

Eastside Streetcar Loop – Phase 1 Conceptual Design

**Third Party Public Improvement Project Risk Assessment
Cost & Schedule, Risk & Opportunity Assessment**

28th January 2008

Prepared for
Portland Development Commission



Presented by:

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1. EXECUTIVE SUMMARY

The Portland Development Commission has retained the services of Faithful+Gould to provide an independent review of potential risks to the Streetcar Loop project's scope, schedule and budget based upon the investigation completed to date. This Phase 1 Assessment Report is based upon review of the completed Conceptual Design. A separate Phase 2 Assessment Report will review the 100% Design Development drawings and 100% Design Development Cost Estimate.

The Portland Streetcar Loop Project will be a 3.3 mile extension of the existing Portland Streetcar Project that will extend service from the Pearl District in NW Portland across the existing Broadway Bridge, serving the eastern half of the Portland Central City. The total project cost is estimated at \$147 million, including \$20 million for new vehicles. The project timeline expects commencement of operations of the Streetcar Loop in early 2011.

Following the Phase 1 Eastside Streetcar Loop Cost and Schedule Risk and Opportunity meetings held on 13th and 14th December 2007, analyses were undertaken to assess the potential impact of risks on the project schedule and estimate. The intent of these analyses is to evaluate the level of contingency applied to the Total Base Estimate, based upon identified risks. These analyses are not a re-estimate of the total project cost and schedule. The project plan calls for development of these deliverables at key milestones in the design process.

The Cost Risk Analysis was undertaken on the basis of the following estimate breakdown:

Estimate Breakdown	Estimate
Total Base Estimate	\$ 75,116,128
Unallocated Contingency (20% of Base Estimate amount)	\$15,283,226
Professional Services (25% of Base Estimate amount)	\$18,686,532
Finance Charges	\$4,603,000
Escalation (not included in the above base estimate)	\$13,226,000
Vehicles	\$20,000,000
TOTAL PROJECT	\$146,914,886

The Cost Risk analysis was carried out on the Base Estimate amount of \$75,116,128 and forecasts the following contingency and overall base estimate project costs at 50% and 80% confidence levels:

(The 'Complete Project' costs do not include the unallocated contingency, professional services allocation, financial charges, vehicle allocation, or any allocation for escalation).

Confidence Level	Contingency (\$)	Contingency (%)	Complete Project Costs incl. Contingency (\$)
50%	\$5,507,648	7.33%	\$80,623,776
80%	\$13,684,576	18.22%	\$88,800,704

The current Base Estimate of \$75,116,128 and Contingency of \$15,283,226 equates to a 'Complete Project' of \$90,399,354. The above table shows that this amount resides at a confidence level of approximately 80%. Therefore the current contingency level is expected to be adequate based upon the findings of this Phase 1 risk assessment.

The top 5 quantified cost risks are as follows:

Risk ID	Risk Description
2	Risk that additional scope will be required by Water & BES (i.e. the water bureau may stipulate additional and longer casings required under the track, BES enhanced stormwater treatment).
13	Unforeseen site conditions (utilities, environmental etc) during construction
9	Need coordination with other Public Works projects or other major Private Developments to avoid duplication or delay of work i.e. PDOT Burnside/ Couch Couplet, ODOT McLoughlin Viaduct
19	Risk that additional Green features required by BES; requested late in the design stage
5	Bridge conditions (Multnomah County & ODOT) i.e. lift mechanism, deck support etc; result in unforeseen costs during construction

The schedule risk analysis identified the deterministic schedule end date as January 16, 2011. Results indicated that this has a 7% probability of success on the basis of the current project risk status (i.e. pre-mitigation).

The pre-mitigative P50% project completion date is April 25, 2011.

The pre-mitigative P80% project completion date is June 20, 2011.

The top 5 quantified schedule risks are as follows:

Risk ID	Risk Description
16	Delay in receipt of Railroad Permitting for Broadway Bridge crossing; unanticipated permit requirements
19	Risk that additional Green features required by BES; requested late in the design stage
13	Unforeseen site conditions (utilities, environmental etc) during construction
18	Delay in receipt of long lead procurement items (specifically relating to the systems - substations, overhead wire etc)
7	Land acquisition near OMSI could cost more than anticipated, or impact schedule.

Appendices to this report include an updated project risk register.

Strategic opportunities were also identified (as seen in Section 3 below), some of these opportunities have and will make the project fundamentally sounder. This is reflected in less overall risks to the project.

This risk register is to be managed and maintained by the Project Team, updated on a regular basis throughout the duration of the project to assist in the mitigation and management of threats and opportunities to the Eastside Streetcar Loop project.

2. INTRODUCTION

A Stakeholder Risk and Opportunity Meeting was held at the PDC Office, 222 NW 5th Ave, Portland on Thursday 13th December 2007.

The purpose of this meeting was to discuss the key risks to the project (threats and opportunities), from the Stakeholders' perspective, in particular strategic risks that could affect the project.

A Phase 1 Technical Risk and Opportunity Workshop was held at the Port of Portland Office, 121 NW Everett St, from 9am-1pm on Friday 14th December 2007.

The purpose of this meeting was to discuss all threats and opportunities facing the project, develop a robust project risk register including the current risk status, probability of occurrence (likelihood), possible mitigation measures and range of time and cost implications (Minimum, Most Likely, Maximum) should the risk occur.

Further to this workshop, a conference call was held on Wednesday 19th December 2007, to review the project estimate and update the range of cost variance (Minimum, Most Likely, Maximum).

The following report provides recommendations for project contingency, probabilistic completion date and an updated risk register.

The intention of the risk register is to provide the Project Team with a useful tool, to be updated and maintained on a monthly basis throughout the duration of the project, to support the proactive management of the threats and opportunities facing the Eastside Streetcar Loop project.

It is anticipated that many mitigating actions identified in the Phase 1 Risk Register will be partially and/or fully implemented by the project team prior to the Phase 2 Risk Identification process. Initiating positive response to risks will add increased confidence in project success, significantly reduce project contingency or exposure and provide better opportunity to meet project schedule.

Assumptions and Exclusions

This cost and schedule risk analysis is based on the following assumptions and exclusions:

- The Quantitative Cost Risk Analysis (QCRA) and Quantitative Schedule Risk Analysis (QSRA) are based on 'sensible' ranges for costs and possible schedule deviations. It does not deal with extreme events such as 'Wars', 'Earthquakes' or 'Stock Market Crashes' and the like.
- Although some allowance is notionally included in the cost risk assessment for scope changes, no allowance has been made in the QCRA for Client-inspired

- changes (change to program or funding, engineering requirements, acceptance criteria, project scope, project specification or legislative change).
- The durations of activities within a schedule which are in the past will not have uncertainty attached to them, as they have definitively finished at a set date. Pertmaster, the software used to run this schedule risk analysis, automatically discards the uncertainty in these activities.

Abbreviations

The following abbreviations are used within this report:

DEA – David Evans and Associates

F+G – Faithful + Gould

PDC – Portland Development Commission

PDOT – Portland Department of Transportation

SOJ – Shiels Obletz Johnsen

TriMet – Tri-County Metropolitan Transportation District of Oregon

URS – URS Consulting Engineers

URA – Urban Renewal Area

Risk and Opportunity Stakeholder Meeting Agenda

10:30am-11:30am, Thursday 13th December 2007

1. Opening Address (PDC)
 - a) General Introductions
 - b) Briefing on Risk Assessment Effort
 - c) Meeting guidelines and objectives
2. Risk Register (F+G)
 - a) Review Initial Risk Register
 - b) Roundtable to brainstorm additional risks
 - c) Roundtable to review additional opportunities
3. Next Steps (F+G)
 - a) Technical Risk and Opportunity workshop, Fri 14th Dec 2007 – further develop risk register, review and range cost estimate
 - b) Model Cost and Schedule risks using @RISK and Pertmaster
 - c) Roundtable final questions or comments
4. Close

Risk and Opportunity Technical Team Workshop Agenda

9:00am-1:00pm, Friday 14th December 2007

1. Opening Address
 - a) General Introductions
 - b) Agenda, workshop guidelines and objectives
 - c) Project scope and current status update
2. Risk Register
 - a) Review Initial Risk Register and brainstorm additional risks
 - b) Assign probabilities, mitigation measures and responsible owners to each risk (if time permits)
 - c) Range the cost and schedule impacts of each risk
3. Next Steps and Workshop Wrap-Up
 - a) Model Cost and Schedule risks using @RISK and Pertmaster
 - c) Prepare and Issue Draft and Final Reports to PDC
4. Close

Cost Estimate Review & Ranging Meeting Agenda

Wednesday 19th December 2007

1. Review of current cost estimate at Summary Level
2. Ranging the elements within the estimate

Ranging involves discussing the Minimum, Most Likely and Maximum cost estimates associated with each of the elements within the estimate.

As the estimate has been prepared on the basis of conceptual design, subsequently there is currently a lower level of confidence in the estimate. On completion of Detailed Design, and validation and verification of the estimate by a third party, the level of confidence surrounding the estimate should increase significantly. During the Phase 2 Risk Assessment, F+G will perform an initial review of the 100% Design estimate. Findings from this review will be included in the Phase 2 report with recommendations for further detailed review and analysis that is considered to be appropriate to obtain a sufficient level of validation and confidence in the project Budget. Validation and verification of the 100% Design estimate by a third party may require a full independent cost estimate to be performed.

During the Ranging Meeting the Most Likely cost estimate for the Maintenance Facility was requested to be increased from \$2,800,000 to \$6,000,000. Since the cumulative impact of this would increase the Total Project Cost to circa \$152m, the original estimated amount of \$2,800,000 was used for the purposes of this risk assessment. Any base estimate adjustments are expected to be captured in the next scheduled estimate revision. This aspect underlines the lower level of confidence that is prevalent in estimates at the Conceptual Design stage.

The ranged cost estimate is included in Appendix B.

3. STRATEGIC RISKS AND OPPORTUNITIES

A number of Strategic risks were discussed during both the Stakeholder and Technical Meetings. These are largely out of the control of the Project Team however the high level potential for time and cost implications has been considered resulting in the High, Medium and Low risk ranking in the table below. These strategic risks have not been included within the quantitative risk analysis undertaken by F+G but it is recommended that these be monitored by the Project Team throughout the life of the project. Should any of the strategic risks translate into project risks, they should be added to the project risk register, quantified and managed accordingly.

Strategic Risk Description	Risk Ranking
Federal funding is a significant portion of the total project funding (\$75m out of \$147m), so there is a risk that the project would be cancelled should FTA funding not be forthcoming.	High
Lack of clarity as to who owns the risk if there are cost overruns on the project.	High
Upon review by F+G of the 100% DD Cost Estimate; may require detailed 3rd party estimate verification by an independent party.	Medium
PDC and PDOT to negotiate and execute an Interagency Agreement to define the funding, communication, roles and responsibilities.	Medium
Sponsor politics may interfere with the project schedule, scope and or funding.	Medium
Risk that obligations to the community may not be met should the track be shortened due to funding constraints	Medium
Limited URA funding OCC, CES and RD; no public support to increase beyond initial amount.	Medium
Unforeseen site conditions in Central Eastside i.e. old streets, environmental issues, poor roadbed, extra costs to mitigate during construction	Medium
Risk that project involves multiple funding agencies - state and federal and may result in approval delays.	Medium
Major bridge crossings on old existing bridges (ODOT & Multnomah County) not previously included in past streetcar projects	Medium
In the event the project doesn't proceed, there may be some fall	Medium

out that a significant amount of money has been spent to date	
Vehicles to be build locally complicated tech device, +/- risk of quality, schedule & cost	Medium
Risk that price of steel rail (supplied by Austrian firm) may increase prior to order by contractor	Medium
Borrowing and financing costs to bridge multi year release of PDC URA funds	Medium
Risk that BES Big Pipe Project completion is delayed, could delay Eastside Streetcar project commencement	Low
Loss of key resources on the project should funding be delayed and project be prolonged	Low
Project Accounting - complex multi funding sources, could lead to risk of incorrect billing etc	Low

A number of Strategic Opportunities were also identified in discussion with the key stakeholders and Project Team. It is recommended that each of these is reviewed by the Project Team in more detail and plans made to increase the potential benefit of these opportunities. These opportunities make the project fundamentally sounder. This is reflected in less overall risks to the project.

Strategic Opportunities include:

1. Performing an independent Risk Assessment by PDC during initial design will expedite final approval and help minimize risk.
2. There are no local major opponents to the track route, project timing or budget.
3. An opportunity exists for the design to maximize headway times through the use of slipways and signalization etc. This may be further investigated in the coming weeks by the Design Team and Contractor, and should efficiencies be identified, this may translate into scope modification.
4. Vehicles to be build locally - reduced manufacturing transportation costs and local employment, buy-local
5. Strong, experienced and knowledgeable project team assembled; have direct experience on prior on/time on budget streetcar projects
6. Local experienced and qualified contractors likely available to perform work; lower project cost, on-time construction and local jobs

4. QUANTITATIVE COST RISK ANALYSIS

Ranging the Project Estimate

The Project Cost Estimate provided by URS is contained at Appendix B. All elements of the base estimate were ranged, with the exception of professional services and unallocated contingencies.

Estimate Breakdown	Estimate
Total Base Estimate	\$ 75,116,128
Unallocated Contingency (20% of Base Estimate amount)	\$15,283,226
Professional Services (25% of Base Estimate amount)	\$18,686,532
Finance Charges	\$4,603,000
Escalation (not included in the above base estimate)	\$13,226,000
Vehicles	\$20,000,000
TOTAL PROJECT	\$146,914,886

In ranging the elements of the base estimate, Minimum and Maximum estimates were discussed with URS and applied to each element (for example, it was estimated that the 'Embedded Track Way Outbound' estimate could potential reduce by 9%, or increase by 9%), the resultant ranges for this estimate element are shown below:

Estimate Element	Minimum Estimate	(Most Likely) Estimate	Maximum Estimate
Embedded Track Way Outbound	\$6,316,807	\$6,918,835	\$7,547,820
Range as a %	-9%		+9%

Ranging the Project Risks

Each risk on the project risk register was reviewed in detail and ranged with respect to the potential cost implications, should the risk occur. Minimum, Most Likely and Maximum cost implications were assigned to each risk. Appendix A contains the Project Risk Register developed during the workshop on 14th December 2007.

Cost Risk Analysis Results

A Cost Risk analysis was undertaken using @RISK software. The ranged estimate and risk items inform the @RISK model, enabling it to calculate the 'Complete Project' costs for various levels of confidence (up to 100%). It is important to note that the 'Complete Project' costs calculated by @RISK do not include the unallocated contingency, professional services

allocation, or any allocation for escalation. The 'Complete Project' cost does, however, include a recommended contingency.

The **Complete Project Costs (at 50% confidence)** including contingency is **\$80,623,776**.

The **Complete Project Costs (at 80% confidence)** including contingency is **\$88,800,704**.

The current Base Estimate of \$75,116,128 and Unallocated Contingency of \$15,283,226 equates to a 'Complete Project' of \$90,399,354. Therefore there is a greater than 80% confidence level that the current contingency level will be adequate based upon the findings of this Phase 1 risk assessment.

Contingency Results

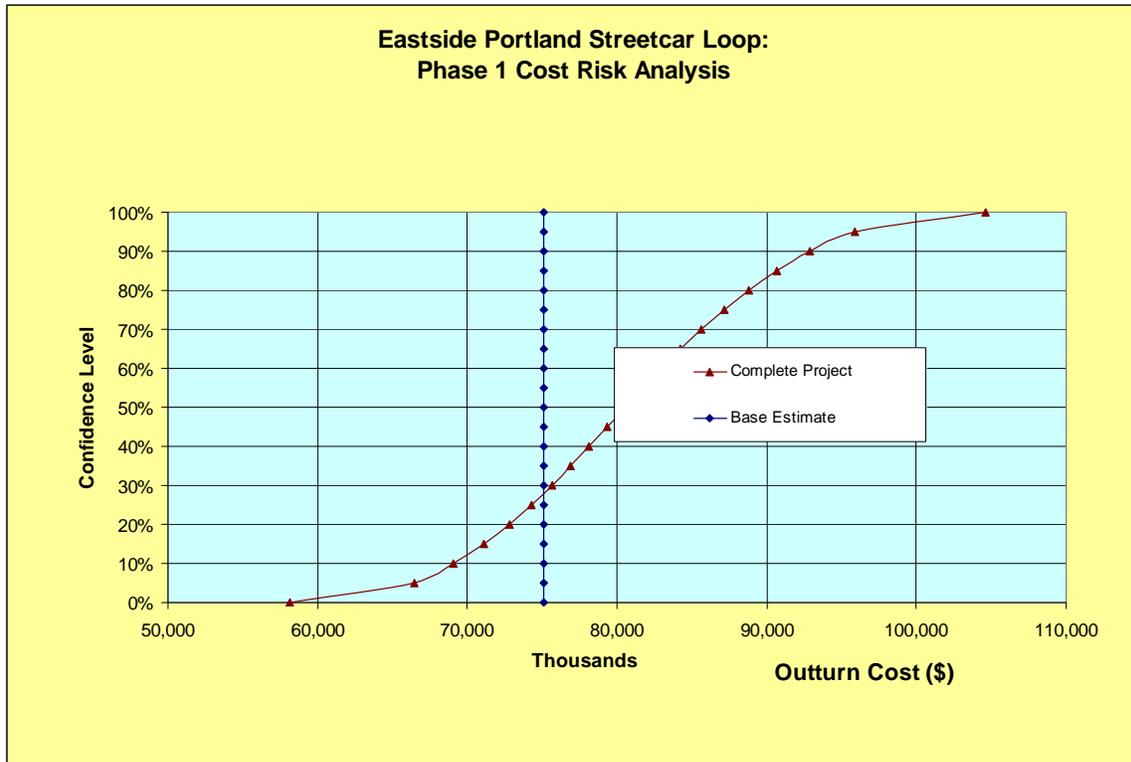
The table below shows recommended Project Contingency for various confidence levels (up to 100%). A contingency of \$5,507,648 (or 7.33%) is recommended for a 50% confidence level, and a contingency of \$13,684,576 (or 18.22%) is recommended for an 80% confidence level.

Results Table - Total Outturn Costs			
Confidence Level	Complete Project	Contingency (\$)	Contingency (%)
0%	58,149,264	- 16,966,864	-22.59%
5%	66,495,352	- 8,620,776	-11.48%
10%	69,116,008	- 6,000,120	-7.99%
15%	71,126,032	- 3,990,096	-5.31%
20%	72,839,272	- 2,276,856	-3.03%
25%	74,290,952	- 825,176	-1.10%
30%	75,703,984	587,856	0.78%
35%	76,879,904	1,763,776	2.35%
40%	78,101,000	2,984,872	3.97%
45%	79,382,584	4,266,456	5.68%
50%	80,623,776	5,507,648	7.33%
55%	81,829,760	6,713,632	8.94%
60%	83,030,128	7,914,000	10.54%
65%	84,277,240	9,161,112	12.20%
70%	85,664,824	10,548,696	14.04%
75%	87,149,656	12,033,528	16.02%
80%	88,800,704	13,684,576	18.22%
85%	90,714,096	15,597,968	20.77%
90%	92,897,136	17,781,008	23.67%
95%	95,935,352	20,819,224	27.72%
100%	104,654,224	29,538,096	39.32%

Project Contingency Analysis		
Estimate	\$75,116,128	
20% Unallocated Contingency	\$15,283,226	80% to 85% confidence range

Cost Risk Analysis S-Curve

The chart below offers a graphical representation of the results in the table above and shows the Complete Project cost inclusive of contingency at varying confidence levels.



Confidence Level	Contingency (\$)	Contingency (%)	Complete Project Costs incl. Contingency (\$)
50%	\$5,507,648	7.33%	\$80,623,776
80%	\$13,684,576	18.22%	\$88,800,704

Note: The 'Complete Project' costs calculated by @RISK do not include the unallocated contingency, professional services allocation, or any allocation for escalation. The 'Complete Project' cost does, however, include a recommended contingency.

5. QUANTITATIVE SCHEDULE RISK ANALYSIS

A high level Conceptual Project Schedule (dated August 2007) was provided by PDC prior to the Risk and Opportunity Workshop. As the schedule contained only high level activities, and lacked detailed task information and links between activities, it was revised by F+G in order to enable basic analysis for this risk assessment. The schedule was progressed to the Workshop date (14th December 2007) and it was assumed that all schedule activities to date had been completed according to plan, and all activities were linked and terminated at a single milestone (construction complete).

A copy of the revised schedule is included in Appendix C for reference.

It is important to note that limited benefit can be derived from a schedule analysis performed on such a high level schedule. A more refined Project Schedule that includes a moderate level of detail for all key activities (design, permits, procurement, construction, post construction), key milestones and dependencies is required in order to obtain more meaningful results from the schedule risk analysis. The refined Project Schedule can then be used as the baseline for the detailed construction schedule that the Contractor will prepare and maintain during construction.

It is anticipated that a more detailed schedule will be prepared and available as part of the Phase 2 review. At this stage, schedule risks may be clearly identified and linked to specific schedule activities, to forecast the potential impact of risks on the schedule, should they occur, and identify those risks requiring urgent attention in order to maintain the project's critical path.

Nine (9) schedule risks were identified during the Risk and Opportunity Workshop, however the Project Team were only able to link these to 3 key schedule activities. As mentioned previously, this does not reflect the specific impact of potential risks on the schedule, and as such, provides only a basic analysis of the schedule risks.

Ranging the Project Risks

Each risk on the project risk register was reviewed in detail and ranged with respect to the potential schedule implications, should the risk occur. Minimum, Most Likely and Maximum schedule implications were assigned to each risk.

Schedule Risk Analysis

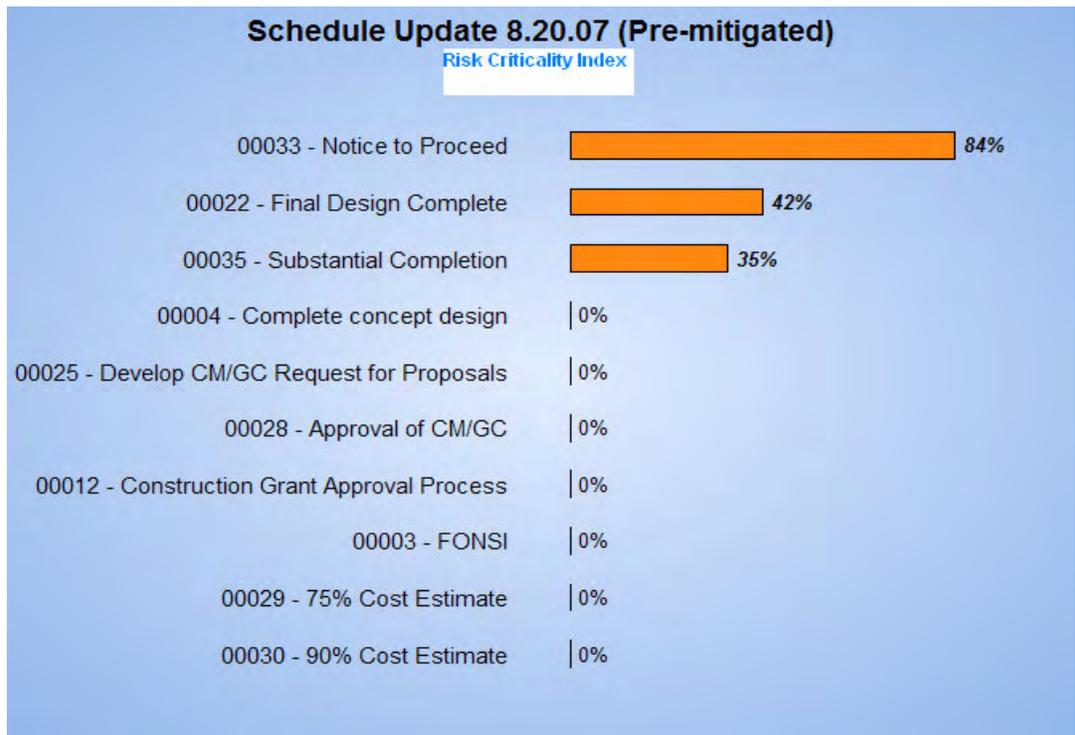
A Schedule Risk analysis was undertaken using Pertmaster software, assuming that no corrective action has been taken as yet (i.e. pre-mitigation). The project schedule and ranged risk items inform the Pertmaster model, enabling it to identify; the confidence level of the deterministic project completion date (or schedule end date), and the activities within the project

driving any identified overrun (to ensure that mitigation actions may be taken to eliminate or reduce the forecast overrun).

Criticality within the Schedule

The nature of a risk model is such that the durations of individual activities will vary as the model is run, particular risks will sometimes occur and sometimes won't, all of which reflects the uncertainty of the real world. As a result of this fluidity within the model the critical path is not fixed. Activities will sometimes appear on the critical path and sometimes will not. Criticality is an indication of how critical a particular task is to the overall schedule, or put more simply it is how often in percentage terms an individual activity appears on the critical path when the risk model is run.

The tornado diagram below shows the top 3 highest tasks affecting the critical path. The risks which impact these tasks are critical in maintaining the critical path. It is strongly recommended that these risks are discussed in more detail by the Project Team, and that a strategy is developed to mitigate or remove them as far as possible.



The following risks were identified as having a potential impact on schedule activity 00033 'Notice to Proceed':

Risk ID	Focus Area	Risk Description	Mitigation Action
7	Design	Land acquisition near OMSI could cost more than anticipated, or impact schedule	Confirm basis of estimate for acquisitions, ongoing communications with land owners, resolve prior to 100% CD
16	Permitting	Delay in receipt of Railroad Permitting for Broadway Bridge crossing; unanticipated permit requirements	Timely application, maintain communications with Railroads; resolve special permit requirements prior to 100% CD; senior level resolution if necessary

The following risk was identified as having a potential impact on schedule activity 00022 'Final Design Complete':

Risk ID	Focus Area	Risk Description	Mitigation Action
19	Scope	Risk that additional Green features required by BES; requested late in the design stage	Ongoing communications with BES; clarity in permit requirements prior to 100% CD; senior level resolution if necessary

The following risks were identified as having a potential impact on schedule activities 00035 'Substantial Completion':

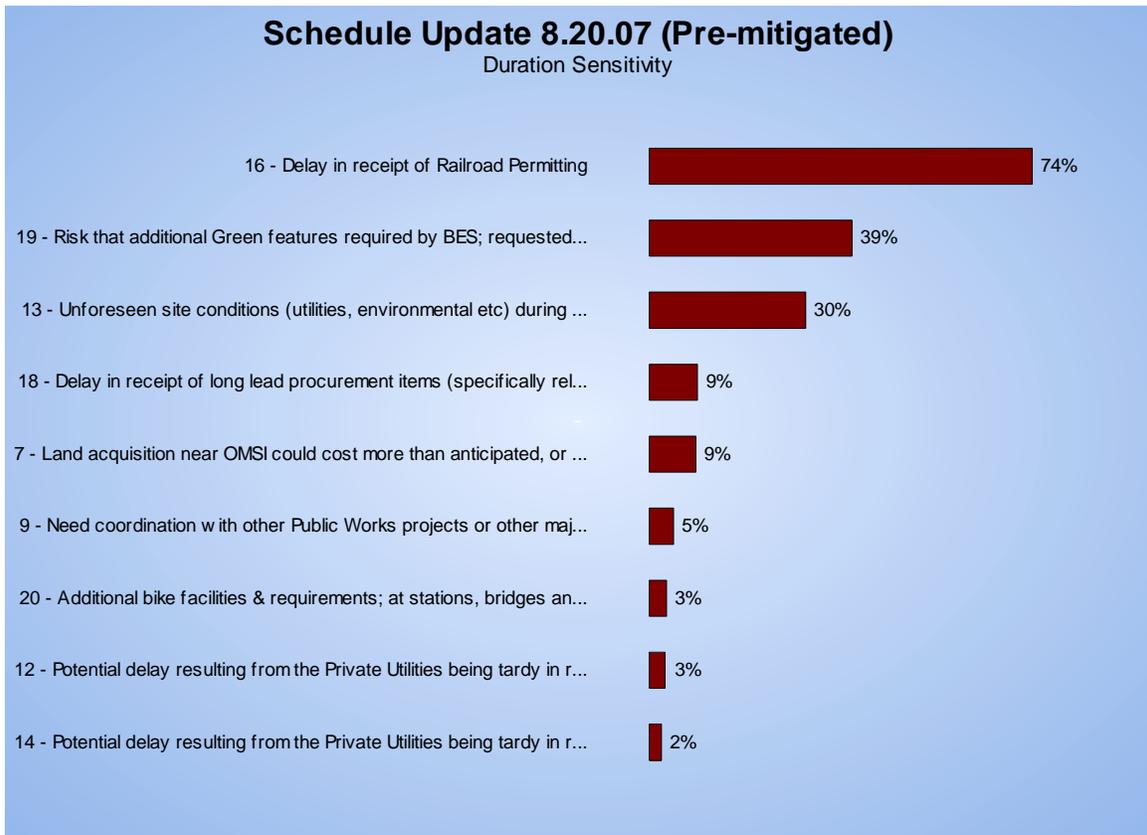
Risk ID	Focus Area	Risk Description	Mitigation Action
9	Design	Need coordination with other Public Works projects or other major Private Developments to avoid duplication or delay of work ie. PDOT Burnside/Couch Couplet, ODOT McLoughlin Viaduct	Continue regular communications with other major planned Private Development & Public works projects
12	Construction	Potential delay resulting from the Private Utilities being tardy in relocating utilities	Notify Privates of schedule & allow sufficient time to design then relocate utilities
13	Construction	Unforeseen site conditions (utilities, environmental etc) during construction	Through site investigations during design to reduce risk; sufficient budget contingency; re-sequencing of portions of track in the schedule if required
14	Construction	Differential settlement to properties due to ODOT Viaduct work; impacts to design and construction	On going communication with ODOT; post via duct conditions integration into project; monitoring settlement
18	Procurement	Delay in receipt of long lead procurement items (specifically relating to the systems - substations, overhead wire etc)	Early/timely procurement, CMGC contract with sufficient schedule and clear early purchase requirements
20	Scope	Additional bike facilities & requirements; at stations, bridges and street crossings	Ongoing communications with PDOT Traffic; resolve in permit requirements prior to 100% CD; senior resolution if necessary

Sensitivity within the Model

The sensitivity of the risks gives an indication of how much the potential increase in duration of that activity could affect the completion date of the project. It can also be used for identifying activities that are most likely to cause delay to the project. The chart below illustrates which activities within the model are the most sensitive. It is strongly recommended that these risks are mitigated and removed as far as possible.

The most significant potential impact on the project schedule is likely to be brought about by the following 9 risks;

- Risk ID 16 – Delay in receipt of Railroad Permitting for Broadway Bridge crossing; unanticipated permit requirements
- Risk ID 19 – Risk that additional Green features required by BES; requested late in the design stage
- Risk ID 13 – Unforeseen site conditions (utilities, environmental etc) during construction
- Risk ID 18 – Delay in receipt of long lead procurement items (specifically relating to the systems - substations, overhead wire etc)
- Risk ID 7 – Land acquisition near OMSI could cost more than anticipated, or impact schedule.
- Risk ID 9 – Need coordination with other Public Works projects or other major Private Developments to avoid duplication or delay of work i.e. PDOT Burnside/Couch Couplet, ODOT McLoughlin Viaduct
- Risk ID 20 – Additional bike facilities & requirements; at stations, bridges and street crossings
- Risk ID 12 – Potential delay resulting from the Private Utilities being tardy in relocating utilities.
- Risk ID 14 – Differential settlement to properties due to ODOT Viaduct work; impacts to design and construction



Schedule Risk Analysis

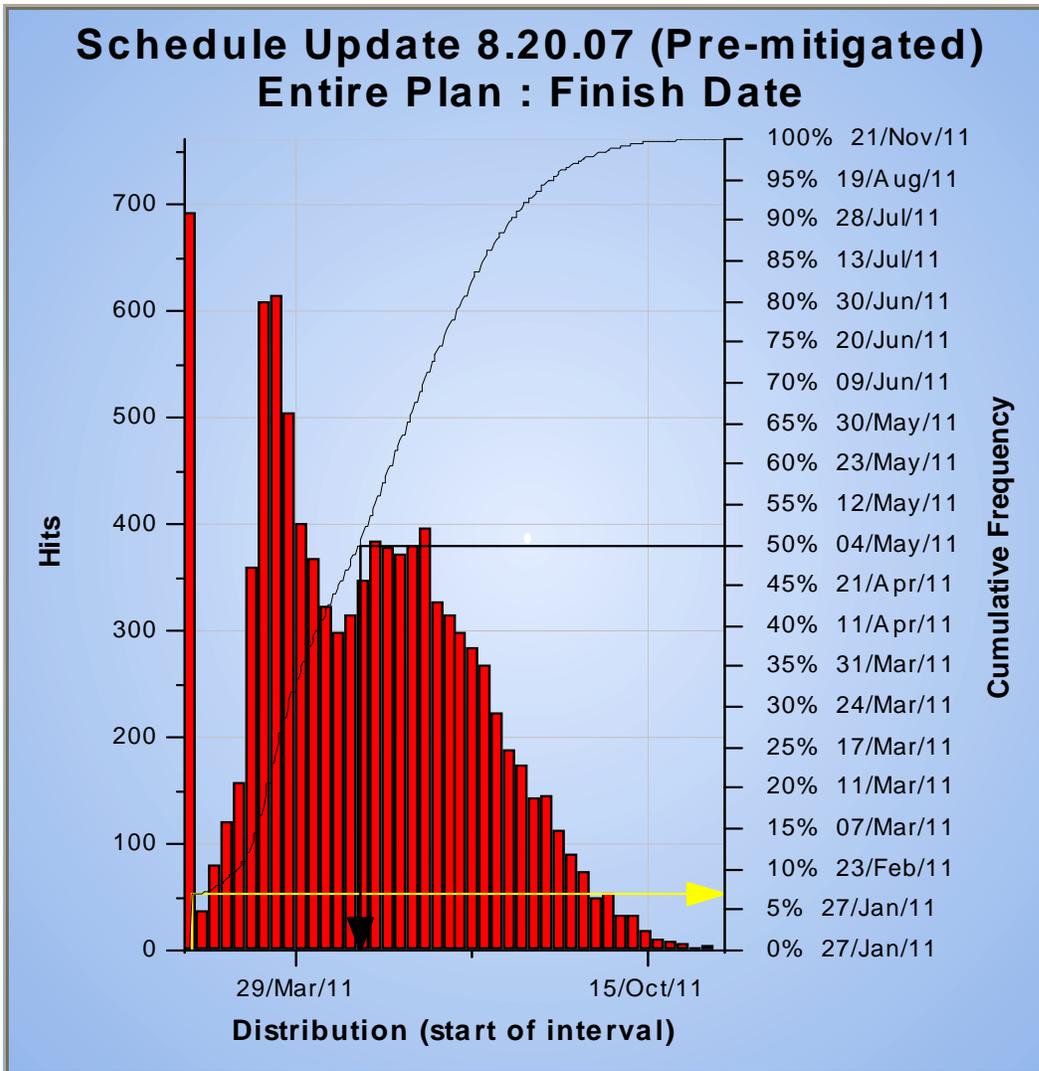
Probabilistic Results for Project Completion

The revised schedule was used for this analysis, in conjunction with the project risk register developed during the meetings on 13th and 14th December 2007.

Results from the analysis indicate that the **Project Completion Date** (or deterministic date) of **January 16, 2011 has 7% probability of success**. This assumes no mitigation actions have been taken to avoid the risks currently included within the project risk register.

The pre-mitigation P50% project completion date is April 25, 2011.

The pre-mitigation P80% project completion date is June 20, 2011.



6. CONCLUSIONS

Based on review of the “Conceptual” level of design, cost estimate and schedule, input at the Risk Workshops the overall project appears to be fundamentally sound. No extraordinary risks for a project of comparable size and complexity were identified during this review.

The analysis concludes that, as at 14th December 2007, on the basis of a Total Base Estimate of \$75,116,128 (excluding Unallocated Contingency, Professional Services, Vehicles, Finances Charges and Escalation allowance), a further Contingency allowance of \$13,684,576 is required for an 80% confidence level.

It also indicates that the Project Completion Date shown in the current schedule will not be achieved without the implementation of ongoing risk management. There is currently an 80% Confidence level that the project will be completed by the 20th June 2011. This is nearly 5 months later than the current Final Completion date shown in the Project Schedule.

The above initial conclusions at a “Concept” level review are not unusual. Furthermore the magnitude of project risk in terms of cost (contingency) and schedule will almost always exceed the baseline to meet a desired confidence level. The key is to successfully manage and to the extent practicable eliminate, transfer, mitigate or minimize project risks. The risk register is key to maintaining current status of all risks affecting the project, and detailing the actions required to mitigate or manage these risks.

The Phase 2 Assessment Report and review of the 100% Design Development Drawings and 100% Design Development Cost Estimate along with progress by the team in addressing some of the risks, will likely result in greater confidence in the project budget and schedule.

Appendix A – Phase 1 Risk Register

Appendix B – Project Cost Estimate

Appendix C – Original Project Schedule

Appendix D – Meeting Attendees

Stakeholder Meeting Attendees:

Michael Powell, Chair of Portland Streetcar Inc

Vicky Diede, PDOT Project Manager

Irene Bowers, PDC Senior Project Coordinator

Kia Selley, PDC Central Eastside Project Manager

Dave Obern, PDC Construction Services Manager

Sean Cole, F+G Vice President

Mark Petchey, F+G Project Director

Susan Adibi, F+G Senior Risk Consultant

Ailsa Taylor, F+G Risk Consultant

Technical Team Meeting Attendees:

Vicky Diede, PDOT Project Manager

Carter MacNichol, SOJ Project Manager

Greg Jones, PDOT Division Manager

Bill Korsak, SOJ Utilities Coordinator

Lynn Schwartz, URS Cost Estimator

Kelly Burnell, DEA Bridge Design

Mark Dorn, URS Civil Design Team Leader

Kia Selley, PDC Central Eastside Project Manager

Dave Obern, PDC Construction Services Manager

Sean Cole, F+G Vice President

Mark Petchey, F+G Project Director

Susan Adibi, F+G Senior Risk Consultant

Ailsa Taylor, F+G Risk Consultant

Cost Estimate Review & Ranging Meeting Attendees:

Carter MacNichol, SOJ Project Manager

Mark Dorn, URS Civil Design Team Leader

Susan Adibi, F+G Senior Risk Consultant

Eastside Streetcar Loop Project Risk Register

Faithful+Gould Initial Key Risks

Project Phase: Phase 1 Conceptual Design

Last Updated : 1-28-08



Risk ID	T/O	Focus Area	Risk Description	Mitigation Action	Action Owner & Date	Probability	Cost Impacts			Schedule Impacts			Comments
							Min Cost (\$)	Most Likely Cost (\$) (Overall)	Max Cost (\$)	Min Time (wks)	Most Likely Time	Max Time (wks)	
SR8	T	Design	Unforeseen site conditions in Central Eastside i.e. old streets, environmental issues, poor roadbed, extra costs to mitigate during construction	Core sampling and environmental assessment to be performed by A/E team - results integrated into final design.	A/E 1-1-08	Strategic Risk	below	below	below	below	below	below	
SR9	T	Project Team	Risk that project involves multiple funding agencies - state and federal and may result in approval delays.	Establish clear coordination roles and responsibilities; communication; approval process between all funding agencies.	PDOT - PDC - TriMet 2-15-08	Strategic Risk	n/a	n/a	n/a	n/a	n/a	n/a	coordinating committee exists, roles and responsibilities well defined
SR10	T	Design	Major bridge crossings on old existing bridges (ODOT & Mult Co.) not previously included in past streetcar projects	A/E is experienced in bridge crossings with other light rail projects; extra effort of due diligence during design & coordination with Mult Co & ODOT	A/E On-Going	Strategic Risk	below	below	below	below	below	below	
SR11	T	Political	In the event the project doesn't proceed, there may be some fall out that a significant amount of money has been spent to date	Incorporate in SR7 a best logical A/E stop point strategy to optimize future reuse of A/E work products and minimize costs.	PDOT - SOJ 2-15-08	Strategic Risk	n/a	n/a	n/a	n/a	n/a	n/a	
SR12	T/O	Design	Cars to be build locally complicated tech device, +/- risk of quality, schedule & cost	Monitor prototype streetcar being built currently; reaffirm capability of delivery, schedule and cost.	PDOT On-going	Strategic Risk and Opportunity	unk	unk	unk	unk	unk	unk	
SR13	T	Budget	Risk that price of steel rail (supplied by Austrian firm) may increase prior to order by contractor	Monitor steel rail cost and availability; explore other source opportunities	PDOT - SOJ On-going	Strategic Risk	below	below	below	below	below	below	
SR14	T	Schedule	Risk that BES Big Pipe Project completion is delayed, could delay Eastside Streetcar project commencement	Communicate with BES CSO Construction Team to identify any potential delay	PDOT - SOJ On-going	Strategic Risk	n/a	n/a	n/a	4	8	16	
SR15	T	Project Management	Loss of key resources on the project should funding be delayed and project be prolonged	Incorporate in SR7 a strategy to optimize future reuse of A/E work products and process to reassemble team in future.	PDOT - SOJ 2-15-08	Strategic Risk	unk	unk	unk	unk	unk	unk	
SR19	T	Project Accounting	Project Accounting - complex multi funding sources, could lead to risk of incorrect billing etc	Incorporate in SR2 and SR6 process to track budget and payment process.	PDOT - SOJ 4-15-08	Strategic Risk	n/a	n/a	n/a	n/a	n/a	n/a	links to previously identified risk regarding common language in Interagency Agreement
SR20	T	Budget	Borrowing and financing costs to bridge multi year release of PDC URA funds.	Strategic scheduling and use of available funding to minimize borrowing costs.	PDOT	Strategic Risk	20,000	40,000	60,000	n/a	n/a	n/a	links to SR5 maximum URA funds available for project
1	T	Design	Once a key design option is selected, there is a risk this decision could be revisited and changed by project sponsors.	Reaffirm as part of SR6 a project sponsor approval process of major design issues.	PDC - PDOT - TriMet 4-15-08	15%	-	15,000	15,000	0	0	0	Potential for significant political fallout and time delay as a result of change in design option
2	T	Design	Risk that additional scope will be required by Water & BES (ie. the water bureau may stipulate additional and longer casings required under the track, BES enhanced stormwater treatment).	Continue regular communication with Water and BES; define during final design any special permit requirements; resolve at senior level if necessary.	SOJ - A/E On-going	50%	2,000,000	3,500,000	5,000,000	0	0	0	

Eastside Streetcar Loop Project Risk Register

Faithful+Gould Initial Key Risks

Project Phase: Phase 1 Conceptual Design

Last Updated : 1-28-08



Risk ID	T/O	Focus Area	Risk Description	Mitigation Action	Action Owner & Date	Probability	Cost Impacts			Schedule Impacts			Comments
							Min Cost (\$)	Most Likely Cost (\$) (Overall)	Max Cost (\$)	Min Time (wks)	Most Likely Time	Max Time (wks)	
3	T	Design	Risk in change of scope by PDOT Street Light permit approval ie. risk pole locations may need to be revised or other requirements added	Continue regular communication with PDOT Streetlights; resolve prior to 100% CD any special permit requirements; resolve at senior level if necessary	SOJ - A/E On-going	50%	50,000	100,000	250,000	0	0	0	
4	T	Design	Central eastside poor street conditions result in unforeseen costs during construction	Pavement coring to be undertaken early in design stage; resolve prior to 100% CD	A/E 1-1-08	30%	100,000	300,000	500,000	0	0	0	trench restoration works could potentially become more difficult and incur costs
5	T	Design	Bridge conditions (Mult Co & ODOT) ie. lift mechanism, deck support etc; result in unforeseen costs during construction	Continue regular communication with ODOT & Mult Co and through investigation; resolve issues prior to 100% CD	A/E On-going	15%	300,000	600,000	3,600,000	0	0	0	
6	T	Design	Additional streetscape or stormwater requirements	Continue regular communications with BES during the design; resolve at senior level if necessary	A/E On-going	20%	50,000	125,000	350,000	0	0	0	
7	T	Design	Land acquisition near OMSI could cost more than anticipated, or impact schedule	Confirm basis of estimate for acquisitions, ongoing communications with land owners, resolve prior to 100% CD	PDOT On-going	10%	ranged in estimate	ranged in estimate	ranged in estimate	2	2	8	
8	T	Design	Pole foundation design conflicts with existing underground utilities and vaults etc unforeseen risk during construction	Undertake a survey of existing utilities during design stage; resolve conflicts prior to 100% CD	A/E On-going	50%	50,000	150,000	250,000	0	0	0	
9	T	Design	Need coordination with other Public Works projects or other major Private Developments to avoid duplication or delay of work ie. PDOT Burnside/Couch Couplet, ODOT McLoughlin Viaduct	Continue regular communications with other major planned Private Development & Public works projects	SOJ On-going	20%	1,250,000	1,500,000	2,000,000	0	3	8	
10	T	Design	Potential survey error (incorrect grades, locational error etc)	Employ robust QA/QC process in survey prior to 100% CD	A/E On-going	5%	-	12,500	50,000	0	0	0	
11	T	Construction	Cost escalation (of materials/equipment) during construction period (during the 2 year period post GMP)	Specific escalation conditions in construction contract; sufficient budget contingency reserves; early purchase by contractor of key volatile materials	Procurement At time of Bid	5%	1% of hard cost	2% of the hard cost	3% of the hard cost	0	0	0	Potential variables: Fuel, all metals (steel, copper in substations and overhead wire)
12	T	Construction	Potential delay resulting from the Private Utilities being tardy in relocating utilities	Notify Privates of schedule & allow sufficient time to design then relocate utilities	PDOT On-Going	10%	-	-	-	0	2	8	
13	T	Construction	Unforeseen site conditions (utilities, environmental etc) during construction	Through site investigations during design to reduce risk; sufficient budget contingency; re-sequencing of portions of track in the schedule if required	A/E On-going	60%	500,000	1,000,000	2,000,000	4	6	12	
14	T	Construction	Differential settlement to properties due to ODOT Viaduct work; impacts to design and construction	On going communication with ODOT; post via duct conditions integration into project; monitoring settlement	A/E On-going	5%	50,000	100,000	200,000	0	2	4	

Eastside Streetcar Loop Project Risk Register
Faithful+Gould Initial Key Risks
 Project Phase: Phase 1 Conceptual Design
 Last Updated : 1-28-08



Risk ID	T/O	Focus Area	Risk Description	Mitigation Action	Action Owner & Date	Probability	Cost Impacts			Schedule Impacts			Comments
							Min Cost (\$)	Most Likely Cost (\$) (Overall)	Max Cost (\$)	Min Time (wks)	Most Likely Time	Max Time (wks)	
15	T	Permitting	Delay in obtaining bridge permits Mult Co or ODOT	On going communication with Mult Co and ODOT; senior level resolution if necessary to	SOJ On-going	10%	-	-	-	0	0	0	
16	T	Permitting	Delay in receipt of Railroad Permitting for Broadway Bridge crossing; unanticipated permit requirements	Timely application, maintain communications with Railroads; resolve special permit requirements prior to 100% CD; senior level resolution if necessary	SOJ On-going	50%	50,000	100,000	250,000	4	12	24	
17	T	Permitting	Delay in receipt of design approval for the Trimet Max Line crossing	On going communication with TriMet; resolve special permit requirements prior to 100% CD; senior level resolution if necessary	SOJ On-going	15%	500,000	500,000	500,000	0	0	0	
18	T	Procurement	Delay in receipt of long lead procurement items (specifically relating to the systems - substations, overhead wire etc)	Early/timely procurement, CMGC contract with sufficient schedule and clear early purchase requirements	Procurement At time of Bid	20%	-	-	-	2	5	8	
19	T	Scope	Risk that additional Green features required by BES; requested late in the design stage	Ongoing communications with BES; clarity in permit requirements prior to 100% CD; senior level resolution if necessary	PDOT On-going	25%	500,000	1,000,000	2,000,000	4	8	12	
20	T	Scope	Additional bike facilities & requirements; at stations, bridges and street crossings	Ongoing communications with PDOT Traffic; resolve in permit requirements prior to 100% CD; senior resolution if necessary	On-going	5%	1,700,000	1,700,000	1,700,000	0	5	10	

Eastside Streetcar Loop Options BUILD Option Alive.ex1

Portland Eastside Streetcar																
Portland, Oregon																
Order of Magnitude Estimate																
Summary Base Option (FTA BUILD) (NW Northrup to OMSI via MLK)																
Outbound Alignment																
Inbound Alignment																
Start Sta End Sta Length																
Start Sta End Sta Length																
0+00 0+00 16,421 TF																
0+00 0+00 16,960 TF																
3.49 TK-mile																
3.21 TK-mile																
3.35 Rt-mile																
3rd Quarter																
2007\$																
URS Line NO.	Base	Code	Description	Quantity	Unit	Unit Cost	Extension	Extension low	Extension	Extension high	E&A %	E&A	Cont%	Unallocated Contingency	Detail Total	Summary Total
10.0	TRACKWORK															\$25,008,418
10.1		10.02	Embedded Trackway Outbound	17,971	TF	\$385.00	\$6,918,835	\$6,316,807	\$6,918,835	\$7,547,820	25%	\$1,729,709	20%	\$1,383,767	\$10,032,311	
10.2		10.02	Embedded Trackway Inbound	16,960	TF	\$385.00	\$6,529,600	\$5,961,440	\$6,529,600	\$7,123,200	25%	\$1,632,400	20%	\$1,305,920	\$9,467,920	
10.3		10.09	Direct Fixation Trackway Outbound	450	TF	\$775.00	\$348,750	\$320,625	\$348,750	\$378,000	25%	\$87,188	20%	\$69,750	\$505,688	
10.4		10.02	Track Crossing	9	EA	\$200,000.00	\$1,800,000	\$1,777,500	\$1,800,000	\$1,822,500	25%	\$450,000	20%	\$360,000	\$2,610,000	
10.5		10.12	Turnout	11	EA	\$150,000.00	\$1,650,000	\$1,622,500	\$1,650,000	\$1,677,500	25%	\$412,500	20%	\$330,000	\$2,392,500	
20.0	PLATFORMS															\$3,074,000
20.1		20.01	Side Loading	12	EA	\$60,000.00	\$720,000	\$684,000	\$720,000	\$882,000	25%	\$180,000	20%	\$144,000	\$1,044,000	
20.2		20.01	Side Loading	17	EA	\$60,000.00	\$1,020,000	\$969,000	\$1,020,000	\$1,071,000	25%	\$255,000	20%	\$204,000	\$1,479,000	
20.3		20.01	Center Loading	3	EA	\$75,000.00	\$225,000	\$213,750	\$225,000	\$236,250	25%	\$56,250	20%	\$45,000	\$326,250	
20.4		20.01	Center Loading	0	EA	\$75,000.00	\$0	\$0	\$0	\$0	25%	\$0	20%	\$0	\$0	
20.5		20.01	Grand Platform	0	EA	\$120,000.00	\$0	\$0	\$0	\$0	25%	\$0	20%	\$0	\$0	
20.6		20.01	Special Platform	1	EA	\$155,000.00	\$155,000	\$147,250	\$155,000	\$162,750	25%	\$38,750	20%	\$31,000	\$224,750	
30.0	SUPPORT FACILITIES															\$4,060,000
30.1		30.02	Maintenance Facility Modifications Allowance	1	LS	\$2,800,000.00	\$2,800,000	\$2,800,000	\$2,800,000	\$8,000,000	25%	\$700,000	20%	\$560,000	\$4,060,000	
40.0	SITE WORK AND SPECIAL CONDITIONS															\$7,300,506
40.1		40.06	Curb and Gutter	3,728	LF	\$44.00	\$164,032	\$140,918	\$164,032	\$188,637	25%	\$41,008	20%	\$32,806	\$237,846	
40.2		40.01	Excavation	0	CY	\$15.00	\$0	\$0	\$0	\$0	25%	\$0	20%	\$0	\$0	
40.5		40.07	Commercial Driveways	0	SY	\$50.00	\$0	\$0	\$0	\$0	25%	\$0	20%	\$0	\$0	
40.6		40.07	AC Road Construction	1	LS	\$600,000.00	\$600,000	\$500,000	\$600,000	\$700,000	25%	\$150,000	20%	\$120,000	\$870,000	
40.7		40.07	PCC Roadway Construction	0	SY	\$55.00	\$0	\$0	\$0	\$0	25%	\$0	20%	\$0	\$0	
40.8		40.06	Sidewalk Construction other than platform areas	10,000	SY	\$60.00	\$600,000	\$484,500	\$600,000	\$724,500	25%	\$150,000	20%	\$120,000	\$870,000	
40.9		40.07	AC Overlay 3" Thick (Grind & Replace)	75,000	SY	\$35.00	\$2,625,000	\$2,160,000	\$2,625,000	\$3,135,000	25%	\$656,250	20%	\$525,000	\$3,806,250	
41.0		40.01	Remove Existing Trolley Track	4,944	TF	\$75.00	\$370,800	\$311,472	\$370,800	\$435,072	25%	\$92,700	20%	\$74,160	\$537,660	
40.0		40.06	Bridgehead Pedestrian Improvements - Morrison	1	LS	\$350,000.00	\$350,000	\$315,000	\$350,000	\$385,000	25%	\$87,500	20%	\$70,000	\$507,500	
0.0		40.06	Bridgehead Pedestrian Improvements - Hawthorne	1	LS	\$325,000.00	\$325,000	\$292,500	\$325,000	\$357,500	25%	\$81,250	20%	\$65,000	\$471,250	
50.0	SYSTEMS															\$20,340,412
50.1		50.03	Traction Power Substations (TPSS)	5	EA	\$650,000.00	\$3,250,000	\$2,250,000	\$3,250,000	\$3,750,000	25%	\$812,500	20%	\$650,000	\$4,712,500	
50.1		50.03	TPSS Installation and Testing	5	EA	\$145,000.00	\$725,000	\$600,000	\$725,000	\$0	25%	\$181,250	20%	\$145,000	\$1,051,250	
50.2		50.04	OCS including Catenary	35,381	TF	\$270.00	\$9,552,870	\$8,571,047	\$9,552,870	\$10,587,764	25%	\$2,388,218	20%	\$1,910,574	\$13,851,662	
50.3		50.05	Signal Communication system	5	EA	\$100,000.00	\$500,000	\$300,000	\$500,000	\$625,000	25%	\$125,000	20%	\$100,000	\$725,000	
70.0	STRUCTURES															\$19,282,319
70.1		40.05	Lovejoy Approach	1	LS	\$696,360.00	\$696,360	\$626,724	\$696,360	\$765,996	25%	\$174,090	20%	\$139,272	\$1,009,722	
70.2		40.05	Broadway Spans 2, 3, 4, 6, 7	1	LS	\$5,044,635.00	\$5,044,635	\$4,540,172	\$5,044,635	\$5,549,099	25%	\$1,261,159	20%	\$1,008,927	\$7,314,721	
70.3		40.05	Broadway Span 5	1	LS	\$2,889,878.00	\$2,889,878	\$2,600,890	\$2,889,878	\$3,178,866	25%	\$722,470	20%	\$577,976	\$4,190,323	
70.4		40.05	Interstate Ave Structures	1	LS	\$83,558.00	\$83,558	\$75,202	\$83,558	\$91,914	25%	\$20,890	20%	\$16,712	\$121,159	
70.5		40.05	Modify I-5 Structures	1	LS	\$155,360.00	\$155,360	\$139,824	\$155,360	\$170,896	25%	\$38,840	20%	\$31,072	\$225,272	
70.6		40.05	Modify I-84 Structures (MLK Boulevard)	1	LS	\$239,560.00	\$239,560	\$215,604	\$239,560	\$263,516	25%	\$59,890	20%	\$47,912	\$347,362	
70.6		40.05	Modify I-84 Structures Grand Ave	1	LS	\$188,800.00	\$188,800	\$169,920	\$188,800	\$207,680	25%	\$47,200	20%	\$37,760	\$273,760	
70.7		40.05	New OMSI Structure MLK (Including Interface with Existing Structure)	1	LS	\$4,000,000.00	\$4,000,000	\$3,600,000	\$4,000,000	\$4,400,000	25%	\$1,000,000	20%	\$800,000	\$5,800,000	
70.7		40.05	New OMSI Structure 3rd Ave	0	LS	\$4,950,000.00	\$0	\$0	\$0	\$0	25%	\$0	20%	\$0	\$0	
80.0	UTILITIES															\$11,146,169
80.1		40.02	Parallel Water <12" dia	4,750	LF	\$275.00	\$1,306,250	\$1,116,844	\$1,306,250	\$1,580,563	25%	\$326,563	20%	\$261,250	\$1,894,063	
80.2		40.02	Parallel Water 12" - 18" dia	6,380	LF	\$450.00	\$2,871,000	\$2,454,705	\$2,871,000	\$3,473,910	25%	\$717,750	20%	\$574,200	\$4,162,950	
80.3		40.02	Parallel Water >18" dia	310	LF	\$1,000.00	\$310,000	\$265,050	\$310,000	\$375,100	25%	\$77,500	20%	\$62,000	\$449,500	
80.4		40.02	Xing Water <12" dia (replace w/HDPE)	970	LF	\$175.00	\$169,750	\$145,136	\$169,750	\$205,398	25%	\$42,438	20%	\$33,950	\$246,138	
80.5		40.02	Xing Water 12"-18" dia (sleeve)	675	LF	\$200.00	\$135,000	\$115,425	\$135,000	\$163,350	25%	\$33,750	20%	\$27,000	\$195,750	
80.6		40.02	Xing Water >18" dia (sleeve)	212	LF	\$230.00	\$48,760	\$41,690	\$48,760	\$59,000	25%	\$12,190	20%	\$9,752	\$70,702	
80.7		40.02	Parallel Storm <12" dia	574	LF	\$175.00	\$100,450	\$85,885	\$100,450	\$121,545	25%	\$25,113	20%	\$20,090	\$145,653	
80.8		40.02	Parallel Storm 12"-18" dia	1,681	LF	\$200.00	\$336,200	\$287,451	\$336,200	\$406,802	25%	\$84,050	20%	\$67,240	\$487,490	
80.9		40.02	Parallel Storm - Special	435	LF	\$370.00	\$160,950	\$137,612	\$160,950	\$194,750	25%	\$40,238	20%	\$32,190	\$233,378	
81.0		40.02	Water Connection Allowance	1	LS	\$1,200,000.00	\$1,200,000	\$1,000,000	\$1,200,000	\$1,400,000	25%	\$300,000	20%	\$240,000	\$1,740,000	
81.1		40.02	Manhole Adjustments	21	EA	\$25,000.00	\$525,000	\$448,875	\$525,000	\$635,250	25%	\$131,250	20%	\$105,000	\$761,250	
81.3		40.02	Stormwater Quality-Stormfilters Only Base	35,381	TF	\$30.00	\$1,061,430	\$907,523	\$1,061,430	\$1,284,330	25%	\$265,358	20%	\$212,286	\$1,539,074	
81.4		40.02	Stormwater Quality-Stormfilters + Grand Platform Swales	0	TF	\$25.00	\$0	\$0	\$0	\$0	25%	\$0	20%	\$0	\$0	
81.5		40.02	Parallel San <12" dia	337	LF	\$175.00	\$58,975	\$50,424	\$58,975	\$71,360	25%	\$14,744	20%	\$11,795	\$85,514	
81.6		40.02	Parallel San 12"-18" dia	1,499	LF	\$200.00	\$299,800	\$256,329	\$299,800	\$362,758	25%	\$74,950	20%	\$59,960	\$434,710	

Portland Streetcar Loop Project

