

Link Light Rail

University Link

Project Execution Plan



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University Link Project Execution Plan

September 2008

REVISION RECORD
U-LINK LINK CONTINGENCY MANAGEMENT PLAN

Rev No.	Date	Description of Revision
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LIST OF ABBREVIATIONS & ACRONYMS

BCE	Baseline Cost Estimate
CHS	Capitol Hill Station
CMP	Contingency Management Plan
FFGA	Full Funding Grant Agreement
FTA	Federal Transit Administration of the USDOT
GBR	Geotechnical Baseline Report
GDM	Geotechnical Design Memorandum
GDR	Geotechnical Data Report
GIR	Geotechnical Interpretive Report
GP	Geotechnical Plan
GRAP	Geotechnical Risk Allocation Plan
I-5	Interstate-5
IFB	Invitation for Bid
IPS	Integrated Project Schedule
MOU	Memorandum of Understanding
NTP	Notice to Proceed
PEP	Project Execution Plan
PES	Project Execution Strategy
PMOC	Project Management Oversight Contractor
PMP	Project Management Plan
PSST	Pine Street Stub Tunnel
RFP	Request for Proposals
SAFETEA-LU	Safe, Accountable, Flexible, and Efficient Transportation Equity Act - A Legacy for Users
ST	Sound Transit (Central Puget Sound Regional Transit Authority)
TBM	Tunnel Boring Machine
UL	University Link extension of the Central Link Light Rail System (also called U-Link)
USC	United States Code
USDOT	United States Department of Transportation
UWS	University of Washington Station
YOE	Year of Expenditure
WBS	Work Breakdown Structure

1.0 Purpose

This Project Execution Plan (PEP), developed and discussed during a project execution strategy meeting held in August 5, 2008, supplements Grantee's Project Management Plan (PMP) as prescribed by 49 U.S.C. Section 5327. This PEP supersedes the Technical MOU signed in January 2007 by the Federal Transit Administration (hereinafter "FTA" or "Government"), its Project Management Oversight Contractors (PMOCs), and Sound Transit (hereinafter "ST", or "Grantee"). All references to the FTA are to FTA Region X, unless otherwise noted; and all dollar amounts are in Year of Expenditure (YOES), unless otherwise noted.

The primary goal of this PEP is to advance ST's University Link (U-Link) Project through the Final Design and Construction phases to the Revenue Operations Date on budget and on schedule. This requires that the Project be substantially complete with respect to definition of start-up requirements. The Parties agreed that the following project management strategies shall be employed:

- Establish and maintain a technical and commercial risk baseline, based on cost estimates, cost forecasts, risk assessments, and a critical path schedule, all of which shall be updated quarterly
- Identify minimum target cost and schedule contingency levels, and cost and schedule risk management capacity implemented to achieve targets at key project milestones throughout the Project execution
- Develop and maintain "Primary" cost and schedule risk management capacity as needed to manage risks throughout the Project execution to achieve targets
- Develop "secondary cost mitigation strategies" (if feasible) to be implemented to offset cost contingency drawdown inside the "cost mitigation buffer zone" described below
- Develop "secondary schedule mitigation strategies" to be implemented to offset critical-path or near-critical-path activity slippage and meet other scheduling requirements.

2.0 Background

A series of working sessions attended by ST, FTA, and the PMOCs were conducted during November 2006 and early January 2007 (referred to as the "2006 workshops") to support FTA's programmatic decision to allow Grantee to enter Final Design. The purpose was to develop data to support ST's project execution strategy (PES) documented in a January 2007 Technical Memorandum of Understanding (MOU) for Grantee's U-Link Project. Incorporated in this MOU was an agreement to increase the escalation component included in the proposed Baseline Cost Estimate (BCE) and a reallocation of monies from the total project contingency to the base cost and YOES adjustment to reflect current market conditions and a revised out-year forecast.

As an outcome to the 2006 workshops, a graph showing the minimum contingency requirements as well as mitigation coordination was developed and documented in the MOU that supported a recommended BCE of \$1.646 billion inclusive of a total contingency level of \$329 million. The BCE at that time net of finance cost was calculated to be \$1.514 billion.

In August 2007, ST revised the BCE by increasing the project budget by \$152 million inclusive of finance cost (\$100 million exclusive of financing) to address the construction and right-of-way cost escalation and to provide a higher level of staffing to address the technical capacity and capability concerns from the FTA and PMOC. ST also extended the Revenue Operations Date by 3 months derived from the outcome of Schedule Risk Assessment. In September 2007 the ST Board approved a revised BCE of \$1.798 billion inclusive of a total contingency level of \$312 million, and a revised Revenue Operations Date of September 24, 2016. The 2007 revised BCE net of finance cost was \$1.614 billion.

Subsequently, another series of working sessions between the FTA, PMOCs, and ST were conducted between October 2007 and April 2008 to assess the revised BCE and update project risk assessment products. The FTA/PMOC identified market risk, geotechnical risk, and cost escalation as three primary risk areas requiring mitigation and execution strategies, which ST agreed to treat with additional contingency coverage. At a meeting on June 26, 2008, the Parties agreed to increase the BCE by another \$150 million inclusive of finance cost, and to increase the FFGA Project schedule contingency by 7 months to address these identified cost and schedule risks. On July 24, 2008 the ST Board approved a revised BCE of \$1.948 billion and a FFGA Revenue Operations Date of April 24, 2017. The 2008 revised BCE net of finance cost is currently \$1.756 billion.

On August 5, 2008, a Project Execution Plan Workshop was conducted in parallel with the FFGA application process for Grantee's Project. Graphs showing the minimum cost and schedule contingency requirements were preliminarily developed, which have subsequently been finalized, revising the 2006 PES graphics (see attached Exhibit 1 - Minimum Cost Contingency Curve, and Exhibit 2 - Minimum Schedule Contingency Curve). These contingency drawdown curves were developed based on a revised total contingency of \$422 million and total Project Schedule Contingency (Total Float) of 18 months.

3.0 Scope of Agreement

The scope of this PEP covers technical capacity and capability and project management plan elements, but it does not describe all of Grantee's requirements for technical capacity and capability, or project management plans under other FTA documents such as but not limited to FTA circulars, directives, master agreement, etc. In the case of a conflict with these other FTA requirements in the FTA master agreement or FFGA terms and conditions, those documents will take precedence.

3.1 Technical Capacity and Capability

Section 3011 (c) (1)(B) (i) of the new transportation statute, Safe, Accountable, Flexible, and Efficient Transportation Equity Act - A Legacy for Users (SAFETEA-LU, 2005), requires that the FTA only approve a grant with applicants (Grantees) **that have, or will have the technical capacity to carry out the project** (emphasis added). Grantee also must prepare and carry out a project management plan (hereinafter "PMP") approved by the FTA. Further, the Grantee is required to develop and implement such PMP for all project activities. Such PMP should adhere to the requirements in FTA Full Funding Grant Agreement (FFGA) Circular 5200.1A (dated December 5, 2002). Chapter II, Section 5 PROJECT MANAGEMENT PLAN states that "The Project Management Plan is central to FTA's determination of whether an applicant has the technical capacity and capability to build,

operate, and maintain a new starts project. Therefore, Government and Grantee understand and agree that **technical capacity and capability is defined** as a set of processes inclusive of resources and authority, defined, implemented, and maintained by the Grantee organization that has demonstrated, or will have the ability to demonstrate its ability to:

- Conform to grant agreements, applicable statutes, codes, ordinances, and safety standards;
- Comply with FTA requirements on the part of agencies, consultants, contractors, and subcontractors working under approved third party contracts or inter-agency agreements;
- Maintain the project work schedule agreed to by FTA and Grantee and constantly monitor grant activities to assure that schedules are met and other performance goals are being achieved; and
- Manage expenditures within the latest approved project budget;

By Grantee organization providing:

- Continuous administrative and management direction of project operations;
- Adequate technical inspection and supervision by qualified professionals of all work in progress that allows the Grantee organization to implement a process to define project requirements, engage stakeholders to produce positive outcomes, allocate resources, perform project activities, monitor progress, and make adjustments, as required, to obtain the proper information and assure decisions are made at the appropriate time.

3.2 Project Management Plan

49 U.S.C. Section 5327 requires the Grantee to develop and implement a PMP for all project activities. The PMP is a dynamic document that will be expanded and updated as necessary throughout Project implementation period. As part of the execution plan, this PMP scoping product delivers recommendations to advance project development and implementation inclusive of but not limited to Project Delivery Method, Contract Packaging Strategy, Project Cost and Schedule, Risk and Contingency Management.

Grantee's Project Management Plan as developed and implemented is central to FTA's determination of whether an applicant has the technical capacity and capability to build, operate, and maintain a New Starts project. PMP scoping offers FTA and the Grantee an opportunity to gauge effectively the requirements for Grantee capacity, and the requirements for demonstrating such, i.e. the "adequacy" of Project Management Plan components. PMP scoping as a process, allows a consensus on what should be determined - that is, what will be covered, to what extent and in what detail in the grantee PMP and its downstream implementation as well as the outline of future scoping efforts. Future PMP scoping efforts ensure that the PMP is truly a dynamic document and meets project requirements.

To that purpose, a series of working sessions between the FTA, Grantee and PMOC were jointly conducted to develop data and information to support this PMP scoping effort for Grantee's PMP.

In addition to the minimums specified in 49 CFR Part 633, Government and Grantee agree that the PMP requirements for the U-Link Project include additional management plans as set forth in this PEP inclusive of but not limited to Risk and Cost and Schedule Contingency Management Plans and a Geotechnical Risk Allocation Plan. Sound Transit will develop, modify, implement, and maintain its policies and procedures to support the project execution strategy.

This PEP was developed to supplement and support Grantee's PMP. The FTA and ST also understand and agree that the following are additional requirements for the Grantee's PMP, but do not represent an exhaustive description of all the requirements for the Grantee's PMP.

4.0 Contingency Management

For the purposes of this PEP, the contingency reference in Section 13 - Baseline Cost Estimate of the FTA standard FFGA is interpreted as "total contingency." In November 2006, this total contingency was reported to be \$329 million. As discussed in the background above, this contingency was increased to \$422 million in July 2008. Further, the Government and Grantee understand and agree that although the cost segregations below may vary, the appropriate basis for assessing Grantee's management of project contingency is the amount of total contingency. Additionally, such total contingency shall be further segregated into Unreserved and Reserved contingency as defined below:

- Unreserved Contingency: those contingency funds that are readily and freely available to absorb cost increases to the Project.
- Reserved Contingency: those contingency funds that are not readily and freely available as they are subject to use only with Sound Transit Board approval.

The Government and Grantee further agree that in order to ensure sufficient contingency for completion of the project, distribution, or consumption of total contingency, whether in the form of reservations, encumbrances, etc. shall be subject to additional requirements as described below.

4.1 Grantee Roles and Responsibilities

Grantee shall implement and maintain throughout the Project, an acceptable Contingency Management Plan that ensures that distributions of project contingency are appropriately controlled resulting from deliberate and sufficiently independent Grantee management actions with adequate internal controls that are tested regularly. All transactions shall be sufficiently documented in a timely manner with no retroactive accounting actions.

Similarly, Grantee's management system shall ensure that new contingency that is created by means of construction bids lower than estimated, contract under runs, Value Engineering, and exercising secondary mitigation is transferred back to the appropriate contingency account in a timely manner, and identified as part of total contingency.

The Contingency Management Plan shall also describe the manner in which Grantee shall forecast and trend the project contingency, as part of its overall budget and progress reporting effort, in conformance with FTA requirements.

Grantee shall also ensure that the amount of total contingency shall be above the minimum amounts, at the following specified times, also known as "FTA Milestone Review Points."

- These time periods set forth below, are defined in terms of physical completion of sealed bid procurement actions for construction ("Bid") and the construction contract completion itself ("Constructed"). At the end of these specific time periods, ST and FTA anticipate conducting a joint review, to review among other matters, the project implementation with respect to the Contingency Management Plan and its update. ST and FTA agree that Grantee shall maintain Reserved Contingency up to the following "Hold Points" as appropriate for execution of the Project currently targeted as follows:
 - \$150 million through 90% Bid. Currently, this is forecasted to occur during the 3rd quarter of 2011.
 - Thereafter, the Reserved Contingency shall be reduced to \$80 million. This contingency amount shall be held as reserves for one year after the completion of U220 and U230 contracts for potential Differing Site Condition (DSC) and other claims, or final settlement of all claims, whichever occurs first. Currently, this is forecasted to occur during the 3rd quarter of 2014.
 - Thereafter, the Reserved Contingency shall be reduced to \$50 million through the Sound Transit's projected Revenue Operations Date. Currently, this is forecasted to occur during the 3rd quarter of 2016.
 - Thereafter, a minimum of \$25 million shall be held as reserves through the FFGA Revenue Operations Date milestone, which is April 24, 2017.

The above-targeted Reserve Contingency amounts are subject to change upon mutual agreement of the Parties to this Agreement.

ST and FTA also agree to establish a Minimum Contingency thresholds as follows:

- \$250 million at the award of FFGA, which is currently December 2008.
- Thereafter the minimum shall be lowered incrementally each period, but not below \$200 million until after the Bid/Award of U220 contract. Currently, this is forecasted to occur during the 3rd quarter of 2009.
- Thereafter, the minimum shall be lowered incrementally each period, but not below \$150 million until after 90% Bid, which is currently forecasted to be in the 3rd quarter of 2011.
- Thereafter, the minimum shall be lowered incrementally each period, but not below \$80 million until one year after the completion of U220 and U230, which is currently forecasted to be in the 3rd quarter of 2014.
- Thereafter, the minimum shall be lowered incrementally each period, but not below \$50 million until after Revenue Operations Date.

A Buffer Zone, calculated to be twenty percent (20%) above the Minimum Contingency, shall be maintained until 100% Bid/U220 & U230 Contract Completion currently scheduled in 2Q2013. If the Total Contingency falls into the Buffer Zone, Sound Transit shall evaluate implementing secondary risk mitigation measures and other mitigation as discussed in the Project Execution Strategy section below.

The above-cited targeted contingency amounts are shown graphically in Exhibit 1.

Current forecast information cited above is based on the Integrated Project Schedule (IPS) updated as of June 30, 2008. As the IPS is revised and updated throughout the life of the program, the above listed time periods may shift.

Grantee shall manage distribution and use of project contingency above the Minimum Contingency and Reserved Contingency levels in conformance with the requirements further detailed in the Project Execution Strategy section of this PEP.

4.2 FTA Roles and Responsibilities

FTA and its PMOC will monitor and evaluate Grantee's implementation of the Project and the management of total contingency in conformance with the requirements of this PEP and the awarded FFGA.

5.0 Schedule Contingency Management

5.1 Schedule Management

- The current baseline schedule is Integrated Project Schedule (IPS) updated as of June 30, 2008.
- Grantee's reporting shall analyze the critical path and the next longest path(s) monthly. This information will be provided as part of the Monthly Report.
- Grantee shall update the project schedule for major activities using forecast data resulting from progress curves. Such progress functions shall be applied to critical path activities and the next longest path.

Schedule contingency shall be further segregated into **Forced Lag**, **Buffer Float**, and **Contingency Float**, which are all elements of **Project Schedule Contingency** as defined below:

- **Forced Lag:** built-in float on the Critical Path; it is also referred to as "Project Interface Float." Currently the IPS contains 5 months (155 calendar days) of Forced Lag.
- **Buffer Float:** duration between Sound Transit targeted Revenue Operations Date and the Schedule Revenue Operations Date. Currently the IPS contains 6 months (176 calendar days) of Buffer Float, which is also on the Critical Path.
- **Project Float:** equal to Forced Lag plus Buffer Float.
- **Contingency Float:** duration between FFGA Revenue Operations Date and Sound Transit targeted Revenue Operations Date. Currently the IPS contains 7 months (211 calendar days) of Contingency Float.
- **Project Schedule Contingency:** sum of Forced Lag, Buffer Float, and Contingency Float. Currently, the IPS contains 18 months (542 calendar days) of Total Float.

- **“Desired Minimum” Float:** float required by conducting “Backwards Pass” review of schedule to develop contingency minimum

The Government and Grantee further agreed that in order to ensure sufficient schedule contingency for completion of the project, distribution, or consumption of schedule contingency shall be subject to additional requirements as described below.

5.2 Grantee Roles and Responsibilities

Grantee shall come into substantial conformance with the requirements of this Agreement within 90 calendar days of its acceptance. This shall be accomplished by updating the PMP as necessary to describe, as an identifiable element in the PMP, an acceptable Schedule Contingency Management Plan and process. Thereafter, Grantee shall implement and maintain an acceptable Schedule Contingency Management Plan throughout the project, as an element of the PMP.

Grantee shall manage distribution, transfers and use of all Project Schedule Contingency in conformance with the requirements of this plan. This plan shall ensure that the distribution of all Project Schedule Contingency is appropriately controlled resulting from deliberate and sufficiently independent management action with adequate internal controls that are tested regularly. Additionally, all related transactions shall be sufficiently documented in a timely manner.

Grantee’s plan shall also ensure that new schedule contingency that is created by means of shortened critical path activities, work-arounds that realign activities and increase float, is transferred back to the appropriate schedule contingency account in a timely manner, and identified as part of total schedule contingency.

This Schedule Contingency Management Plan shall also describe the manner in which the Grantee shall forecast and trend the project contingency, as part of its overall progress reporting effort, in conformance with FTA requirements. Grantee’s plan shall also ensure that the amount of schedule contingency throughout project implementation meets the following requirements which are defined in terms of physical completion of procurement actions for construction (competitively negotiated, or by sealed bid) and the substantial completion of construction contracts.

Project Float in the form of Critical Path Buffer Float plus Forced Lag in the Project Schedule shall be maintained above the minimums at the time periods set forth below:

- 331 calendar days through Bid and Award of the U220 contract. Currently, this is forecasted to occur during the 3rd quarter of 2009.
- 241 calendar days through the completion of U220 and U230 Tunneling activities. Currently, this is forecasted to occur during the 4th quarter of 2012.
- 150 calendar days through the start of Systems work in the Stations. Currently, this is forecasted to occur during the 3rd quarter of 2014. Prior to this date, the following activities are anticipated to be complete.
 - Contract package/Procurement Notices to Proceed (NTPs)
 - Stakeholder milestones such as UW, WSDOT, King County, permitting, approvals, etc.

- ROW/Real Estate activities or milestones
- Tunneling production completion milestones
- 75 calendar days through the completion of Systems work and the beginning of Systems testing. Currently, this is forecasted to occur during the 4th quarter of 2015.

Project Schedule Contingency for all schedule activities is currently distributed as follows:

- 542 calendar days through Bid and Award of the U220 contract. Currently, this is forecasted to occur during the 3rd quarter of 2009
- Thereafter, 451 days through the completion of tunneling in U220 and U230 Tunneling activities. Currently, this is forecasted to occur during the 4th quarter of 2012
- Thereafter, 391 days through the start of Systems work in stations. Currently, this is forecasted to occur during the 3rd quarter of 2014
- Thereafter, 211 calendar days through the ST Revenue Start Date (3Q2016)

Milestones	"Desired Minimum" Float (Cal. Days)	Buffer Zone (Cal. Days)	Project Schedule Contingency (Cal. Days)
3Q08 - FFGA Award	241	331	542
3Q09 - 40% Bid	241	331	542
2Q10 - 20% Const	150	241	451
4Q11 - 50% Const	150	241	451
4Q12 - 75% Const	150	241	451
4Q13 - 85% Const	90	150	361
2Q14 - 90% Const	90	150	361
2Q16 - 100% Const	30	75	285
3Q16 - Revenue Service	0	0	211

Through means of the Forced Lag Grantee shall maintain a minimum float of 30 calendar days between the completion/ demobilization of U230 contract (TBM Tunnels CHS to PSST) and the start of U240 contract (Capitol Hill station).

- Grantee shall maintain a minimum float of 20 calendar days between the completion of the equipment rooms in the UWS and CHS and the installation of the Systems equipment in these rooms.

Through the use of available "Contingency Float" of 211 calendar days, the UL schedule contingency in the form of minimum differences between the project critical path and the next longest path(s) shall be maintained as follows: 180 calendar days thru 100% bid; 120 days thru 50% constructed and 90 days thru 90% constructed.

In the event that any of the above requirements are not met, Grantee shall implement appropriate actions as stated below in the Project Execution Strategy section.

Current forecast float cited above is based on the Integrated Project Schedule (IPS) updated as of June 30, 2008. As the IPS is revised and updated throughout the life of the program, the above listed time periods will be adjusted as necessary to maintain prudent Schedule Contingency throughout the Project. The project schedule will be re-evaluated quarterly to validate float inventory on the critical path. Should the float associated with critical path fall below the "Contingency Float" as specified on Page 10 and shown in Exhibit 2, it will also be reported in the Monthly Report.

6.0 Risk Management

FTA's objective is to work in partnership with Grantee to ensure that Grantee's management processes are focused around sound decision-making made at the appropriate time, driven by a thorough understanding and control management of project risks and their mitigation; namely the grantee's technical capacity and capability to implement the Project as demonstrated by its Project Management Plan.

6.1 Grantee Roles and Responsibilities

Grantee shall implement and maintain throughout the Project, an acceptable risk management plan for the following:

- Assessing (identifying and analyzing) project cost and schedule risk;
- Developing risk-handling options inclusive of primary risk mitigation;
- Developing a secondary mitigation plan and related capacity to handle risk events or "triggered" mitigation activities and as appropriate, their recapture;
- Monitoring risks to determine how risks have been handled or changed; and
- Documenting and reporting to the FTA, the Grantee's risk management program.

This plan shall include the specifics on what is to be done, when it should be accomplished, who is responsible, what is the associated cost and schedule, how will its effectiveness be measured or tested, as well as how the most appropriate risk management strategy will be selected from those options.

6.2 Secondary Cost Mitigation Capacity

Separate and above the mitigation scope required by the Grantee's primary mitigation effort, the Grantee shall also develop a secondary mitigation plan and related capacity to handle risk events or "triggered" mitigation activities that are project phase specific. These activities arise when events occur that may include, but are not limited to, required scope changes, cost overruns, unforeseen site conditions and outside agency and force account cost and schedule impacts.

In accordance with the terms of the MOU previously agreed in January 2007, ST had identified an initial 14 secondary mitigation items with a total capacity of \$110 million. However, most of these cost savings opportunities have already been exercised. Sound Transit is continually looking for opportunities to reduce cost while delivering the basic U-Link scope on time and within budget. The challenge is to identify potential cost savings as early as possible in the design process and then act to preserve the option in the construction phase.

Inasmuch as most of the secondary mitigation capacity has already been utilized, a significant amount of secondary cost mitigation capacity is no longer available to Sound Transit for this PEP; nevertheless, Grantee shall continue to make a “best effort” to identify further secondary mitigation opportunities and use good judgment in deciding on the use of such opportunities to maintain the contingency balance above the minimum.

6.3 Secondary Schedule Mitigation Capacity

Separate and above the mitigation scope required by the Grantee’s primary schedule mitigation effort, Grantee shall develop and maintain a capacity to effectuate secondary mitigation as follows:

- Grantee shall develop an aggregate minimum capacity of 60 calendar days of schedule compression for the critical path of the project.

These secondary mitigation strategies include, but not limited to:

- Alternate Distribution of rail – If the tunnel work is delayed and the U240 contract is in danger of being delayed, the planned distribution of the rail through the Capitol Hill excavation can be eliminated. The alternate distribution point is through the Pine Street Stub Tunnel.
- Shared Access at Capitol Hill Station Site – If the U220 tunnel contract is delayed the U240 contractor can have access to the south end of the excavation or if the U230 tunneling is delayed the U240 contractor can have access to the north end of the excavation.
- Concurrency of Systems Equipment Installation in Stations and Tunnels – Currently there is three months overlap in the installation of systems equipment at the Capitol Hill and UW Stations. If further schedule compression is required, these installations can occur concurrently.

The project schedule will be re-evaluated quarterly to validate the identification of the three longest paths. Should the float associated with any of those paths fall below the “Contingency Float” as specified on Page 10 and shown in Exhibit 2, it will also be reported in the Monthly Report.

Current forecast information cited above is based on the Integrated Project Schedule (IPS) updated as of June 30, 2008. As the IPS is revised and updated throughout the life of the Project, the above listed time periods may be adjusted as necessary to maintain prudent Project Schedule Contingency throughout the Project.

6.4 Geotechnical Risk Mitigation Capacity

Recent experience on FTA’s New Starts projects with geotechnical scope is some of the largest risks that transit projects face are in fact geotechnical risks. The primary focus of developing this mitigation capacity is three areas of geotechnical scope that represent large scale cost and schedule risk; namely, TBM tunnels, I-5 construction pits, support of excavation and mined tunnel cross-passages. These types of geotechnical risk factors are also some of the more difficult elements to identify, analyze, and mitigate.

The FTA has determined that taken as an aggregate, the typical New Starts project with geotechnical risk has experienced the following:

- *Cost growth in terms of geotechnical scope, market risk and post award changes in the form of differing site conditions in the range of 45-75% over the initial engineer's estimate.*
- *Geotechnical design documentation presents contingent scope in the range of 10-25% and typically is missing a formal, clearly defined allocation between project budget and allocated contingency.*
- *Geotechnical Risk is often fully allocated to and not shared with the Contractor; and sometimes is even negotiated in the form of cost overrun insurance.*
 - *Efficient risk transfer/sharing is only commercially feasible if two conditions are met: (1) the specific, identifiable risk is capable of being valued differently by the grantee and the contractor and (2) the contractor can manage the risk more efficiently than the grantee.*
 - *Non-specific risk transfer in the form of differing site conditions indemnity is inefficient and costly.*
- *Procurement cycle times from issuance of IFB/RFP to NTP (inclusive of re-bids) in the range of 7-24 months with an average for all projects of 14 months.*
 - *Grantees choosing sealed bids over competitive negotiation 65% of the time.*
 - *Addenda to the procurement ranging from 10 to 20 in number.*
- *Competition that is limited and largely joint ventures; where the onsite contractor enjoys a perceived advantage; where the average number of bids received on the first package bid is 3; with a 50% reduction in the competition for the second package in the range of 1-2 bids.*
- *Re-bidding/Repackaging where the agency chose to reject all bids and repackage the work, and re-bid at least once; a grantee with a geotechnical contract faces an 85% likelihood of being forced to re-bid and repackage the work with virtually no reduction in cost on the second round. Such repackaging creates additional risk in that it is often performed in the absence of a project level work breakdown structure (WBS)/ contract package level WBS control structure.*
- *Geotechnical construction delays to the project ranging up to 20% of the activity duration and creating claim impacts to other contracts or delays to the Revenue Operations Date itself.*

Based upon FTA's program experience with allocating and transferring/sharing geotechnical risk on other New Starts projects, risk management strategies have been developed to mitigate this type of risk and form the basis for these PEP requirements. Therefore, separate and above the required cost and schedule mitigation scopes (primary and secondary), Grantee shall also develop a geotechnical risk capacity to effectuate primary geotechnical risk mitigation as follows:

- Project Level Strategies:
 - With respect to contracts with geotechnical scope, Grantee shall ensure that some level of risk allocation is achieved by means of explicit contract language, supplementary provisions, etc. and the presence of recognizable financial

consideration. Grantee shall make use of Geotechnical Baseline Reports (GBRs) in this regard, but does so as a matter of its own business decision.

- Such risk identification shall for discrete, identifiable items that are capable of being transferred to the contractor and Grantee estimates that the Contractor can manage the risk more efficiently.
- Recognizable financial consideration for geotechnical scope items may be in the form of provisional sums, allowances, incentives, award fees, unit pricing, etc. Project savings may be shared or not shared with the Contractor based upon Grantee's analysis.
- Contract Package Level Strategies:
 - A Geotechnical Plan (GP) shall be developed as a primary management sub-plan under the PMP and it is the parent document to all underlying geotechnical, environmental site, groundwater hydrology reports, etc.
 - The GP shall describe Grantee's development and implementation of underlying sub-plans consisting of as a minimum; data reports (GDRs, etc.), interpretative reports such as GIRs, allocation documents (such as Geotechnical Contracts Risk Allocation Plan, Source Selection Plans for selected contracts), control documents such as PWBS/CWBS, estimates, progress functions and contract documents such as General Conditions, specification section (Division 1,2,3) and as applicable GBRs.
 - All interpretative reports such as the Geotechnical Interpretative Report (GIR), Groundwater Hydrology, Environmental site assessments, and so forth, shall contain construction considerations sections that address all material scope items; these construction considerations sections shall be independently reviewed by project construction managers, estimators as well as subjected to periodic, formal constructability reviews.
 - Such interpretative reports shall be managed as a configuration process item and kept current with project configuration as it changes and Geotechnical Design Memorandums as they are produced.
 - All Geotechnical Design Memorandums (GDMs) shall contain (as much as practical) separate construction consideration section which then shall be integrated into the project level GIR. [GIR (Parent) and GDMs (Children)]
 - The Geotechnical Contracts Risk Allocation Plan (GRAP) shall disaggregate the project level interpretative reports into a WBS or a detailed technical memorandum that "crosswalks" to cost estimates, schedules and contract documents. This allocation shall also identify contingent scope in the reports and allocate them between one of the following; fully allocable to specific budget lines, fully allocable to specific allocated contingency lines, or partially allocable to specific budget and partially allocable to specific allocated contingency. This report shall also serve to formally document Grantee's approach to allocation of risk for geotechnical scope between the Contractor and Grantee.

- Source selection plans shall be developed for Contracts U220 and U230. Such plans shall be consistent with and extend the risk allocation planning in the parent GRAP document. These plans shall identify a process for establishing and negotiating transfer of specific risks and associated financial resources. The agreed upon design allowances for U220 and U230 in the approved Baseline Cost Estimate shall be used to mitigate geotechnical risks identified in the GRAP are currently estimated to be on the order of \$25 million. This geotechnical mitigation strategy is based upon Grantee's contract packaging strategy as of August 2008.

6.5 FTA Roles and Responsibilities

FTA shall provide technical assistance to Grantee in development of GRAP and its underlying management plans such as source selection plans.

FTA and its PMOC will monitor and evaluate Grantee's implementation of the Federal Project, its risk mitigation plan as well as the effectiveness of its risk mitigation activities in conformance with the requirements of this PEP.

7.0 Project Execution Strategy

The major goal of the Project Execution Strategy is to complete the proposed New Starts Project within budget and on schedule. The primary strategy is to maintain a total contingency balance throughout the life of the project that is acceptable to both grantee and FTA and is totally sufficient to complete the Federal Project.

A "secondary" strategy is in the recognition that there is a "break point" in project execution where all market risk and early construction risk has been mitigated, beyond which, the application of contingency is the only effective way to treat project risk. Prior to this break point, FTA and ST agree that risk mitigation often is required to preserve the agreed upon contingency minimum balances. ST may apply contingency, without mitigation, in those circumstances where such contingency is sufficient. This will require the integration of Grantee risk management and contingency management activities and the creation of a "Buffer Zone" above the Reserved Contingency (or "Desired Minimum" Float for the schedule contingency) balances identified above. This strategy also recognizes that Grantee management of the Project may create new contingency or preserve sufficient existing contingency to allow "recapture" of earlier, secondary mitigation efforts.

FTA and ST agree that risk mitigation activities and plans need to be coordinated with contingency activities and plans. As part of the ongoing project management process, specifically, the annual update and FTA review and approval of Grantee's PMP, the Minimum Contingency Curves attached to this PEP will be adjusted to reflect the current cost and schedule status as well as demonstrate conformance with the agreed upon Reserved Contingency minimums.

7.1 Grantee Roles and Responsibilities

Grantee shall coordinate its Risk Management plans and activities with its Contingency Management and Schedule Contingency Management Plans and activities in order to ensure that the Reserved Contingency minimums and “Desired Minimum” Float are preserved throughout the duration of the project. Grantee shall also integrate such plans and activities through the creation of a Buffer Zone as described below.

For Cost Contingency, a Buffer Zone will be established and maintained at approximately 20% above the associated undistributed contingency minimum through the completion of U220 and U230 contracts, and the award of U240 contract, which currently is forecasted to occur during the 2nd quarter of 2013, as defined above and in the attached Cost Contingency Minimum Curve. Grantee requirements for contingency where the balance is greater than the associated buffer zone boundary may be satisfied by the application of either contingency, secondary mitigation or some combination thereof. In those instances where the contingency balance is within the Buffer Zone, the Grantee shall implement appropriate mitigation actions to bring the contingency up above the Buffer Zone prior to the next FTA Milestone Review Point. Should the implementation of these mitigations fail or the contingency balance remains within the Buffer Zone at the FTA Milestone Review Point, Grantee shall initiate a Full Project Review by the Project Office and develop and implement a Contingency Recovery Plan in conformance with the FFGA requirements within 90 days.

Should the contingency balance fall below the Minimum Contingency balance, and Grantee is unable to bring the contingency up above the minimum contingency prior to the next FTA Milestone Review Point, Grantee shall grant the FTA the right to conduct a Full Project Review. Grantee and FTA/PMOC shall hold workshops to develop a Contingency Recovery Plan within 90 days. Should the contingency balance falls below the Reserved Contingency, and the Grantee is unable to obtain permission from its Board to sustain the contingency balance below the Reserved Contingency prior to the next FTA Milestone Review Point, Grantee shall request its Board to initiate a Full Project Review to be conducted by a committee chosen by Board (e.g. Experts Review Panel). Grantee shall work with this entity to develop and implement a Contingency Recovery Plan in conformance with the FFGA requirements within 90 days. The specifics and details of the Buffer Zone will be reviewed annually.

For Project Schedule Contingency, a similar Buffer Zone will be established and maintained at approximately three months above the associated “Desired Minimum” Float through the completion of tunneling, which currently is forecasted to occur during the 2nd Quarter of 2012. After that point the Buffer Zone will be reduced to two months through the start of Systems work in the stations, which currently is forecasted to occur during the 3rd Quarter of 2014. After that point the Buffer Zone will be reduced to 1.5 months until 100% Construction which currently is forecasted to occur during the 2nd Quarter of 2016.

Secondary cost mitigation capacity requirements in any one time period shall be satisfied first by drawing against the current mitigation opportunities identified in the Grantee's plan. In the event there is no current capacity, Grantee may then sequentially draw against future mitigation capacity elements identified for that period or future elements. Sound Transit may recapture earlier secondary mitigation to the extent that the total contingency balance exceeds \$50 million in 3rd Qtr 2014 or as adjusted as part of the annual review.

For Project Schedule Contingency, in the event that any of the schedule contingency requirements (Forced Lag, Buffer Float and Contingency Float) are not met, Grantee shall immediately implement appropriate mitigation strategies to bring the subject float or additional requirement to the agreed upon levels prior to the next FTA Milestone Review Point. Should the implementation of these mitigations fail, Grantee will revise its schedule to reflect the changes to the critical path and provide an impact assessment within 90 calendar days. Should this impact assessment indicate that the project schedule contingency will fall below the "Desired Minimum" Float (Exhibit 2), Grantee shall initiate efforts to develop and implement a recovery plan in conformance with the FFGA requirements.

In order to manage the contingency drawdown, the following steps have been agreed to:

- As a part of the FTA Quarterly Meeting, ST will report on the level of available contingency as compared with the predicted levels on the minimum contingency balance curve. Such reporting shall be timely, current and include forecasting and trend analysis of all contingency elements.
- At each FTA Milestone Review Point, ST and PMOC will review the Risk Model to examine potential risks remaining and to update the Project Execution Graphics.
- As part of an overall budget control process, ST will review the cost for individual construction contracts at each design deliverable (60%, 90% and 100%) to see how the most current estimates compare with budget values. These reviews will be on-going and will take place between FTA Milestone Review Points.

7.2 FTA Roles and Responsibilities

FTA and its PMOC will monitor and evaluate Grantee's implementation of the Project Execution Strategy for the Federal Project as well as the effectiveness of its integration of risk mitigation activities and contingency management in conformance with the requirements of this Plan.

Attachments:

Exhibit 1 - Minimum Cost Contingency Curves

Exhibit 2 - Minimum Schedule Contingency Curves