-4289	<a href="mailto:albert.hoe@sfmta.com">albert.hoe@sfmta.com</a>	
Mark Latch	CSP	415-701-5294	<a href="mailto:mark.latch@sfmta.com">mark.latch@sfmta.com</a>	
Brad Lebovitz	STV/PMOC	510-464-8052	<a href="mailto:Bradley.lebovitz@stvinc.com">Bradley.lebovitz@stvinc.com</a>	
Richard Redmond	CSP	415-701-4288	<a href="mailto:Richard.redmond@sfmta.com">Richard.redmond@sfmta.com</a>	
Eric Stassevitch	CSP	415-701-4426	<a href="mailto:Eric.stassevitch@sfmta.com">Eric.stassevitch@sfmta.com</a>	E
Beverly Ward	CSP	415-701-5291	<a href="mailto:Beverly.ward@sfmta.com">Beverly.ward@sfmta.com</a>	BW
Luis Zurinaga	SFCTA	415-716-6956	<a href="mailto:luis@sfcta.org">luis@sfcta.org</a>	
DAVID BROUSSARD	SFMTA	415 701-5286	DAVID.BROUSSARD@SFMTA.COM	DAB
Jeffrey Davis	F 719	415 744 2598	Jeffrey S. Davis @ DOT, BOV	JSD

Brad Lebovitz was in attendance, but did not sign the attendance sheet.

CSP Risk Analysis Table

Project Schedule	Minimum Duration	Likely Duration	Maximum Duration	80% Finish Date	50% Finish Date	Comments
CSP Risk Schedule Rev 0	75%	100%	125%	7-Dec-18	9-Oct-18	Critical Activities
CSP-July13-Risk3	75%	100%	125%	28-Nov-18	12-Oct-18	All Task Dependent Activities
CSP-July13-Risk3.01	75%	110%	125%	21-Jan-19	7-Dec-18	All Task Dependent Activities
CSP-July13-Risk3.02	100%	110%	125%	15-Apr-19	15-Mar-19	All Task Dependent Activities
CSP-May-13-risk4	75%	100%	125%	17-Oct-18	18-Sep-18	All Task Dependent Activities
CSP-May-13-risk4.01	75%	110%	125%	18-Dec-18	15-Nov-18	All Task Dependent Activities
CSP-May-13-risk4.02	100%	110%	125%	4-Apr-19	19-Mar-19	All Task Dependent Activities
CSP AUG13 Risk-03.01	75%	100%	125%	3-Dec-18	9-Oct-18	Selected Activities
CSP AUG13 Risk-03.02	100%	110%	125%	21-Dec-18	29-Oct-18	Selected Activities
CSP AUG13 Risk-03.03	100%	115%	150%	24-Jan-19	21-Nov-18	Selected Activities
CSP AUG13 Risk-04	75%	100%	125%	3-Dec-18	9-Oct-18	Selected Digging Activities
CSP AUG13 Risk-04.01	100%	110%	125%	14-Mar-19	23-Jan-19	Selected Digging Activities
CSP AUG13 Risk-04.02	100%	115%	150%	8-Aug-19	3-Jun-19	Selected Digging Activities
CSP AUG13 Risk-04.03	80%	110%	125%	21-Jan-19	27-Nov-18	Selected Digging Activities
CSP AUG13 Risk-04.04	90%	110%	150%	27-Jun-19	15-Apr-19	Selected Digging Activities
CSP AUG13 Risk-04.05	90%	110%	135%	3-Apr-19	5-Feb-19	Selected Digging Activities
CSP AUG13 Risk-04.06	90%	100%	125%	8-Jan-19	14-Nov-18	Selected Digging Activities



































Activity ID	Activity Scope	Original Duration	Start	Finish	2013												2014												2015												2016												2017												2018											
					J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D					
<b>SFMTA Contract 1300</b>					1350	18-Apr-13	20-Jun-18																																																																					
<b>All Locations</b>					1350	18-Apr-13	20-Jun-18																																																																					
Bid	Project Bid Date April 18, 2013	0	18-Apr-13		Project Bid Date April 18, 2013																																																																							
Cert	Bid Evaluation, Certification & Award	90	18-Apr-13	16-Jul-13	Bid Evaluation, Certification & Award																																																																							
Contx	Contract Execution, Bonds, Insurance	10	17-Jul-13	26-Jul-13	Contract Execution, Bonds, Insurance																																																																							
NTP-1	Estimated NTP-1, UMS-1253, CTS-1254R, YBM-1255, STS-1256	0	27-Jul-13		Estimated NTP-1, UMS-1253, CTS-1254R, YBM-1255, STS-1256																																																																							
U.NTP	Estimated Notice to Proceed (UMS)	0	27-Jul-13		Estimated Notice to Proceed (UMS)																																																																							
C.1.010	Mobilization	30	27-Jul-13	25-Aug-13	Mobilization																																																																							
UOPT1	Option 1 Exercise Period (NTP+30)	30	27-Jul-13	25-Aug-13	Option 1 Exercise Period (NTP+30)																																																																							
UOPT7	Option 7 Exercise Period (NTP+60)	60	27-Jul-13	24-Sep-13	Option 7 Exercise Period (NTP+60)																																																																							
UOPT36	Options 3-6 Exercise Period (NTP+180)	180	27-Jul-13	22-Jan-14	Options 3-6 Exercise Period (NTP+180)																																																																							
UOPT2	Option 2 Exercise Period (NTP+450)	450	27-Jul-13	19-Oct-14	Option 2 Exercise Period (NTP+450)																																																																							
DUR	Construction Duration - 1,700 Calendar Days	1700	27-Jul-13	22-Mar-18	Construction Duration - 1,700 Calendar Days																																																																							
NTP-2	Estimated NTP-2, (w/ 210 Days of NTP-1) - Remaining Construction	0	22-Feb-14		Estimated NTP-2, (w/ 210 Days of NTP-1) - Remaining Construction																																																																							
C.ACC	(CTS) Tunnel Access Available From CN 1252 Contractor (NTP+450cd)	0	20-Oct-14		(CTS) Tunnel Access Available From CN 1252 Contractor (NTP+450cd)																																																																							
MS-10	Substantial Completion - 1,700 Calendar Days (SP-4.B)	0		22-Mar-18*	Substantial Completion - 1,700 Calendar Days (SP-4.B)																																																																							
C.Punch	Closeout Punchlist/Remaining Work	90	23-Mar-18	20-Jun-18	Closeout Punchlist/Remaining Work																																																																							
MS-20	Final Completion - 1,790 Calendar Days (SP-4C)	0		20-Jun-18*	Final Completion - 1,790 Calendar Days (SP-4C)																																																																							
<b>Chinatown - CTS-1254R</b>					1214	27-Jul-13	22-Mar-18																																																																					
<b>All Locations</b>					328	27-Jul-13	29-Oct-14																																																																					
C.1.030	Obtain Permits	60	27-Jul-13	24-Sep-13	Obtain Permits																																																																							
C.1.070	Traffic & Pedestrian Control Plan Submittal & Approval	36	29-Jul-13	17-Sep-13	Traffic & Pedestrian Control Plan Submittal & Approval																																																																							
C.1.330	Conduct Preconstruction Surveys	60	29-Jul-13	21-Oct-13	Conduct Preconstruction Surveys																																																																							
C.1.020	Non-Technical Submittals	60	29-Jul-13	21-Oct-13	Non-Technical Submittals																																																																							
C.1.050	Engineering Submittals	180	29-Jul-13	14-Apr-14	Engineering Submittals																																																																							
C.2.300	Install Instrumentation	25	22-Oct-13	26-Nov-13	Install Instrumentation																																																																							
C.2.340	Instrumentation Baseline Reading Period	60	27-Nov-13	25-Jan-14	Instrumentation Baseline Reading Period																																																																							
C.2.280	Install Sewer System Slip Lining & Laterals	20	16-Jan-14	12-Feb-14	Install Sewer System Slip Lining & Laterals																																																																							
C.1.080	Procure Mining Equipment & Materials	240	04-Mar-14	29-Oct-14	Procure Mining Equipment & Materials																																																																							
<b>Washington Street</b>					316	04-Sep-13	19-Nov-14																																																																					
C.1090	Perform Environmental Soil Borings & Secure Disposal Site	60	04-Sep-13	27-Nov-13	Perform Environmental Soil Borings & Secure Disposal Site																																																																							
C.1080	Implement Traffic & Pedestrian Control Plans	10	02-Jan-14	15-Jan-14	Implement Traffic & Pedestrian Control Plans																																																																							
C.1.060	Close Washington Street	0		15-Jan-14	Close Washington Street																																																																							
C.2.030	Utility Relocations in Washington Street	20	16-Jan-14	12-Feb-14	Utility Relocations in Washington Street																																																																							
C.2.240	Backfill Deck @ Washington Street & Reconstruct	22	20-Oct-14	19-Nov-14	Backfill Deck @ Washington Street & Reconstruct																																																																							
C.2.270	Re-open Washington Street	0		19-Nov-14	Re-open Washington Street																																																																							
<b>Stockton Street</b>					45	14-Jul-17	14-Sep-17																																																																					
C.4.375	Site Restoration / Paving / Calernary Restoration	44	14-Jul-17	14-Sep-17	Site Restoration / Paving / Calernary Restoration																																																																							
<b>HeadHouse</b>					1091	16-Jan-14	22-Mar-18																																																																					
C.2.020	Perform Hazardous Material Abatement - 933-949 Stockton	10	16-Jan-14	29-Jan-14	Perform Hazardous Material Abatement - 933-949 Stockton																																																																							
C.2.010	Demolish Building & Salvage Items @ 933-949 Stockton (Phase 1 Work)	20	16-Jan-14	12-Feb-14	Demolish Building & Salvage Items @ 933-949 Stockton (Phase 1 Work)																																																																							
C.2.290	Archeological Investigation Period (15days)	15	13-Feb-14	05-Mar-14	Archeological Investigation Period (15days)																																																																							
C.2.040	Install Temporary Shoring Walls - Site Perimeter	10	06-Mar-14	19-Mar-14	Install Temporary Shoring Walls - Site Perimeter																																																																							
C.2.050	Install Guide Walls	10	20-Mar-14	02-Apr-14	Install Guide Walls																																																																							
C.2.060	Prepare Bench to Top of Slurry Walls	5	03-Apr-14	09-Apr-14	Prepare Bench to Top of Slurry Walls																																																																							
C.2.070	Install Guide Walls & Slurry Walls - North, East, West Sides	97	10-Apr-14	26-Aug-14	Install Guide Walls & Slurry Walls - North, East, West Sides																																																																							
C.2.080	Excavate to Surface Level Deck EL 92	10	27-Aug-14	10-Sep-14	Excavate to Surface Level Deck EL 92																																																																							
C.2.090	Form/Rebar/Pour Surface Level Deck	22	04-Sep-14	03-Oct-14	Form/Rebar/Pour Surface Level Deck																																																																							
C.2.100	Cure & Strip Falsework for Surface Level Deck	22	18-Sep-14	17-Oct-14	Cure & Strip Falsework for Surface Level Deck																																																																							
C.2.110	Excavate for Compensation Grout Tubes to El 92'	10	09-Oct-14	22-Oct-14	Excavate for Compensation Grout Tubes to El 92'																																																																							
C.2.120	Install Compensation Grout Tubes	22	15-Oct-14	14-Nov-14	Install Compensation Grout Tubes																																																																							
C.2.130	Excavate for Level 1 Struts - EL 81.5'	12	29-Oct-14	14-Nov-14	Excavate for Level 1 Struts - EL 81.5'																																																																							
C.2.140	Install Level 1 Struts & Wales & Preload	7	05-Nov-14	14-Nov-14	Install Level 1 Struts & Wales & Preload																																																																							
C.2.150	Excavate for Level 2 Struts - EL 65'	16	20-Nov-14	15-Dec-14	Excavate for Level 2 Struts - EL 65'																																																																							
C.2.160	Install Level 2 Struts & Wales & Preload	7	05-Dec-14	15-Dec-14	Install Level 2 Struts & Wales & Preload																																																																							
C.2.170	Excavate for Level 3 Struts EL 48.5'	16	16-Dec-14	08-Jan-15	Excavate for Level 3 Struts EL 48.5'																																																																							
C.2.180	Form/Rebar/Pour Composite Walls Between 1.0 & 4.0 From Strut Level 3 to 4.5	10	19-Dec-14	05-Jan-15	Form/Rebar/Pour Composite Walls Between 1.0 & 4.0 From Strut Level 3 to 4.5																																																																							
C.2.190	Install Level 3 Struts & Wales & Preload	8	31-Dec-14	12-Jan-15	Install Level 3 Struts & Wales & Preload																																																																							
C.2.200	Excavate to 4' Below Level 4 Struts EL 32.5'	16	12-Jan-15	02-Feb-15	Excavate to 4' Below Level 4 Struts EL 32.5'																																																																							
C.2.210	Form/Rebar/Pour Composite Walls Between 1.0 & 4.0 to Level 4	10	15-Jan-15	28-Jan-15	Form/Rebar/Pour Composite Walls Between 1.0 & 4.0 to Level 4																																																																							
C.2.230	Install Level 3.5 Strut & Wale	8	26-Jan-15	04-Feb-15	Install Level 3.5 Strut & Wale																																																																							

24-Apr-13 Plot Date

18-Apr-13 Data Date

SFMTA - Central Subway

Contract 1300

Proposal Schedule

Tutor-Perini Corporation

























**CENTRAL SUBWAY  
RISK SUMMARY**

Risk #	Risk Description	Risk Owner	Risk Category	Risk Rating	Status	Contract
99	Breakdown in relationships between SFMTA and Contractors during construction results in increased claims and delays to the overall construction schedule.	MB	C	8	7/27/12 FDS 1940	GEN
F	Underground obstructions Stations (UMS)	JW	C	8	8/12/15 UMS 1320	UMS
F	Underground obstructions stations (CTS)	QC	C	8	10/9/17 CTS1500	CTS
F	Underground obstructions Stations (MOS)	QC	C	8	4/28/15 MOS1150	MOS
70	Change in traffic control requirements after bid.	RR	C	8	5/22/17 STS1020	GEN
83	Cost of vehicles may be more than estimated due to sole source and small order	LA	R	8	11/17/17 STS 1500	GEN
203	Headwalls interface delay 1300 Contractor (SSTS)	MB	C	8		SSTS
208	Additional cost if we change direction going to the Pagoda	RR/MB	C	8		TUN
46	Public complaints result in unanticipated restrictions on construction at CTS. (schedule and estimate for underground work assumes 6 day work week and 2 shifts per day)	MB/BC	C	6	10/9/17 CTS1500	CTS
52	Unacceptable settlement and impact on major utilities at CTS. (OLD SEWERS AND OTHERS WITHIN 20FT SPACE BETWEEN TOP OF CAVERN AND STREET LEVEL)	RR	C	6	4/22/16 N-CTS9730	CTS
204	AT&T Vault - New Sewer Work south of Bryant	RR/MB	C	6		SSTS
B	Storage and testing of excavated soils from tunnel limits advance rate of tunneling.	SW	C	6	2/5/14 TUN1124	TUN
34	Loss of business results in unanticipated restrictions on construction at UMS.	RR	C	5	9/7/16 UMS1430	UMS
72	Interface new Signaling and Train Control system to existing at Fourth and King	SP	C	5	3/4/16 STS1045	STS
104	CPUC approval at Grade Crossing for G0164d takes longer to negotiate / obtain than schedule allows	SP	R	5	7/27/12 FDS 1940	STS
E	Underground obstructions tunnel and retrieval shaft	SW	C	5	2/5/14 TUN1124	TUN
T	Delay on station emergency ventilation approval	JW	R	5	7/27/12 FDS 1940	GEN
16	TBM loss and / or damaged in Transit	MB	C	5	5/20/13 TUN1095	TUN
67	Archeological/Cultural findings during construction increases schedule and/or cost. (UMS)...LESS THAN 1%	MB	C	5	8/12/15 UMS1320	UMS
68	Archeological/Cultural findings during construction increases schedule and/or cost. (CHINA TOWN) ...AROUND 10%	MB	C	5	10/9/17 CTS1500	CTS
7	Potential for excessive settlement of BART tunnels - SIGNIFICANT COMPENSATION GROUT REQUIRED OVER ESTIMATE ALLOWANCES	SW	C	4	8/28/13 TUN1120	TUN
111	Major Earthquake stops work	AW	C	4	12/30/20 MS 0010	GEN
112	Major safety event halts work	MB	C	4	12/30/20 MS 0010	GEN
116	TBM procurement, delivery and assembly takes longer than assumed in schedule.	MB	C	4	5/20/13 TUN1095	TUN
196	The process of acquiring station licenses: acquisition/condemnation could significantly delay schedule and cost more than that presently planned.	RR	C	4		GEN
210	Mission Bay Loop Grant – Needs to be built to allow for train turnarounds (June 2013)	LA	C	4	06/13 TUN	GEN
212	UMS Inclined piles – 8" clearance between piles and tunnel results in damage or safety issues within the tunnel	RR	C	4		TUN
213	Micro Piles exist within tunnel path at UMS	RR	C	4		TUN
38	'Tiebacks in Stockton Street misallocated (in path of walls and would have to be dug out within 20ft of surface level)'	MB	C	3	5/6/14 UMS1170	UMS
48	Incomplete drawdown of groundwater. (inside of box and inside of caverns)	QC	C	3	5/1/16 CTS1140	CTS
50	CTS station contractor delayed by tunnel contractor since station platform construction cannot start until tunnels have been finished.	MB	C	3	12/16/13 TUN1122	CTS
66	Archeological/Cultural findings during construction increases schedule and/or cost.(Moscone) AROUND 10%	QC	C	3	4/28/15 TUN1150	MOS
102	Late finish of early contract delays later contracts and extends PM / CM and incurs additional costs	AW	C	3	12/30/20 MS 0010	GEN
115	Jet grouted station end walls are installed by Tunnel contractor. Station Contractor assumes risk of possibly leakage problems due to insufficiently quality of end walls.	SW	C	3	5/26/15 UMS1295	TUN
205	Prolong period of CMod's creates additional cost/causes bad blood between Resident Engineer and Contractor	ES/ RR	C	3		GEN
214	Micro Piles at UMS interfere with Tube-a-manchette installation (60' deep micropiles)	MB	C	3		TUN
J	Macy's entrance conflict with new piles	JW	C	3	1/23/14 UMS1060	UMS
PR37	Temporary construction power and ability to provide permanent power feed - PGE ability to provide power requirements to the program together with their other commitment	QC	C	3	5/3/18 STS1080	GEN
Q	As-built drawings and UMS construction drawings do not contain enough information to produce shop drawings without significant surveying effort delaying construction north	JW	C	3	3/24/12 UMS1280	UMS
V	Incorporation of revised Planning Zoning/ development criteria for Moscone Station TOD impact MOS and CTS construction contract.	RE	D	3	12/13/16 N-CTS1225	GEN

Design
Required
Market

**CENTRAL SUBWAY  
RISK SUMMARY**

Risk #	Risk Description	Risk Owner	Risk Category	Risk Rating	Status	Contract
15	Major TBM machine failure	SW	C	2	2/5/14 TUN1124	TUN
33	Damage to utilities at UMS causes delay to construction and/or consequential cost. (very close to walls adjacent to relocated utility trenches)	JW	C	2	7/19/16 UMS1410	UMS
89	3rd Party reviews of Design documents delays completion of Final Design.	JW	D	2	5/23/12 FDS 1930	GEN
95	Contractor default during construction impacts schedule. (key sub-contractor)	AW	C	2	11/17/17 STS 1500	GEN
100	Procurement of long lead items delays work. (fans, rails and special track work, TPSS, Escalators, elevators, TBM)	JW	C	2	11/17/17 STS 1500	GEN
106	Risk of Labor dispute delaying the work.	RR	C	2	11/17/17 STS 1500	GEN
211	Differing site conditions encountered during ground freezing of Cross Passage 5 results in increased costs.	RR	C	2		TUN
215	DPW Excavation permit reviews delay contract works	AC	C	2		GEN
PR1	Actual TBM production rate may be slower than forecasted.	MB	C	2	2/5/14 TUN1124	TUN
PR78	Delays or complication by other SFMTA projects delays CSP: radio, fare collection, C3/TMC	MB	C	2	7/27/12 FDS 1940	STS
27	Loss of business results in unanticipated restrictions on construction at MOS.	BN	C	2	4/28/15 MOS1150	MOS
28	Incomplete cutoff of groundwater at UMS	JW	C	2	8/12/15 UMS1320	UMS
65	Archeological/Cultural findings during construction increases schedule and/or cost. (Portal) AROUND 10%	SW	C	2	10/24/12 TUN1080	TUN
103	Difficulty in getting required permits.	AC	C	2	12/18/12 FDS 1275	GEN
105	Electrical service delays startup and testing.	RR	C	2	11/17/17 STS 1500	GEN
216	Olivet building potential construction impact	MB	C	2		TUN
2a	42"/48" sewer line relocated as part Utility 1 package is damaged by subsequent construction of the launch box.	SW	C	2	10/24/12 TUN1080	TUN
PR80	ROW costs higher than anticipated.	AW	M	2	7/1/12 FDS 1240	GEN
5	Possibility that lowest level of tie-backs extending out from Moscone Center could be within the tunnel alignment.	SW	C	1	7/2/13 TUN1118	TUN
8	Flowing groundwater in vicinity of UMS Station could make adequate annulus grouting difficult.	SW	C	1	8/28/13 TUN1120	TUN
32	Delay in advanced utility relocation delays ground treatment and start of construction. (Uty 2)	JW	R	1	7/31/12 N-ATT00100	UMS
35	Ground support structure causes groundwater table to rise which results in leakage into adjacent structures. (new structure might create a dam that results into leaks into new and existing structures)	JW	C	1	9/7/16 UMS1430	UMS
37	Damage to adjacent buildings at UMS due to surface construction activities.	JW	C	1	9/7/16 UMS1430	UMS
71	Power supply interruptions to TBM's (no dual power feed currently planned)	RR	C	1	2/5/14 TUN1124	TUN
202	Cargo Preference (Ship America) must solicit U.S.- flag carriers. Civilian Agencies Cargo = at least 50% (governed by Cargo Preference Act of 1954	RR	C	1		SSTS
1	Additional night shift work required at portal launch box due to bus storage facility relocation delay	SW	C	1	3/20/15 TUN1160	TUN
U	Proximity at junction of head house boundary wall and school yard may result in relocation of school yard during wall construction	MB	C	1	8/16/13 CTS1010	CTS
13	Damage / settlement 3x 5' to old brick sewer running parallel to tunnel alignment	MF	C	1	12/16/13 TUN1121	TUN
21	Incomplete cutoff of groundwater at MOS	QC	C	1	4/28/15 MOS1150	MOS
22	Public complaints result in unanticipated restrictions on construction at MOS.	JW	C	1	9/16/16 MOS1230	MOS
36	Damage to buildings or utilities as a result of heave from jet grouting at UMS.	JW	C	1	4/14/15 UMS1310	UMS
79	Delay in obtaining tunnel easements (3 #) (goes to condemnation) - Costs of ROW may cost more than expected	AC	R	1	9/7/2012	TUN
PR83	Coordination with prime contractor could result in schedule impacts to others.	RE	C	1	0	GEN
209	Implementing Pagoda Option - Obtaining Environmental Clearance	RR	C	-	Retired 7/9/13	TUN
107	Market risk in achieving 100% bonding capacity (cost and reduction in contractors able to get bonding)	RR	M	-	Retired 07/09/13	GEN
A	Timely resolution of Sewer lines south of portal.	SP	R	-	Retired 07/09/13	STS
3	Unacceptable settlement and impact on pavement or utilities from break-out (turn under) of TBMs from launch box.	JC	D	-	Retired 1/12/12	TUN
4	Unacceptable settlement of buildings along tunnel alignment. (Old Navy Building / Virgin Music piled foundations)	JC	D	-	Retired 01/12/12	TUN

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6	Special ground stabilization required for Cross Passage #5	JC	D	-	Retired 1/12/12	TUN
9	Mixed face (rock/soil) ground conditions beneath Stockton Street at Post Street. Potential for increase settlement tunneling through hard/soft interface (adjacent Union	SW	D	-	Retired 1/12/12	TUN
10	Unforeseen ground conditions beneath the Stockton Tunnel. - hard rock and / or fractured rock band - slows TBM	SW	D	-	Retired 1/12/12	TUN
11	Buried valley beneath Stockton Street at Sacramento Street increases risk of settlement as TBM transitions from rock into soil. (old buildings and damage to façade more	SW	D	-	Retired 1/12/12	TUN
12	Uncertainty of Alluvium/Colma Contact with respect to tunnel crown beneath Stockton Street in Chinatown.	SW	D	-	Retired 1/12/12	TUN
14	Excess settlement at break in to North Beach TBM Retrieval shaft due to low cover of alluvium.	SW	D	-	Retired 1/12/12	TUN
17	Steep gradients result in accident and suspension of works	SW	D	-	Retired 1/12/12	TUN
18	Market risk in single or re-bid in tunnel contract due to excess work in SF area	AW	M	-	Retired 11/10/11	TUN
18	Market risk in single or re-bid in tunnel contract due to excess work in SF area	SW	M	-	Retired 11/10/11	TUN
19	NFPA 101 approval to exceed 5% gradient at portal may not be approved (emergency stair wells would be required)	SW	R	-	Retired 11/10/11	TUN
20	Incomplete seal at TBM break in and break out at MOS station leads to excessive settlement	QC	D	-	Retired 1/12/12	TUN
23	Time to relocate existing utilities at MOS (fiber optics - uty 1, large water main - uty 2),	MB	C	-	Retired 11/08/12	UTL
24	Buildings adjacent to Station are subject to combined tunnel and station excavation settlement. (Wolf building and college building)	QC	D	-	4/28/15 MOS1150	MOS
25	Insufficient time in station schedule for fit out and finishes at MOS	QC	D	-	Retired 1/12/12	MOS
26	Misallocated Moscone Convention Center tiebacks. (angle v's position)	QC	D	-	Retired 1/12/12	MOS
29	Method and productivity for SEM excavation sequence proposed for Platform Cavern drifts at UMS more difficult than expected	JW	C	-	Retired 11/10/11	UMS
30	Slow advance of platform cavern at UMS due to insufficiently experienced (SEM) labor.	JW	C	-	Retired 11/10/11	UMS
31	Limited number of NATM/SEM experienced contractors leads to delay in contract award and/or increase in bid prices at UMS.	JW	M	-	Retired 11/10/11	UMS
39	Modifications to Ellis Street Garage could trigger seismic retrofit.	JW	C	-	Retired 11/10/11	UMS
40	Buildings adjacent to UMS station are subject to combined tunnel and station excavation settlement. (more sensitive structures)	JW	D	-	Retired 1/12/12	UMS
41	Secant pile walls may prove more expensive and / or take longer to install than expected (walls on incline)	JW	D	-	Retired 1/12/12	UMS
42	Insufficient space in UMS station to house equipment	JW	D	-	Retired 1/12/12	UMS
43	Insufficient time in station schedule for fit out and finishes at UMS	JW	D	-	Retired 1/12/12	UMS
44	BART impose additional constraints and / or take longer to approve FD submissions (for connection) than planned delaying completion of design	JW	R	-	Retired 5/24/12	UMS
45	Market risk - few bidders (less than 3 bonafide bids) for UMS station	AW	M	-	10/30/12 FDS1692	UMS
47	Revisions to the SEM sequence during construction at CTS, which differ from the plan, could lead to significant delays if not sufficiently pre-planned.	AH	D	-	Retired 12/13/12	CTS
49	Market risk - few SEM qualified bidders (less than 3 bonafide bids) for CTS contract resulting in higher costs than planned.	AW	M	-	Retired 08/09/12	CTS
51	Buildings adjacent to CTS station are subject to combined tunnel and station excavation settlement. (Mandarin Tower less so than other masonry buildings)	QC	D	-	Retired 1/12/12	CTS
53	Insufficient space in CTS station to house equipment	QC	R	-	Retired 11/10/11	CTS
54	Insufficient time in station schedule for fit out and finishes at CTS	QC	D	-	Retired 3/8/12	CTS
55	Proximity at junction of head house boundary wall and school yard may result in relocation of school yard during wall construction	QC	R	-	Retired 1/12/12	CTS
56	Escalation more / less than expected (Increase in bid prices to hedge possible increases in cost of volatile commodities.)	AW	M	-	Retired 06/13/13	GEN
57	The process of acquiring property: acquisition/condemnation and relocation of tenants could significantly delay schedule beyond that presently planned.	GH	R	-	Retired 08/09/12	MOS/CTS
58	Delay in vacation and interference with existing building services of sub-sidewalk basements delays utility relocations.	DG	R	-	Retired 5/24/12	UTL
59	Insufficient time in schedule to complete IGA's (joint utility trench issues) to meet relocation schedule (Agency resources etc.)	DG	R	-	Retired 1/12/12	UTL
60	Utility companies do not complete relocations in timely manner. (UTY 1 and UTY 2)	MB	C	-	Retired 10/18/12	UTL
61	Utility relocation is delayed due to non-standard materials not being available. (UTY 1 and UTY 2) AWSS special material ?	AW	C	-	Retired 02/14/13	UTL
62	Hazardous materials during building demolition. (China Town)	QC	D	-	Retired 4/12/12	CTS
63	Hazardous materials in soils during excavation.	RE	R	-	Retired 5/24/12	GEN
64	Environmental remediation at 76 Gas station underestimated.	ES	R	-	Retired 3/8/12	MOS
69	Historic preservation requirements for 933-949 Stockton.	DG	R	-	Retired 5/24/12	CTS

**CENTRAL SUBWAY  
RISK SUMMARY**

Risk #	Risk Description	Risk Owner	Risk Category	Risk Rating	Status	Contract
73	Integration of new equipment at Transportation Management Center (TMC) at 1455 Market Street with existing equipment at Lenox OCC.	CC	D	-	Retired 1/12/12	STS
74	Insufficient time in schedule for testing and commissioning S&C	CC	R	-	Retired 11/08/12	STS
75	Signals and Comms equipment may need to be stored off site	SW	C	-	Retired 04/11/13	STS
76	CS system may need re-design to new system (not yet identified - Coordinating with SFMTA Accessible Services on the wayfinding system for the visually impaired.)	RE	D	-	Retired 11/08/12	GEN
77	Translink behind schedule and fare system not available at ROD.	CC	S	-	Retired 11/10/11	STS
78	Current scope defines Lenox as point of connection - a late change of differing location would cause redesign and additional costs -Location of Operation Central Control (OCC) and coordination with OCC project.	CC	R	-	Retired 1/12/12	GEN
80	Delay in obtaining access to Moscone station sites (goes to condemnation).	GH	R	-	Retired 8/09/12	MOS
81	Additional ROW requirements	GH	R	-	Retired 1/12/12	GEN
82	ROW issues may impact Vent Shafts and / or stair locations	JW	R	-	Retired 1/12/12	GEN
84	More vehicles may be required than estimated	LA	R	-	Retired 2/9/2012	GEN
85	Delay in achieving ROD delays schedule (ROD planned end October 2008)	AW	R	-	Retired 11/10/11	GEN
86	Obtain FTA approval of a Letter of No Prejudice (LONP) to construct the TBM Launch Box Portal Structure, complete the Temporary Trolley Re-route, and incur associated construction management costs for these items.	ES	D	-	Retired 02/09/12	TUN
87	Insufficient design and processes in place to achieve project readiness to request entry into FD (October 2009)	ES	R	-	Retired 11/10/11	GEN
88	Bid protest delays award and NTP for Final Design.	AW	M	-	Retired 11/10/11	GEN
90	Multiple outside design consultants & mix of SFMTA / City could result in delays and additional costs due to complexities in design coordination	RE	D	-	Retired 12/12/12	GEN
91	Obtain prompt approval of FTA Full Funding Grant Agreement (FFGA).	ES	R	-	Retired 10/18/12	GEN
92	Additional construction contracts (over current proposed 7) resulting in multiple contractor interfaces and the potential for increased contractor conflicts/delays and management costs.	AW	C	-	Retired 10/13/11	GEN
93	Reduction of current strategy of 4 major civil contracts result in too large for reasonable economic competition (opposite to risk #100)	AW	R	-	Retired 10/13/11	GEN
94	Bid protests delay award and NTP for construction contracts	AW	M	-	Retired 06/13/13	GEN
96	Re-bid due to bid prices exceeding budget (by well over 10%) delays award of a contract or contracts. (negotiation with lowest bidder not possible)	AW	M	-	Retired 5/24/12	GEN
97	Conflicts arising from Contractors working concurrently in the same work space results in delays and claims for additional costs (systems / civil interface)	RE	C	-	Retired 05/10/13	GEN
98	Unqualified Contractors submit bids below reasonable market expectations	AW	M	-	Retired 09/13/12	GEN
101	More expensive staffing costs as a result of attracting labor into the expensive cost of living in San Francisco	AW	M	-	Retired 12/15/11	GEN
108	Inability of SFMTA / State (State of CA more than City) to achieve mitigation in market risk through alternate contract clauses etc. (as set down in Contract Package document) - Bidders perception of SFMTA litigation reputation could result in significantly higher bids and reduced number of bidders (inability to change GC's and alter contracting industry perception of the City)	AW	M	-	Retired 10/13/11	GEN
109	Additional Homeland security requirements imposed on Transit Agencies. (eg possible refuge in MOS, CTS, UMS for Earthquake, terrorist or other such event)	RE	R	-	Retired 5/24/12	GEN
110	Unanticipated poor weather delays work. Delay could be extended by Holiday Moratorium period.	MB	C	-	Retired 10/18/12	GEN
113	Finance charges may be required (assumptions on FTA funding at \$150m per annum optimistic) - finance costs would be in order of \$100-150M	ES	R	-	Retired 12/15/11	GEN
114	Grout pipes for BART underpinning are too long and cannot be installed accurately from small shaft.	SW	C	-	Retired 09/13/12	TUN
117	BART lining is not in the condition assumed for the settlement analysis after liner inspection is performed.	SW	C	-	Retired 10/13/11	TUN
118	Insufficient room on the launch box site to launch 2 TBMs concurrently.	SW	C	-	Retired 10/13/11	TUN
119	Schedule of CTS design deliverables could impact the 65% design completion.	RE	D	-	Retired 11/10/11	CTS
120	Geologists identify hard sandstone that could impact pipe canopy installation and other activities.	QC	D	-	Retired 1/12/12	CTS
121	Resolution of travel time issue from surface to CTS station platform for customers.	QC	D	-	Retired 12/15/10	CTS

**CENTRAL SUBWAY  
RISK SUMMARY**

Risk #	Risk Description	Risk Owner	Risk Category	Risk Rating	Status	Contract
122	Impact on Washington Street of the new headhouse design, Need to itemize all impacts and see if they are consistent with the SEIR. School bus access on Washington Street during construction	QC	R	-	Retired 1/12/12	CTS
123	Impact of new headhouse design on church near station construction.	QC	D	-	Retired 11/10/11	CTS
124	Potential additional changes related to new headhouse design layout.	QC	D	-	Retired 11/10/11	CTS
125	Number of escalators at CTS may be inadequate. If one is broken, customer flow may be impacted and redundancy is not available.	QC	R	-	Retired 11/10/11	CTS
152	Entrance north resolution	JW	D	-	Retired 10/13/11	UMS
153	Widen stairs at entrance at Apple	JW	D	-	Retired 10/13/11	UMS
177	Lack of staging area at MOS	QC	D	-	Retired 5/24/12	MOS
190	Tunnel haul routes longer than planned.	JC	D	-	Retired 3/8/12	TUN
193	Redesign to lower station may impact schedule and cost	QC	D	-	Retired 10/13/11	CTS
194	Constructability of design may cause redesign at CTS	QC	D	-	Retired 10/13/11	CTS
195	Constructability of design may cause redesign at UMS	JW	D	-	Retired 1/12/12	UMS
197	The untimely delivery of FFGA funds to the project causes shortfalls in cash flow and the Central Subway will be unable to meet its financial commitments	LA	C	-	Retired 5/10/13	GEN
198	Outreach efforts to get more bidders - (SSTS) 1300 Contract	AW	C	-	Retired 5/10/13	GEN
199	No interests from potential bidders although participated in outreach meet and greet	AW	C	-	Retired 1/10/13	GEN
200	Dealing with Larger Contracting Group	RR	C	-	Retired 01/10/13	SSTS
201	Bid Protest - (SSTS) 1300 Contract	AH	C	-	Retired 06/13/13	GEN
206	Delay in Decision on Retrieval Shaft	RR/MB	C	-	Retired 04/11/13	TUN
207	Implementing Pagoda Option for Retrieval Shaft - Delay in Obtaining Property	RE	C	-	Retired 06/13/13	TUN
138/197	Lack of staging area at UMS	JW	D	-	Retired 5/24/12	UMS
167-9	Lack of staging area at CTS	QC	D	-	Retired 5/24/12	CTS
170/192	Haul routes longer than planned at CTS	QC	D	-	Retired 3/8/12	CTS
52a	Cistern at Washington St is damaged.	QC	C	-	Retired 5/24/12	CTS
C	Air Replenishment system at MOS stations	RE	D	-	Retired 3/8/12	MOS
D	Air Replenishment system Tunnels	RE	D	-	Retired 10/18/12	STS
I	Union Square Garage structural concerns. Many cracks exist, no control joints obvious signs of past expansions and support work.	JW	D	-	Retired 1/12/12	UMS
K	Repairs to buildings, utilities, when the settlement limits are not exceeded at UMS	JW	C	-	Retired 5/24/12	UMS
L	BART delays to apple entrance	JW	R	-	Retired 1/12/12	GEN
M	Haul routes longer than planned at MOS	QC	D	-	Retired 3/8/12	MOS
N	Haul routes longer than planned at UMS	JW	D	-	Retired 1/12/12	UMS
P	DBI review of Union Square Garage modifications triggers seismic upgrade	JW	R	-	Retired 08/09/12	UMS
PR73	Delays or complications of design & construction by others – SF Dept. Of Technology, 3rd party utilities	RE	D	-	Retired 06/13/13	STS
PR74	Incomplete design by City staff – not prioritized to complete 1256 work on time	RE	D	-	Retired 12/13/12	STS
PR75	Limited work windows for the at-grade track construction (at all surface segment street crossings and especially at 4th and King) could extend the schedule and increase labor costs.	RE	D	-	Retired 10/18/12	STS

**CENTRAL SUBWAY  
RISK SUMMARY**

Risk #	Risk Description	Risk Owner	Risk Category	Risk Rating	Status	Contract
PR79	Parking Garage appraised higher than anticipated.	RE	M	-	Retired 11/08/12	UMS
PR82	Confined work spaces along alignment can impact productivity and result in significant cost and schedule impacts.	RE	C	-	Retired 06/13/13	GEN
R	Delay of Tunnel Contract NTP	AW	C	-	Retired 2/9/2012	TUN
S	Delay of station design submittals	RE	D	-	Retired 3/8/12	GEN