

# **SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

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## **SOUND TRANSIT PERFORMANCE AUDIT COMMITTEE**

**Final Report**

**September 21, 2005**

**COMMENT: Rainier Valley shows the most serious problems. See the Annotations toolbar for highlighted issues.**

Prepared by

**Gannett Fleming, Inc.**

*in association with*

**P H Adams & Associates**



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## **Acronyms**

<b>CM</b>	Construction Management
<b>CUD</b>	Contract Unit Description
<b>DART</b>	Dallas Area Rapid Transit
<b>DOD</b>	United States Department of Defense
<b>FTA</b>	Federal Transit Administration
<b>HOV</b>	High Occupancy Vehicle
<b>LACMTA</b>	Los Angeles County Metropolitan Transportation Authority
<b>Metro-North</b>	Metro-North Railroad, New York, NY
<b>MLK</b>	Martin Luther King Jr.
<b>PAC</b>	Sound Transit Performance Audit Committee
<b>PMI</b>	Project Management Institute
<b>PMM</b>	Project Management Manual
<b>PMP</b>	Project Management Plan
<b>RE</b>	Resident Engineer
<b>REX</b>	Regional Express
<b>Tri-Met</b>	Tri-County Metropolitan Transit District, Portland, OR
<b>VTA</b>	Santa Clara Valley Transportation Authority
<b>WSDOT</b>	Washington State Department of Transportation

## **Glossary**

**Earned Value Management:** A recognized method within the project management industry for integrating scope, schedule and resources, and for measuring project performance. Earned value management compares the amount of work that was planned with what was actually earned and with what was actually spent to determine if cost and schedule performance are as planned.

**Project:** A temporary endeavor undertaken to create a unique product, service or result.<sup>1</sup>

**Program:** A group of related projects managed in a coordinated way. Programs usually include an element of ongoing work.<sup>1</sup>

**Project Management Plan (PMP):** A dynamic document that communicates the baseline configuration of a specific project to include scope, schedule and budget, as well as how the particular project is organized, and how it will be managed. PMPs are organized into chapters for each support area of project management, e.g. Procurement, Engineering Management, Real Estate, Construction Management, Quality Assurance, etc. and outline general guidance and processes for each area of support.

**Program Management Plan:** A dynamic document that communicates how projects within a program are generally organized and managed. Program Management Plans are organized in the same manner as PMPs.

**Baseline:** The original approved plan for a project to include scope, schedule and budget.

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<sup>1</sup> A Guide to the *Project Management Body of Knowledge* (PMBOK Guide) 2000 Edition.

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# SECTION I – EXECUTIVE SUMMARY

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The Sound Transit Performance Auditing Committee (PAC) retained Gannett Fleming, Inc. and its sub-consultant, P H Adams & Associates, to carry out a performance audit of Sound Transit's capital project management system.

## **OBJECTIVES**

The audit objectives included: assessing the framework and practices of the Sound Transit capital project management systems against industry best practices and generally accepted project management standards; and making recommendations to the PAC that, if implemented, might result in an improved standard of performance for Sound Transit.

## **SCOPE**

For the audit the PAC selected five projects valued collectively in excess of \$542 million from the Sound Transit capital program. To ensure perspective, the Sound Transit capital program for 1997- 2009 is valued at over \$4.4 billion and includes Link Light Rail, Sounder Commuter Rail and Regional Express (REX). The five audited projects are:

1. Central Link - Beacon Hill Line Segment
2. Central Link - Rainier Valley/Martin Luther King Line Segment
3. REX - Lynnwood Transit Center Project
4. REX - Federal Way Transit Center Project
5. REX - Federal Way HOV Project.

No Sounder Commuter Rail Projects were audited.

While the audit considered the full breadth of project management functions during both the design and construction phases, the greatest emphasis was on practices that relate directly to management of scope, schedule and cost.

## **METHODOLOGY**

The audit followed two main tasks:

Review industry best practices as demonstrated through a survey of select transit agencies, and synthesize these practices together with traditional project management standards, to establish the basis of evaluation for the audit

Conduct specific project audits that assess the level of performance against the established criteria.

### ***Best Practices Survey***

Five transit agencies, engaged in the development of major capital programs, were selected to participate in a survey of capital project management best practices. These agencies were selected in collaboration with the PAC project manager and have comparable responsibilities to Sound Transit for the delivery of transit systems and facilities including bus, HOV, light rail and commuter rail.

The participating agencies included:

Dallas Area Rapid Transit (DART) in Dallas, Texas

Tri-County Metropolitan Transit District (Tri-Met) in Portland, Oregon

Los Angeles County Metropolitan Transportation Authority (LACMTA) in Los Angeles, California

Santa Clara Valley Transportation Authority (VTA) in San Jose, California

Metro-North Railroad (Metro-North) in New York, New York.

The survey was designed to allow participating agencies to identify and share their project management practices that have proven instrumental to the successful delivery of projects.

### ***Survey Results***

A wide range of capital project management best practices were identified by agency executives. From this broad pool of practices, eleven capital project management best practices were the most commonly communicated.

From the findings of the audited projects, Sound Transit's demonstrated practices are clearly on par with three of the key practices communicated by the surveyed agencies.

Audit results also indicate that on six other key practices identified by surveyed agencies Sound Transit is evolving to best practice standards as some, but not all, audited projects routinely incorporated these practices.

Finally, two key practices identified by the surveyed agencies were found to challenge Sound Transit as no audited projects demonstrated these best practice examples.

Table 1 below highlights these best practices and correlates them to the respective agencies that identified the practice as a key to their success. Sound Transit's assessed standings to these practices are also provided.



**Table 1**  
**Project Management Best Practices Survey**  
**Significant Findings**

Best Practices	DART	TRI-MET	LACMTA	VTA	METRO-NORTH	SOUND TRANSIT
1. Use of Project Management Plans	√	√	√	√	√	**
2. Establishing Early Stakeholder Consensus	√	√		√	√	**
3. Budget Flexibility Through Adequate Contingencies	√		√	√	√	**
4. Executive Management Involvement	√	√	√	√	√	*
5. Immediate Response to Significant Issues			√	√	√	**
6. Disciplined Risk Management Practices	√	√	√	√		**
7. Structured Reviews of Project Development	√	√	√	√	√	*
8. Formal Lessons Learned Program	√	√	√	√	√	***
9. Maintenance of Cost Data for Local Transit Projects	√		√	√	√	**
10. Maintenance of Project Master Schedules	√	√	√	√	√	*
11. Development of "Project Managers"		√		√		***

NOTES:

\* Universally demonstrated on audited projects

\*\* Evident on some, but not all, audited projects

\*\*\* Not evident on any audited projects

The above table indicates that five best practices were universally identified by participating agencies as keys to success. These include:

*The development and use of project management plans (PMP) to facilitate project planning and coordination. The delineation of roles and responsibilities is a key element of the PMP*

*Executive management involvement to ensure and maintain project momentum*

*Structured reviews of project development to ensure proper design integration and awareness of design features by all stakeholders*

*Maintenance of formal lessons learned programs to foster a continuous improvement process*

*Maintenance of project master schedules to provide appropriate owner's perspectives on schedule plan, progress and opportunities.*

As demonstrated on all projects audited, Sound Transit routinely implements three of these five universally identified best practices. The audit also indicated mixed results on the other two universally identified best practices.

Section III provides a full discussion of the best practices review. Appendix 2 details questionnaire responses from the each participating transit agency.

### ***Audit Criteria***

The process for developing the audit criteria involved consideration of:

- PAC specified audit study areas
- Feedback from the above survey of transit agencies' best practices
- Review of project management industry standards
- Industry standards
- The audit team's experience.

Fifty-two criteria, covering twelve project management practice areas, were established. The practice areas are:

1. Project integration
2. Scope management
3. Schedule management
4. Cost management
5. Quality management
6. Risk management
7. Contract management
8. Design management
9. Construction management
10. Communication
11. Human resources
12. Post-project reviews.

A full discussion of audit criteria is found in Section III. The criteria are found in Appendix 1.

### **AUDIT RESULTS**

Audit assessments indicate that four of the five projects met the audit criteria. Summary assessments of each project are noted below:

- Beacon Hill Line Segment – project management practices met the audit standards and also demonstrated several outstanding practices

- Rainier Valley/ MLK Line segment – project management practices generally met the audit standards
- Lynnwood Transit Center Project – project management practices were evolving to audit standards
- Federal Way Transit Center Project – project management practices generally met the audit standards
- Federal Way HOV Project – oversight of WSDOT design and construction activities generally met the audit standards.

### ***Well-Developed Practices***

Detailed review of the audited project's project management systems reveals that good examples of well-developed practices were in use. Many of these practices fared favorably against the audit criteria and some matched project management best practice examples shared by surveyed transit agencies.

Audit efforts led to a number of findings of good practices employed by Sound Transit project teams. These include the following examples:

- A strong discipline for structured design reviews to include 30%, 60% and 90% integrated submittals that were accompanied with elaborated cost estimate updates. This practice was demonstrated by all projects and is consistent with surveyed best practices
- The development and maintenance of a project master schedule was demonstrated on all projects. This is also consistent with surveyed best practices
- Regular involvement by executive management on all projects was also clearly demonstrated. This too was consistent with surveyed best practices
- Planning and management of the real estate acquisition and relocation effort associated with the Rainier Valley/ MLK Line segment
- Successfully collaborating with WSDOT to change the WSDOT standard for defining work days for effective schedule control on the Federal Way HOV Project
- The investment in the Beacon Hill Test Shaft to identify and mitigate construction risks thereby saving project dollars
- Development and commitment to the Project Management Manual to outline working relationships between Sound Transit and the City of Seattle related to the Central Link Project

- Attentive and effective construction management oversight of Capital Projects Department projects
- Coordinated efforts among various Sound Transit departments and divisions to identify, process and secure required permits in support of project needs
- Investment in design support teams for complex construction efforts to ensure safe and productive construction operations
- Use of full-scale footprint mock-ups for bus facilities to demonstrate design features and facilitate effective communication with partner transit operators
- Commitment to safety as exemplified by zero lost-time incidents on the Lynnwood Transit Center Project
- Understanding of respective roles in quality management throughout the agency and project teams.

More important, the systems were being managed by qualified individuals who clearly demonstrated a dedication to successfully delivering their capital projects.

### ***Recommendations for Improvement***

Together with the good examples of project management practices highlighted above, twenty-three recommendations were developed based on audit findings. These recommendations, found in Table 2 below, are focused on improving capital project management practices at Sound Transit from project, department and agency-wide perspectives. The recommendations are prioritized into three groups based on the audit team's view of the urgency of needed action by Sound Transit. The auditor's categorization of priorities for recommended Sound Transit actions are as follows:

Priority 1 – Immediately pursue


Priority 2 – Reconcile within two months

Priority 3 – Reconcile within four months

**Table 2**


**Audit Recommendations**

Priority	Findings	Recommended Action	Sound Transit Response
1	1.) Project manager roles and responsibilities during the construction phase were somewhat ambiguous on the audited Capital Projects Department projects, and there was some uncertainty regarding who was responsible for managing ancillary contract budgets and contingencies during the construction phase on both of the audited Link segments.	Clearly define the <b>roles and responsibilities</b> of personnel who function as "project managers". Ensure that policy and procedural guides are consistent in outlining the responsibilities, authority and accountability of project managers.	<p>Capital Projects will clearly and consistently define project manager and construction manager roles and responsibilities. Communication and education efforts will be defined and implemented to clearly communicate roles and responsibilities to all involved.</p> <p>For each Link project (e.g., Initial Segment, North Link, Airport Link), budget and schedule responsibility and accountability resides fully with the Project Manager. The recently updated Link Program Management Plan (PMP) places a strong emphasis on resource assignments, and although individual design and construction support contracts are managed by a variety of personnel, all changes to contract budgets and contingencies require the approval of the Link Project Manager.</p>
1	2.) The Capital Projects Department projects audited did not have clearly defined project baselines of scope, schedule and cost until quite late into final design, or during the construction phase. The lack of an established baseline inhibited demonstrated control of the baseline and credible performance measurements.	Establish, document and implement a <b>project baseline configuration process</b> that defines scope, schedule and cost at the conclusion of preliminary engineering. This process should be applicable to all projects.	<p>The Agency has recently adopted a Phase-Gate process that defines a series of checkpoints in the lifecycle of a project. Gate 3 of the Phase Gate process is to establish a baseline scope, schedule and budget.</p> <p>There are specific criteria that must be in place before a baseline is established. The baseline is established through gate 3 at the conclusion of 30% (preliminary engineering) designs.</p> <p>The process provides for exceptions only if finalizing third party agreements, funding partnerships, permitting waivers, real property transactions, or the like protract and preclude the ability to effectively establish a baseline at the 30% design point of time. In order to keep projects progressing to meet finite timelines, exceptions to the requirement to baseline at 30% may be granted.</p>

Priority	Findings	Recommended Action	Sound Transit Response
1	<p>3.) The Rainier Valley/MLK Line Segment was challenged by a number of significant issues relating to contractor performance. While these issues are known and efforts to remedy them were continuing, these issues have been present for many months.</p> 	<p>Foster a <b>project management culture that responds to issues with prompt recovery actions</b> as early as possible. Support this culture by instituting management protocols that require assessment of significant contract or project issues and the subsequent development of specific actions tailored to the particulars of the issue(s). These actions should have timelines assigned and monitored for definitive resolution. Immediately apply these protocols to the Rainier Valley/ MLK Line Segment issues.</p>	<p>A number of actions are being taken to address contractor performance concerns. Both Sound Transit and our Contractor have made changes in the organization structure on the jobsite to improve the oversight of construction and the administration of this contract. Sound Transit has provided additional staff to the construction management team.</p> <p>Sound Transit and the contractor have engaged a third party facilitator to assist in addressing disputes between the agency and the contractor. The initial meeting with the facilitator occurred September 12. Sound Transit's goal for complete resolution of backlogged issues and dispute resolution is January 15, 2006.</p>
1	<p>4.) Each audited project cited current schedule and working budget objectives as the universal performance measurement. Additionally, several of the projects expressed the goal of minimizing impacts to communities and similarly, maintaining positive relations between Sound Transit and project stakeholders. However, aside from the project completion date and costs-at-completion (which in four of five cases were in the future), no performance measures were found on the projects.</p>	<p>Establish and regularly assess <b>specific performance measures</b> over a broad spectrum of areas for all projects that reflect Sound Transit's defined goals and objectives. Subject areas may include: schedule, including interim milestones as appropriate; budget; safety; quality; stakeholder relations; diversity participation; responsiveness to consultants and contractors; etc. WSDOT, in their quarterly report on performance and accountability entitled <i>Measures, Markers and Mileposts</i>, opens each report with a phrase well-understood by project management practitioners: "What Gets Measured, Gets Managed."</p>	<p>Sound Transit has recently engaged the services of a consultant to assist management in each department to develop appropriate performance measurements. Performance measurements will be identified for each department based on the business needs.</p>

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Priority	Findings	Recommended Action	Sound Transit Response
1	5.) While the two Link segments pointed toward an outdated Central Link Project Management Plan (PMP) that afforded appropriate general guidance, none of the other projects developed a PMP. There were some contract-specific plans or manuals prepared by consultants for the transit center and HOV projects. But, they were narrow in their breadth.	Require the <b>development and use of PMPs</b> on all projects. The minimum standard for the PMP breadth should follow Federal Transit Administration guidelines. Key subordinate guides and procedures, e.g. Quality Plan, Construction Manual, Project Control Procedures, etc., should be developed in support of the PMP.	Capital Projects has issued a department-wide Project Management Plan. Further, the newly implemented agency Phase-Gate process requires an individual Project Management Plan for each project.  Link revised its Program Management Plan in July of 2005. To better support the management organizations for each of the Link capital projects (e.g., Initial Segment, North Link, Airport Link), Link is transitioning from a single, overall Program Management Plan to individual Project Management Plans for each project. Project Management Plans for each of the active Link project will be released by the end of 2005.
1	6.) The Rainier Valley/ MLK Line Segment team has not accepted the contractor's schedule submittal since October 2004. Once the schedule development issues are resolved, the update effort to reconcile at least eight months of progress and numerous contract changes will require exceptional insight and contract savvy. Expertise to effectively address the schedule deficiency issues has not been available. 	In concert with Recommendation #4 above, <b>secure an appropriately qualified resource</b> to assist in the reconciliation of the continuing Rainier Valley/MLK Line Segment schedule development and maintenance disputes.	Link has hired an additional schedule consultant to assist with the evaluation of the contractors schedule and day to day monitoring of progress.  Sound Transit has collaborated effectively with the contractor to develop a functional schedule that is a vast improvement over previous efforts.  Consistent with the auditor's recommendations, Sound Transit has also hired a forensic scheduler to assemble an "as built" schedule for use in evaluation inefficiencies and delays. Target completion of the "as built" schedule is Nov. 15, 2005.

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Priority	Findings	Recommended Action	Sound Transit Response
2	7.) While each project team was actively engaged in risk management activities, their efforts did not follow any disciplined practice to document, monitor and manage project risks. Further, risk assumptions were not integrated into schedule and costs forecasting processes.	Define and implement <b>formal risk management practices</b> on all projects that are tailored-to-fit the specific project. Document the nature of identified risks and their potential impact(s) through the use of traditional risk management tools, e.g. risk registers. Integrate project risk assessments into established schedule and cost forecasting procedures.	<p>Sound Transit concurs with the audit recommendation that the risk identification process become the basis of a formal risk monitoring and evaluation program. Sound Transit aims to implement a formal risk monitoring plan by the end of 2005.</p> <p>To that end, a review of tools to facilitate a centralized process, documentation and delegation of roles and responsibilities for maintaining current risk information, management review, and reports will be implemented. Currently, the use of formal risk assessment is an evolving process in the transit industry in collaboration with the Federal Transit Administration (FTA).</p> <p>Capital Projects will develop a list of projects where a risk register would be appropriate to the scale of the project and the nature of the risks.</p> <p>To date, Link's work in this area has been recognized as industry-leading by the FTA and our transit peers. Link's formal risk identification processes have supported a range of management decisions, including adoption of design changes, construction of the Beacon Hill tunnel test shaft, revisions to bid documents, incorporation of risk mitigation measures into contracts (i.e., steel escalation provisions), and major scope decisions (i.e., First Hill station elimination).</p>

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Priority	Findings	Recommended Action	Sound Transit Response
2	8.) Each project team easily identified several significant experiences where a learning process for future reference was at work. It was evident that many of these lessons were shared informally among colleagues and some lessons were incorporated into updated plans or standards. However, none of the audited projects documented their lessons learned. Project teams were reluctant to identify lessons learned over concerns of how they may be received by reviewers within and external to Sound Transit. Further, there are no lessons learned procedures in either the Capital Projects or Link Departments.	Institute a <b>formal lessons learned program</b> on all projects that gathers, documents, and shares institutional experiences at the close of each phase of the project life cycle, e.g. planning, environmental clearance/PE, final design, construction, start-up. Designate the responsibility for maintaining the lessons learned program to a corporate entity, e.g. program control or quality management, to promote objectivity and facilitate timely gathering, analysis and dissemination of lessons. This program should cultivate the principle that both personal and institutional growth and improvement are often the products of challenging experiences where the outcome is not as designed or desired.	<p>A Lessons Learned process would be beneficial for all ST project managers. Through Agency Project Control we will develop a procedure and the appropriate tools to implement a standard process across the agency.</p> <p>Although this was not formally documented, Capital Projects has applied lessons learned from earlier projects as evidenced in the auditor's review of Lynnwood vs. Federal Way.</p> <p>For the Initial Segment Project, Link applied several lessons learned into the Contract Documents as it related to various types of construction (i.e. tunnels, at-grade and aerial) for this Project.</p>
2	9.) The scope of the Federal Way Transit Center was subject to review, negotiation and re-definition on several occasions. While the dynamics of this particular case were unusual, it was evident that no Sound Transit standards for design of a parking structure were introduced as the foundation in determining what amenities were both included and excluded. Consequently, planning issues were being reconciled while final design was underway leading to less than ideal efficiencies.	Develop Sound Transit <b>criteria and standards for the design of all transit facilities</b> . These criteria and standards should effectively communicate the basis for design and costing of basic Sound Transit-funded facilities. From the standards and criteria, adopt and document a clear project vision that defines the fundamental scope, schedule and cost of each project before engaging project partners. Maintain the posture that additions or improvements to the Sound Transit standards proposed by project partners are only acceptable when additional funding sources are secured.	<p>During the Federal Way Transit Center design phase there was a guideline in place, "The Design Guidelines and Standards for Sound Transit Regional Express Transit Facilities for Bus Operations" dated February 2000.</p> <p>The guidelines and standards expressed in this document are currently used by the Regional Express program and were used by both the Lynnwood Transit Center and Federal Way Transit Center projects.</p> <p>In 2005 Capital Projects has undertaken an effort to consolidate a Design Criteria Standards Manual to address the types of transit facilities (stations, shelters) designed and constructed by the Capital Projects programs, Sounder and Regional Express. These design standards are near completion and will be used by all project managers within Capital Projects and included by reference in all design contracts.</p>

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Priority	Findings	Recommended Action	Sound Transit Response
2	<p>10.) The Lynnwood Transit Center Project applied a limited earned value measurement system during the design phase. Earned value is a standard practice in the project management profession and provides an integrated means to measure three variables:</p> <ol style="list-style-type: none"> <li>1. <i>The Planned Value</i> to include the physical work scheduled and the estimated value of this work</li> <li>2. <i>Earned Value</i>, or the physical work actually accomplished</li> <li>3. <i>Actual Costs</i> incurred to accomplish the earned value</li> </ol> <p>This system was not embraced by the project team or design consultant and it was not pursued during construction. All other projects did not apply any form of earned value practice.</p>	<p>Use <b>formal earned value practices</b> more effectively as tools to measure, assess and understand what progress a contractor, professional services consultant or project is achieving. As earned value is an excellent basis to forecast future performance and trends, incorporate earned value output into schedule and cost forecasting processes.</p>	<p>Both the Federal Way Transit Center and the Lynnwood Transit Center projects required Earned Value reports from the design consultants. These were regularly reviewed and analyzed by the project manager and project control. During construction, the RE's verified placement (progress) as a condition of approval for the contractors' monthly pay applications (earned values). The RE's followed standard forecasting and trend review practices, and furnished monthly estimated final costs and times to completion based on the RE's' analyses of issues, trends, potential change orders, and change orders. Earned Value tools are employed as a standard practice in Capital Projects. However, Capital Projects does not require resource and cost loaded schedules as a standard practice for all projects. The Department's deliberate practice on construction contracts is to not require that schedules be resource/cost loaded for unit price bid items. Such a requirement controverts the appropriate use and benefit of the contractor's required CPM progress schedule to construction management.</p> <p>Link's current project management practices effectively measure and assess each individual contract package together with the Project as a whole. In the case of the Beacon Hill construction contract (the critical path of the Project), for instance, cost and schedule progress is being related using tools and methods that are very much in line with best EV practices.</p> <p>Since adoption of a full EV program requires the imposition of common contract schedule structures and specifications at the outset, Link does not anticipate transition to a formal EV practices during the construction of the Initial Segment but is considering such a transition in connection with the North Link and Airport Link projects.</p>

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Priority	Findings	Recommended Action	Sound Transit Response
2	11.) The audited Link line segments enjoyed the benefits of a Link Department cost estimating database. This database was being used as a resource to cross-check cost values for odd and/or significant field change cost estimates. The Capital Projects Department did not maintain a similar cost database. Four of the five surveyed transit agencies identified the maintenance of capital costs as a best practice.	Expand the Sound Transit <b>cost estimating data base</b> to include current and historical data for projects in the Capital Projects Department. Develop the database so that the effective use by planners, designers and construction management staff is facilitated.	Capital Projects believes this would be a value added effort if implemented and would recommend that Agency Project Control take the lead for capturing and maintaining an estimating database that is populated from information on Link and Capital Projects contracts.
2	12.) Management of both Link segment design efforts had elements of multiple prime contractors. The Rainier Valley/ MLK Segment for example had six prime contractors, many with multiple sub-consultants. This contracting arrangement provided for unwieldy coordination and integration efforts. The arrangement also yielded higher costs for management.	Simplify the agency's <b>design management process</b> by shifting the responsibility for coordinating the various subordinate design disciplines (electrical, mechanical, architectural, etc.) from Sound Transit to a prime consultant.	Link concurs with this finding and our staff has taken steps to simplify our design management process for both Airport and University Link Projects.  For both of these Projects, the Link Project Director has instructed staff to procure a single prime consultant for Final Design to be responsible for coordinating the various subordinate design disciplines.
2	13.) The Central Link PMP referenced by the two audited line segments was dated September 2002. The project and its processes have evolved beyond what was reflected in the outdated plan.	Immediately <b>update the Central Link Project Management Plan</b> ; coordinate content of subordinate references, procedures and guides accordingly to ensure consistency.	The Link Project Management Plan was in the process of being updated during the PAC audit. The updated PMP was released in July 2005 but was not available to the PAC auditors. See also response to recommendation number 16.
2	14.) There was over 160 work directives issued to-date on the Rainier Valley/ MLK Line Segment. A work directive requires the contractor to proceed with a specific assignment on a time-and-material basis. The high volume was disquieting to the auditors as work directives can carry management and administrative liabilities. Contractor invoices reflect the work directives in that substantiation of time-and-material invoicing was voluminous. At the time of the project team interview, there were three contractor invoices in process.	Consider the <b>assignment of additional field inspectors and office engineering staff</b> to the Rainier Valley/MLK Line Segment construction management team to overcome the added requirements for field verifications of time-and material work, and administrative burdens associated with the large number of active work directives.	See response to finding #4. Link has provided additional staff to the Resident Engineer team to assist in closing work directives.  It should be noted work has been completed on the majority of these work directives and that interim payment has been made based on time and material invoices from the contractor. However, the contractor has failed to submit final invoices. In an effort to close these out, the Resident Engineer has been directed to offer lump sum settlements. Target completion for this effort is Dec 15, 2005.

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Priority	Findings	Recommended Action	Sound Transit Response
2	15.) Review of construction contract change orders and change control logs on the Federal Way HOV Project suggest that many experienced changes were the result of design coordination issues or design calculation errors. WSDOT performed both quality control and quality assurance functions as part of their design services agreement on the project. In 2003, a consultant recommended that Sound Transit need not regularly perform Quality Assurance audits of WSDOT design or construction services. Sound Transit quality management resources were quite limited in the early stages of the project.	Revisit the decision to forego <b>quality assurance oversight of WSDOT</b> design and construction services. Apply similar quality assurance attention to WSDOT HOV projects as applied to all other projects.	Sound Transit reserves the right to review and audit WSDOT design and construction documents and exercises that option when we deem it necessary.  The recommendation from the QA Auditor indicated that WSDOT was following its own requirements and kept good documentation on file.
2	16.) Four of the five transit agencies surveyed reported that establishing credible project budgets requires the application of adequate allowances and contingencies. With regard to contingencies, they added that a correlation to identified risks was essential for effective management. Of the five audited projects, there was mixed evidence on the application of allowances and contingencies.	In establishing early project budgets, ensure <b>appropriate design allowance and contingency</b> are incorporated based on an assessment of project scope, design development attained and risks. When awarding subsequent contracts, correlate contingencies to assessed risks rather than uniform allocations.	Capital Projects currently includes design allowances in its estimates in the early design stages and applies standards associated with risk for project contingencies.  Link applies a hierarchy of cost contingencies in the development of capital budgets. At each level, contingency assignments reflect an assessment of the risk levels that are aimed to be addressed. For instance, Link recommends varied levels of contract contingency to the Sound Transit Board at the time of contract award, ranging from 5 percent for selected systems procurements to as much as 15 percent for several contracts involving high-risk underground utility relocations. To date, the overall cost forecast for the Initial Segment Project is 6% below budget with all the major construction and procurement packages awarded.

## CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

SEPTEMBER 21, 2005

Priority	Findings	Recommended Action	Sound Transit Response
3	17.) It was observed that the Lynnwood Transit Center Project engaged an Executive Advisory Committee, comprised of project partners. Additionally, transit survey participants VTA and Metro-North have been successful in reducing pressure for scope and budget creep by engaging partners in standing panels to define and control project scope.	On all projects, <b>establish formal standing panels of project partners and stakeholders</b> to gain consensus on and enforce scope, schedule and budget commitments for projects.	<p>Both the Lynnwood Transit Center and the Federal Way Transit Center projects engaged an Executive Advisory Committee. When a project is complex in scope; has multiple partners and a number of design issues to address, this is an ideal way to proceed and matches the practice within the Capital Project program.</p> <p>For some of the smaller projects with straight-forward scopes of work, short schedules and less risk associated with the work, the addition of an Executive Advisory Panel would overly complicate project delivery. Capital Projects reviews its project organization and the program manager determines during concept 1) if an advisory panel is considered advisable; 2) if yes, who should be represented on the panel.</p>

Priority	Findings	Recommended Action	Sound Transit Response
3	<p>18.) A significant contract change was processed on the Rainier Valley/MLK Line Segment to incorporate late design comments received by the City of Seattle. Among the comments was designation of specific standards related to wet utilities that resulted in the specification of pipe that was different than that premised by designers. On a similar note, code interpretations of fire sprinklers in the Federal Way Transit Center led to a significant cost for their inclusion into the structure which was not originally believed to be required.</p>	<p>Secure and document <b>understandings about applicable codes, criteria and standards</b> to be applied to work on infrastructure owned by third parties, and/or new facilities in specific jurisdictions. These interpretations should be obtained as early as practical to ensure appropriate designs and costs are incorporated into the project baseline configuration.</p>	<p>Currently Capital Projects tasks the design consultant with identification of permitting requirements which includes documentation of applicable codes, criteria and standards to be applied to each project.</p> <p>In the case cited for Federal Way, originally sprinklers were included, but upon review with the building officials at 60%, it was agreed that they were not a code requirement. Subsequently, at the 100% final design level, the City Fire Marshall insisted on sprinklers, thereby impacting the costs.</p> <p>Link concurs with this finding and our staff makes every effort early in design to secure and document criteria and standards from our local jurisdictional partners.</p> <p>During design, Link and City staff were challenged to address over 7000 review comments related to designs for utility relocation and roadway reconfiguration work in Contract C735 (Rainier Valley). This volume of comments far exceeded similar reviews from City staff for other corridors within Seattle for the Initial Segment Project.</p> <p>To maintain the overall Project schedule, Link management made a deliberate decision to proceed with the award of Contract C735 before all the outstanding comments were addressed with the City. Since the award of Contract C735 (Rainier Valley), Link has revised the design criteria and standard specifications to incorporate these revised city and third party requirements. Link and the City of Seattle have also developed a joint Project Management Manual and a Construction Service Agreement that detail policy and procedure with regard to changes during construction.</p>

# CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

SEPTEMBER 21, 2005

Priority	Findings	Recommended Action	Sound Transit Response
3	19.) Three of the five surveyed transit agencies indicated that they regularly engage consultants to provide second-opinion cost estimates. Second opinion cost estimates were not found to be a standard practice on the projects audited.	Establish a standard that would require obtaining <b>second-opinion cost estimates</b> on complex and/or high risk projects, or project elements, at key intervals.	<p>Capital Projects currently uses an on-call estimating firm to obtain independent cost reviews on projects with high risks or complex scopes. We believe this is a best practice and would want to continue using independent cost reviews, value engineering and other reviews as deemed necessary for specific projects.</p> <p>Link routinely augments its own cost estimating efforts through the solicitation of independent cost estimates during the design phase. This was done for the E-3 Busway and the Beacon Hill tunnel construction contracts. In both cases, the independent cost estimate informed Link's final engineer's estimate. Further, Link has adopted the practice of developing independent risk assessments as a means for evaluating and refining its cost estimates.</p> <p>In both cases, the independent cost estimate informed Link's final engineer's estimate. Further, Link has adopted the practice of developing independent risk assessments as a means for evaluating and refining its cost estimates.</p>
3	20.) LACMTA and Metro-North both expressed that their preferred project delivery strategy is design/build. In the LACMTA case, this is particularly true for smaller transit facility projects. The parking structure within the Federal Way Transit Center may have been a viable candidate for a design/build execution. There was no evidence of such consideration. Also, there were no contracts which featured cost incentives within the five audited projects. While the Contracts Division indicated readiness to explore and support alternative contracting strategies, the established protocol was to await such requests from the Line of Business.	Establish a process that would ensure that <b>alternative contracting strategies</b> , e.g. design/build, and/or cost-incentive based contracting, etc., are considered systematically.	Capital Projects considered a number of procurement strategies for the Lynnwood Transit Center and Federal Way Transit Center projects. Furthermore, the agency's newly implemented Phase-Gate process requires the development of a Procurement Plan as described in the audit.

# CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

SEPTEMBER 21, 2005

Priority	Findings	Recommended Action	Sound Transit Response
3	21.) Transit agency executives in the project management best practice survey were enthusiastic about sharing practical and valuable advice from their experiences.	Consider hosting a transit capital <b>project management roundtable</b> of experienced transit agency executives that would allow Sound Transit to learn first-hand about the practices that have been successfully implemented on other properties.	<p>Hosting roundtable workshops are beneficial to the agency and it should be noted that Sound Transit actively participates in a variety of roundtable workshops hosted by FTA and other transit agencies. And we are hosting a roundtable in October with other transit agencies to talk about best practices and other project management issues.</p> <p>Sound Transit is firm believer in peer review and our agency has benefited from a number of reviews to learn first-hand about the practices that have been successfully implemented on other properties.</p>
3	22.) The Beacon Hill Line Segment scheduler was also responsible for maintaining the Central Link Project Schedule, and was a key contributor to the Airport and North Link project schedules. While the line segment schedule alone was over 3,000 activities and was a rather complex tool, an average of one-day a week was being dedicated to this complex project. Similarly spread thin was the Link project control lead who was assigned to the two audited line segments. There was over \$600 million of work between the two segments which this lead was responsible to monitor and forecast costs.	Review the <b>workloads</b> of the Beacon Hill Line Segment scheduler and the single Project Control Lead for both audited Link segments to insure against diluting these key resources.	Link is in the process of filling the vacant scheduling position within the Project Control Division, either through recruitment of a Sound Transit employee or through mobilization of a full time consultant staff resource by the end of October 2005. Assignments for the new scheduling resource will include providing schedule support for the Beacon Hill contract.
3	23.) The two Link line segments reported that their efforts to ascertain the number of crews associated with specific elements of work were frustrated by not having a clear provision in the standard schedule specification that required the contractor to provide such data.	Review the standard <b>schedule maintenance specification</b> to strengthen provisions that provide greater insight into portrayals of productivity to include resource loading and bases and assumptions.	We recognized that the current standard schedule specification for Link construction contracts is in need of clarification and refinement. Improvement opportunities have been developed in conjunction with Link's construction management teams. An updated schedule specification will be incorporated into terms of new construction contracts (e.g., Airport Link). Link does not, however, concur with the audit recommendation that schedule specifications should in all instances require contractors to resource-load their schedules. We will address this on a case-by-case basis.

# CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

SEPTEMBER 21, 2005



Section IV provides assessments of each project. Additionally, Appendix 4 provides detailed observations and findings developed from document reviews and project team interviews.

#### **AUDITOR'S OPINION**

It is the opinion of the audit team that Sound Transit's project management systems, as evidenced through the audited projects, are in good standing in comparison with other transit agencies. Although there are opportunities for improvement, the development of policies and practices for effective and efficient capital project management are appropriately progressing.

## SECTION II – INTRODUCTION

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### AUDIT OBJECTIVE

The objectives of this audit were to:

- Assess the framework used by Sound Transit to manage the five PAC-selected capital projects in light of industry best practices
- Assess the practices that were followed to implement the five capital projects
- Make recommendations to the PAC concerning the current capital projects management system that, if implemented, might result in an improved standard of performance for Sound Transit.

### AUDIT SCOPE

The following five representative projects were selected by the PAC to be audited:

- Central Link - Beacon Hill Line Segment
- Central Link - Rainier Valley/Martin Luther King Jr. Segment
- REX - Lynnwood Transit Center Project
- REX - Federal Way Transit Center Project
- REX - Federal Way HOV Project.

The specific project audits should be understood in the overall context of Sound Transit's capital program. The agency is managing over \$4.451 billion in its project delivery plan (1997-2009) as described in Table 3 below.

The value of the projects audited approximates \$542 million. Two of the *projects*, Beacon Hill Line Segment and Rainier Valley/Martin Luther King, are segments of the larger Central Link Light Rail Project and represent approximately 18% of the Link Light Rail Program. The design and construction of these segments is managed by the Link Department. The three other projects are managed by the Capital Projects Department and are included in the REX capital budget. Together these three projects represent about 12% of the REX capital program.

**Table 3 Sound Transit Capital Program 1997-2009**

<b>PROJECT DELIVERY</b>	<b>1997-2009 CAPITAL BUDGET</b>  (IN MILLIONS)
<i>Tacoma Link</i>	\$ 80
<i>Central Link</i>	\$2,327
<i>Sounder</i>	\$1,227
<i>Regional Express</i>	\$ 817
<b>Total Project Delivery</b>	<b>\$4,451</b>

The audit examined the management processes that are being used by Sound Transit in the design and construction of the five capital projects selected by the PAC. The projects were categorized and examined in the broad context of the following twelve (12) project management practice areas:

- Project integration
- Scope management
- Schedule management
- Cost management
- Quality management
- Risk management
- Contract management
- Design management
- Construction management
- Communication
- Human resources
- Post-project reviews

Gannett Fleming's audit opinion is restricted to the Sound Transit project management framework used to manage the five PAC selected projects and the general practices followed by the project teams. We did not assess the appropriateness of any project, nor provide a detailed examination of any individual project's outcome or results.

Instead, based on the interviews and document reviews, the auditors evaluated the project management processes used on each project against the established criteria presented in Appendix 1. The evaluation focuses on the project management team and the dynamics associated with its operations; particularly the project manager's ability to effectively fuse and direct the project team.

Predictably, each project has encountered various stumbling blocks and challenges. This audit assessed the effectiveness of the tools and practices used by Sound Transit managers to steer the five selected projects around these obstacles.

## **AUDIT METHODOLOGY**

The two major audit tasks were:

- Development of best practice and standard criteria as the basis of evaluation.
- Project specific audits.

### ***Best Practices Survey***

To help develop the audit criteria, a survey of transit agencies was designed and conducted to gather input on industry best practices in capital project management.

In consultation with the PAC project manager, five transit agencies were selected to be included in the best practice review. Each of the selected agencies is currently engaged in managing large capital programs, is distinguished by exemplary project management systems, and was agreeable to participating in the survey and providing supporting documentation. Like Sound Transit, this group of agencies is responsible for delivering light rail, commuter rail, and bus related capital programs.

The audit team developed a questionnaire that was reviewed by the PAC project manager. Consistent with the overall scope of this audit and the requirements stipulated by the PAC, the questionnaire focused on the capital project management systems that support design and construction activities. See Appendix 2 for the respective agency best practice questionnaires.

Using this questionnaire as a base, the audit team conducted telephone interviews as well as select site visits to agency offices to gain a general understanding of each property's perceptions of project management best practices. The auditors did not test the actual effectiveness of the practices. The agencies included in the survey are:

1. Dallas Area Rapid Transit (DART) in Dallas, Texas
2. Tri-County Metropolitan Transit District (Tri-Met) in Portland, Oregon

3. Los Angeles County Metropolitan Transportation Authority (LACMTA) in Los Angeles, California
4. Santa Clara Valley Transportation Authority (VTA) in San Jose, California
5. Metro-North Railroad (Metro-North) in New York, New York.

Each agency was responsive and provided information about the practices that contributed to success on their respective programs. The salient findings from this review are discussed in Section III.

### ***Project Management Criteria***

The Gannett Fleming team developed criteria to define project management standards that were consistent with the PAC's interest and defined work scope. This criteria is a product of the best practices survey, as well as a review of current project management industry standards and relevant topics from the Project Management Institute (PMI), and the United States Department of Defense (DOD), standards promoted by the Federal Transit Administration (FTA), together with Gannett Fleming, Inc.'s experience. Audit Criteria is discussed in Section III.

While good project management processes do not guarantee project results, in our opinion, an agency is most likely to be able to repeat project delivery successes with strong project management practices in place.

Successful project delivery is largely the result of project managers who are able to respond effectively to events; both by exploiting opportunities and capably commanding challenges. Project management practices that are comprehensive and integrated facilitate such action by aligning resources and directing efforts in a standardized and repeatable fashion.

The audit criteria were used to assess the repeatable, standardized project delivery practices and tools used by Sound Transit to support the five audited projects. The audit team organized the criteria into the twelve major categories outlined above in the Audit Scope section

### ***Project Audits***

The project audits involved:

- Information gathering
- Document review
- Project team interviews
- Individual follow-up interviews.

The audit team reviewed project-specific documents as well as the agency and department guides that control and direct project delivery activities. An extensive list of

the documents reviewed by the audit team is included as Appendix 3. The types of project-specific documents include:

- Sample weekly status reports
- Progress payments
- Project schedules
- Contract specifications
- Change order logs
- Significant change orders
- Agendas and Meeting Notes for Construction and Design Reviews
- Construction activity reports
- Safety reports
- Peer reviews
- Value engineering reports
- Third party agreements
- Quality assurance audits.

In preparation for the project group interviews/workshops, the audit team created an extensive questionnaire that includes over one hundred questions on project management. The questionnaire was consistent with the interest and scope defined by the PAC and was the basis for the standardized approach to the audit workshops. Appendix 4 includes the five project questionnaires with Observations and Findings from the audit team.

The audit team conducted five separate group interviews/workshops to gain an understanding of the supporting tools and project management practices at work on the projects. This workshop approach provided an opportunity to witness how the project teams communicated and worked together. The project management practices, together with the roles and responsibilities of project managers and their support teams, were then examined from a process perspective. The workshops included the key project team members as appropriate for each project and generally included:

- Designated “Project Manager” (Deputy Construction Managers on Link)
- Construction Manager
- Design Manager

- Resident Engineer
- Assistant Resident Engineer
- Document Control Specialist
- Project Control Lead.

An interview list is provided as Appendix 5.

In addition to the team interviews, several follow-up interviews were conducted both in person and by telephone with team members, other support functions and senior-level management to clarify input received from interviews and or document reviews.

The workshops and interviews were productive. All Sound Transit representatives were cooperative, helpful and open to discussing the successes and challenges of the specific projects, as well as project management related processes in general.

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## SECTION III – BEST PRACTICES REVIEW

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This section describes the findings from the review of five comparable transit agencies. Best practices for managing capital projects with an emphasis on control of budget, schedule and project scopes are identified. This section provides perspective on standard industry practices. Additionally, this section builds on the findings from the review to establish the criteria for the evaluation of Sound Transit's capital management system through the audited projects.

### **SURVEY POOL**

A survey of project management best practices was conducted of five transit agencies recognized by their peers for superior performance in capital project delivery. These agencies were selected from a larger pool of agencies that was identified by the Gannett Fleming Team, in collaboration with the PAC Project Manager. These participating agencies each have significant experience in delivering large capital programs that include bus, light rail and commuter rail facilities.

The survey benefited from an enthusiastic response from the following participating agencies:

- Dallas Area Rapid Transit (DART) in Dallas, Texas
- Tri-County Metropolitan Transit District (Tri-Met) in Portland, Oregon
- Los Angeles County Metropolitan Transportation Authority (LACMTA) in Los Angeles, California
- Santa Clara Valley Transportation Authority (VTA) in San Jose, California
- Metro-North Railroad (Metro-North) in New York, New York.

The intent of the survey was two-fold:

- 1.) To identify the best practices employed within each agency
- 2.) To synthesize these findings into audit criteria that would be used as part of the basis of assessing Sound Transit's project management practices.

The survey was initiated by telephone and followed by a questionnaire. The questionnaire was specifically designed to allow survey participants to identify and discuss the practices they employ that contribute to the successful delivery of their capital projects. The team then contacted representatives from each agency to review their experiences and thoughts in greater detail. The discussions focused on best practices for the design and construction phases of capital project delivery. In addition, some select site visits were made to learn more about how and why these practices proved effective.

A wide range of project management best practices were identified by the agencies. Yet, there was a clear set of practices that were considered by most of the agency executives to contribute to successful capital projects delivery.

The views of participating agencies were supported by extensive written materials. However *the actual effectiveness of practices communicated was not independently verified* by the audit team.

While the participating agencies articulated their most notable best practices in different ways, the messages conveyed were often strikingly similar. Table 4 highlights the most common significant best practices identified as well as the agency that identified the practice as a contributing factor to their success. Sound Transit's assessed standing against these best practices is also indicated.

**Table 4**  
**Project Management Best Practices Survey - Significant Findings**

Best Practices	DART	TRI-MET	LACMTA	VTA	METRO-NORTH	SOUND TRANSIT
1. Use of Project Management Plans	√	√	√	√	√	**
2. Establishing Early Stakeholder Consensus	√	√		√	√	**
3. Budget Flexibility Through Adequate Contingencies	√		√	√	√	**
4. Executive Management Involvement	√	√	√	√	√	*
5. Immediate Response to Significant Issues			√	√	√	**
6. Disciplined Risk Management Practices	√	√	√	√		**
7. Structured Reviews of Project Development	√	√	√	√	√	*
8. Formal Lessons Learned Program	√	√	√	√	√	***
9. Maintenance of Cost Data for Local Transit Projects	√		√	√	√	**
10. Maintenance of Project Master Schedules	√	√	√	√	√	*
11. Development of "Project Managers"		√		√		***

NOTES:

- \* Universally demonstrated on audited projects
- \*\* Evident on some, but not all, audited projects
- \*\*\* Not evident on any audited projects

## SURVEY RESULTS

The following paragraphs identify and discuss the eleven most significant *best practices* shared by participating agencies:

**1) Development and use of Project Management Plans (PMPs):** Universally, survey participants indicated that complete and detailed PMPs are crucial to successful project execution. The agencies described the PMP as an essential document that helps ensure a coordinated effort. The key elements of the PMP include:

- Project roles and responsibilities
- Organizational structure
- Communication protocols
- Procedures to guide the design, procurement, quality assurance, construction, etc.

Participants also noted that the PMPs should be regularly updated to reflect the dynamic nature of the project.

As discussed in Section IV, PMPs are used on some but not all of the audited projects.

**2) Use of advisory boards to gain stakeholder consensus early in the project life-cycle:** Advisory boards are used by most of the agencies as a fundamental tool in managing expectations of external stakeholders and establishing credible project budgets. The boards are comprised of various combinations of executive staff, board members, elected officials, project managers, technical experts, community members, local officials, etc. The mission of these boards is to define and clarify what is within the scope of the project and balance the scope definition against the schedule and budget realities at the onset of the project. The experience of the participants indicates that establishing early consensus helps to limit scope creep on projects.

**3) Provision of adequate allowances and contingencies:** In order to establish realistic project baselines most agencies emphasized the need to use well-thought out design allowances and project contingencies. The nature of a specific project and its level of design development will contribute to determining the appropriate level of allowances. Engineering and construction experience determine the appropriate level of contingencies to address both known and unknown risks. A consistent theme shared by survey participants with regard to allowances and contingencies was that there are no set values. Many agency policies set general ranges for contingencies that could be adjusted based on project specific risks.

**4) Regular involvement of executive management:** Active involvement of executive management throughout the design and construction phases was

universally expressed as a key to maintaining project momentum. Executives “in the loop” are more efficient and effective in smoothing the progress of resolutions.

As described in Section IV, Sound Transit executives are involved throughout project development and are following this best practice.

**5) Immediate response to significant project issues:** Most participants indicated that timely definitive action(s) to resolve significant issues saves time and dollars. These agencies indicate that establishing high standards of performance for themselves and their project partners – while maintaining those standards through fair administration of contracts and agreements – dictates that time, effort and resources are focused on project development rather than on disputes. As a means of maintaining high performance standards from construction contractors, one agency routinely procures services through two-step procurements that include a pre-qualifications process that incorporates a contractor’s dispute resolution history as selection criterion.

**6) Disciplined risk management practices:** Risk management is well understood as an essential element for success. Four of the five participants shared that formal risk management practices have contributed to better management of project risks and associated contingencies. These practices include:

- Comprehensive risk assessments to identify risks and assess their potential impacts to schedule and/or costs
- Formal documentation of identified risks
- Risk response strategies that assign responsibility for the management of specific risks
- Regular monitoring of risks supported by logs or registers which record the current status of risks and associated contingencies.

**7) Structured reviews to control baselines:** All agencies surveyed indicated that structured reviews of project designs are carried out at specified intervals. These intervals are typically at the 30%, 60%, 90% and 100% stages of design. The reviews should be coincident with achieving specific design criteria, e.g. vertical and horizontal guideway alignment fixed, etc.

Each agency requires designers to submit evidence of design accuracy and integration through various quality management processes. Design submittals are widely disseminated for review and comment. Comments are meticulously tracked and evidence of reconciliation is required. This key effort ensures that stakeholders are aware of design developments and that their input is considered as designs advance to completion. Each agency also requires that design submittals be accompanied by detailed cost estimates that are commensurate with the level of design. However, the timing requirements for cost estimates differed among participating agencies. Design allowances are reduced as design

progresses until there is no remaining design allowance at the 100% submittal. Three of the agencies regularly engage independent consultants to perform second-opinion cost estimates to ensure the accuracy of construction costs.

Our review of the five Sound Transit projects found that these types of structured reviews are very much a part of the Sound Transit project management system.

**8) Assembly and maintenance of lessons learned:** All of the agencies surveyed have established lessons learned programs that document experiences from on-going or completed projects. While the approaches to developing lessons differ in their level of formality, each program openly shares lessons and promotes a culture of continuous improvement.

One agency has placed its lessons learned program onto its agency-wide intranet. Another agency promotes review and documentation on an on-going basis rather than at the close of a project to ensure fresh perspectives are captured and there is timely dissemination of lessons learned.

**9) Maintenance of past and current construction costs database on local transit facilities:** Four of the five participating agencies maintain a cost database on past and current local capital project costs. While the emphasis is on construction costs, real estate and professional services data are also often tracked. The databases apply to all types of facilities, e.g. bus maintenance facilities, rail yard expansions, rail station expansions, etc. The data is used by project teams in all phases of project development including during early planning exercises, and later during construction to establish independent cost estimates of contract changes.

**10) Development and use of project master schedules to establish baselines, monitor progress and forecast performance:** Developing and maintaining an owner's perspective of the project schedule was a universal tool for effective schedule management. Each agency indicated that master schedules should be structured in concert with the work breakdown structure to provide a hierarchal perspective consistent with management focus, e.g. summary levels for executives to day-to-day levels for design task leaders or on-site field managers. While software preferences differed, all agencies use critical path methodologies, i.e. a schedule network analysis technique that is used to predict project duration by analyzing which sequence of activities has the least amount of flexibility, or "float". Agencies also emphasized that structured schedule maintenance specifications are necessary. Further, the agencies recognized that not all projects require rigid deliverables and that alternative specifications may often serve the interests of owners and contractors alike.

The five Sound Transit projects audited also used master schedules to monitor progress.

**11) Emphasize continual development of project management resources:** While all agencies indicated that their staff is reimbursed for continuing education, two agencies have formal in-house programs to develop project managers from within their ranks. These agencies cycle their project managers-in-the-making

through different phases of major projects, e.g. design, procurement, construction, start-up, and expose them to different disciplines within the project team, to include project controls, quality management, contracts, construction management. This on-the-job training develops an appreciation for the specific phases and disciplines essential to effective project management.

## **BEST PRACTICES AT WORK AT SOUND TRANSIT**

Reviewing these shared best practices against findings from the five projects audited indicates that Sound Transit is able to favorably compare its own practices in select areas to the project management best practices of these mature agencies. This suggests project management development processes are advancing toward best practice standards.

The auditors categorize Sound Transit's standing against the identified project management best practices into three areas of development: on-par with surveyed agencies; advancing toward best practices; and challenged.

Of the above project management best practices cited by the surveyed transit agencies, Sound Transit is on-par with the following:

- 4. Executive Management Involvement
- 7. Structured Reviews of Project Development
- 10. Maintenance of Project Master Schedules.

The audited projects clearly demonstrated efforts consistent with these survey best practices.

Those practices which Sound Transit was able to demonstrate some evidence of best practices include:

- 1. Use of Project Management Plans
- 2. Establishing Early Stakeholder Consensus
- 3. Budget Flexibility through Adequate Contingencies
- 5. Immediate Response to Significant Issues
- 6. Disciplined Risk Management
- 9. Maintenance of Cost Data for Local Transit Projects.

The audited projects demonstrated mixed-results against these best practices.

The balance of the cited best practices clearly challenge Sound Transit. These include:

- 8. Maintenance of a Formal Lessons Learned Program
- 11. Development of Project Managers.

In all cases, the audited projects did not demonstrate any of these best practice examples.

## **AUDIT CRITERIA**

The audit team established the audit criteria for assessing project performance by incorporating several resource streams:

- Reviewing the specific interests of the PAC as articulated by members through meeting discussions and as outlined in the PAC's solicitation documents for this audit
- Accessing resources for relevant trends in project management to include internet and literature. Notable sources of input were gathered from PMI and DOD
- Gathering feedback from the transit agency survey discussed above
- Reflecting on project management experiences from Gannett Fleming's corporate history and the audit team's personal journeys.

Fifty-two (52) criteria were identified for the performance audit and are organized around twelve project management practice areas presented below. Appendix 1 provides the audit criteria as established and applied to the project audits.

The criteria were developed to determine the effectiveness of each practice area against the following respective focal points:

- Project integration – Planning for success starts with defining how project participants (executives, managers, project staff, support staff, third parties, and other stakeholders) will coordinate their efforts toward meeting the objectives of the project. Project management plans are crucial as a means to document roles and responsibilities, and to identify appropriate references for procedural activities.
- Scope management – The establishment of a credible project baseline and its disciplined control thereafter is essential to success. The structure of the baseline should be universally applied to scope, schedule and costs through the adoption of an appropriately designed work breakdown structure. Measures in the control of the baseline are focused on checking against "creep".
- Schedule management – The close control of schedule is balanced with the regimented management of scope and cost. The use of critical path methodologies is essential for effective time-management.

- Cost management – Together with scope and schedule, cost management is a baseline management function. The appropriate provision of allowances and contingencies is crucial to establishing credible budgets. Regular trending and forecasting of costs-at-completion are essential.
- Quality management – Organizational independence is imperative to ensure meeting project scope objectives. Scheduled and impromptu monitoring of all project functions against stated objectives is necessary.
- Risk management – Awareness of potential project risks and their associated impacts to schedule and cost is the first step to effectively managing threats against the baseline. Disciplined documentation and monitoring of risks and integrating this effort to forecasting protocols provides more effective management of contingency.
- Contract management – Fair and responsive administration of the contract must be emphasized.
- Design management – Structured reviews of designs to ensure consistency to defined scope and integration of design elements are essential. Securing objective reviews from peers and industry sources provides valuable perspective.
- Construction management – A safe working environment is paramount. Coordination of third party efforts is essential to maintain schedule and cost objectives. Strict adherence to permitting provisions keeps projects moving.
- Communication – Regular and frequent communication with project stakeholders is central to maintaining partnerships.
- Human resources – Clear and unambiguous specification of the responsibility, authority and accountability of project managers is essential. The qualifications of matrixed project assignees is crucial to lasting and effective team building.
- Post-project reviews – The prompt documentation of project experiences at the close of each project phase fosters opportunities for continuous improvement.



## SECTION IV – SOUND TRANSIT PROJECT AUDITS

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An overall assessment of the project management systems on each audited project are put forward in this section. The most significant findings that support each assessment are discussed for the individual project. Findings are organized around the twelve categories of criteria outlined in Section III. To place these assessments in context, this section also introduces pertinent project background information on each project. This section is divided into the five separate subchapters, each specifically addressing the background, important observations and overall assessment relating to the project management efforts.

Detailed observations and findings by project are provided in Appendix 4.

### **CENTRAL LINK - BEACON HILL LINE SEGMENT**

#### ***Project Background***

The Beacon Hill Line Segment is the largest, most technically demanding of the five projects reviewed. While for the purposes of this audit the segment is considered as a stand alone project, in truth it is part of the larger Central Link Project. The Beacon Hill Line Segment is a key component of the Central Link Project.

This segment's current construction budget alone is approximately \$300 million. The construction contract was awarded through a two-step procurement process to Obayashi Corporation. The procurement process featured a rigorous qualifications element.

The Beacon Hill Line Segment's completion is critical to the overall Central Link Project schedule. The segment work includes construction of a one-mile twin tube tunnel and a deep mined underground station - both in challenging geologic conditions under Beacon Hill.

In addition to the tunnel, the segment scope includes the construction of an elevated guideway and the aerial Mount Baker Station at McClellan Street. This station will include a new plaza. The light rail alignment will then descend to grade in the median of Martin Luther King Jr. Way.

Over one hundred and fifty (150) property interests were required for this segment. The real estate working budget is more than \$22 million.

At the time of this review construction was approximately 24% complete and the contractor was performing jet grouting operations in the station area, digging the main shaft for the underground station, assembling the tunnel boring machine, and installing noise walls to surround the east portal.

While the ultimate responsibility for the Central Link Project rests with its project manager, the Beacon Hill Line Segment responsibility has been delegated to the construction manager and further delegated to the deputy construction manager. In effect, the deputy construction manager is functioning as the “project manager” of the segment during construction because he is responsible for delivering the segment within scope, schedule and budget. This audit was primarily focused on the processes that support the deputy construction manager’s authority and responsibility.

Table 5 provides a global budget perspective of the Beacon Hill Line Segment.

**Table 5 Beacon Hill Segment Line Segment Budget Profile**

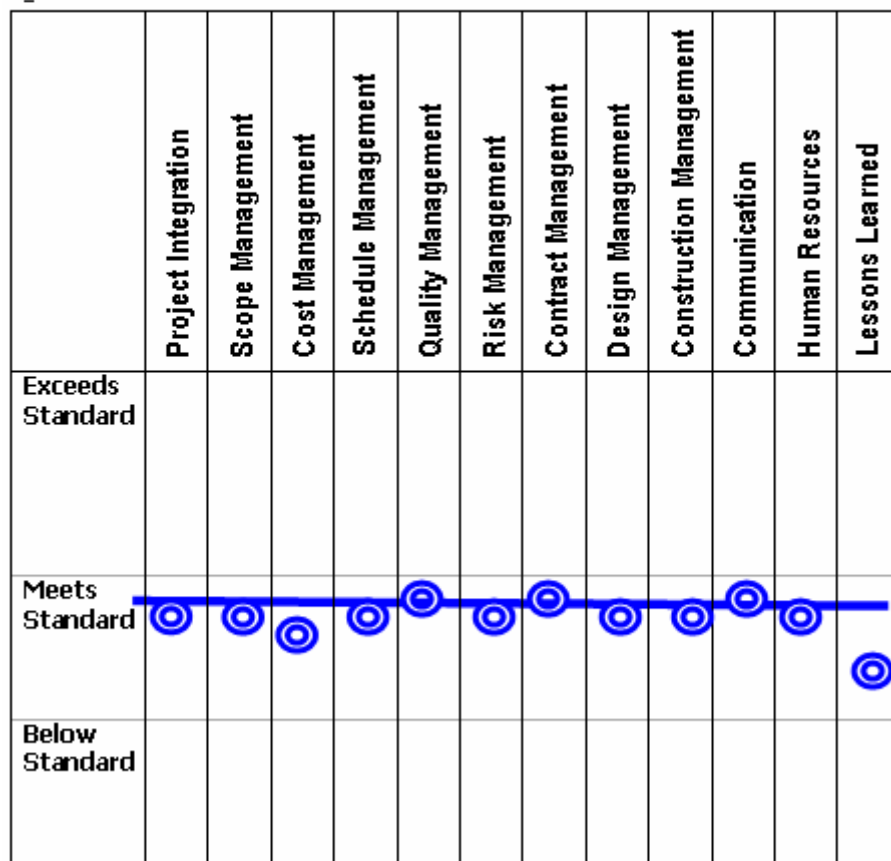
<b>C0710 – Beacon Hill Line Segment</b>	
Admin	*
PE/Environment	\$1,033,052
Final Design	\$26,785,242
Construction Mgmt.	\$15,600,000
Construction	\$300,499,309
Third Parties	\$2,921,175
Right-of-Way	\$22,054,728
<b>Total Working Budget</b>	<b>\$368,893,506</b>

\*Administrative costs are not captured at the segment level.

## Findings and Assessment

Overall, the audit found that the project management practices employed by the Beacon Hill team met the audit criteria as illustrated by Figure 1 below.<sup>2</sup> The auditors observed that the Beacon Hill management team is experienced and capable. The team demonstrated good working relationships and is effective at anticipating issues, formulating action plans and responding to issues. Many of the best practice tools were demonstrated on this project.

**Figure 1**  
**Beacon Hill Tunnel Project Management Assessment**



The discussion below highlights the key observations of some of the exceptional practices as well as the opportunities for improvement.

<sup>2</sup> IN ALL FIVE PROJECT AUDITS, THE CRITERIA FROM WHICH ASSESSMENTS WERE MADE WERE NOT EQUALLY WEIGHTED. THE AUDITORS APPLIED CONSISTENT RELATIVE WEIGHTING BASED ON PROFESSIONAL JUDGMENT.

## Project Integration

The Beacon Hill project team is strong. Team members demonstrated a solid understanding of their roles and responsibilities during the construction phase. The team is well integrated with demonstrated complementary skill sets.




An important indication of good project management practice is that the project is well planned and integrated. This planning process is typically demonstrated by an appropriately elaborated project management plan that is current. The Central Link Project has a Project Management Plan (PMP) that guides the project and its segments execution. Although the audit found that the PMP provides generally reasonable guidance that is consistent with industry standards, it has not kept pace with the project's evolution and requires immediate updating. The last revision was dated October 2003. The Beacon Hill team also makes use of many subordinate references for guidance that include the Link Construction Manual, Link Project Control Procedures, and the Link Quality Plan.

A potential cost management shortcoming was evident in terms linking the responsibility for directing specific ancillary work with the responsibility for controlling the associated budget. Given that the line segment is a component of the Link project, rather than a project in its own right, this split responsibility is understandable but not ideal.

As an example, the deputy construction manager coordinates with other Link managers for survey, material testing or design support during construction, but does not have responsibility for maintaining these significant segment-specific budgets or managing the contract of the firms providing services to the segment. This is in clear contrast to the way that the deputy construction manager is responsible and accountable for the main construction contract as well as the construction management services contract.

Responsibility for contingency management by the construction manager and/or the deputy construction manager was also unclear.

## **Project Integration**

	Project Integration	Project Management Plans	Roles & Responsibilities
Exceeds Standard			
Meets Standard			
Below Standard			






## Scope Managemnt

In terms of scope management tools and practices, Beacon Hill met the audit criteria.

Several significant construction contract changes are now in process that will result in a multi-million dollar change order. These changes demonstrate the understanding the Beacon Hill team has of the change control process in-place on the Central Link Project - which dictates the segment's actions. As of the project team interview date, the team had secured authority to negotiate the above changes from the Link Change Control Board. This timely authority will sustain the momentum to effect a contract change without impact to the segment schedule.

These contract changes also exemplify the active character of the Beacon Hill team with regard to monitoring trends, communication with the contractor, collaboration with the design resources and keeping executive management appraised.

### **Scope Management**

	Scope Management	Work Breakdown Structure	Configuration Management	Change Control	Document Control
Exceeds Standard					
Meets Standard					
Below Standard					

### Schedule Management

The team demonstrated effective use of a variety of schedule tools to manage the segment schedule; critical path methodologies were evident and were being used to control and measure progress.

The schedule activities within the segment were being coordinated effectively and schedule maintenance is up-to-date with progress achieved. Several ad-hoc reports were being used to graphically monitor progress of critical elements of the work which provided an excellent means of communication to the team as a whole.

Some concern over the standard schedule maintenance specification is warranted as resource loading requirements are not specified. If the specification were more rigorous, added perspective on construction crews would be provided to support productivity rates portrayed in the schedule.

The audit team believes that a review of scheduling resources dedicated to this key segment is in order by the Link Department as the current resource is over-extended with other department responsibilities. This segment is fortunate to have a construction contractor who has responsibly managed their own schedule with credible logic and durations represented in each of their schedule submittals. This partnership of schedule management has facilitated a strong awareness of current schedule status that is essential for effective schedule management that includes projecting future opportunities.

### **Schedule Management**

	Schedule Management	Critical Path Methodology	Specifications	Earned Value	Forecasting	Tool Box
Exceeds Standard						⊙
Meets Standard	⊙	⊙	⊙		⊙	
Below Standard				⊙		










## Cost Management

Although the project budget has increased significantly since it was baselined in 2003, the project team's approach to cost management was consistent with industry standard practices.

The project costs were appropriately controlled using a well thought-out work breakdown structure as the basis. Evidence of cost trending and forecasting was demonstrated. Construction contract cost forecasts were integrated and involved the appropriate input from the project control staff, the resident engineer and office engineer before review by the deputy construction manager. The team also made effective use of provisional sums, tool box options, and project contingency to address pressures on the budget.

The auditors noted that project risk assumptions were not formally documented in the cost and schedule forecasting process. Although the absence of formal documentation is not out of the ordinary for public agencies; it represents a deviation from industry regarded best practices.

## **Cost Management**

	Cost Management	Cost Estimating	Budgeting	Trending	Earned Value	Forecasting	Contingency Management	Tool Box
Exceeds Standard								
Meets Standard								
Below Standard								

Similarly, the Beacon Hill team does not employ a formal earned value practice to monitor and objectively quantify current project performance. Earned value is an integrated management control practice that provides a means to quantify:

1. What project activities have been planned, along with their programmed costs.
2. What progress had been achieved.
3. What that achievement has cost in actual dollars.

While the auditors recognize that formal earned value practices are rare in the transit industry, best practices reviews would indicate opportunities for improvement relative to earned value exist on the Beacon Hill Line Segment.







The Project Control Lead, similar to the scheduling resource, is overextended in workload. This individual is responsible for leading project control support for at least two of Central Link's major construction contracts valued in excess of \$450 million.

## Quality Management

A solid Quality Management program was evident on the project.

The roles of each tier of quality management were understood. Overall, the Beacon Hill Line Segment Quality Management Practices were found to be in keeping with standards.

### **Quality Management**

	<b>Quality Management</b>	<b>Quality Plan</b>	<b>Independence</b>	<b>Quality Control</b>	<b>Quality Assurance</b>	<b>Material Testing</b>
<b>Exceeds Standard</b>						
<b>Meets Standard</b>						
<b>Below Standard</b>						



## Risk Management

The team demonstrated an understanding of critical project risks. As is fitting for a project with considerable technical risks, a formal risk assessment was conducted to address the underground elements of the segment. The effort was comprehensive and reflective of broad participation by the project team, The Link Department, as well as appropriate specialty expertise. This demonstrates a best practice.

The project team has been and continues to be actively engaged in managing risks.

For example, during the design phase, Link invested \$3 million in a test shaft to better predict soil behavior and thus manage related risks. The findings from the test shaft resulted in important changes to the design and procurement strategy.

Today, current risks are being addressed through open dialogue with the construction contractor and other stakeholders to ensure understanding of specific issues and to develop practical options. This open communication is buttressed by a significantly staffed team of engineers dedicated to providing design support during construction. This staff is on-site around the clock.

However, the Beacon Hill team does not use formal risk tools such as a register of risks, or a risk matrix to keep track of the team's progress in managing risks. Using such tools is considered best practice because it instills discipline into the risk management process and allows team members to communicate assumptions about the likelihood and potential severity of risks as well as outlines plans to manage risks. Disciplined risk management further allows managers to more effectively manage contingency values.





### **Risk Management**

	Risk Management	Planning	Identify & Quantify	Response	Monitoring & Control
Exceeds Standard				⊙	
Meets Standard	⊙	⊙	⊙		
Below Standard					⊙

## Contract Management

Contractual arrangements for the design services were somewhat cumbersome and complex. The segment as it now appears is a combination of two distinct designs that were merged late in the design development phase. Although the audit team did not explore the merger in detail, it believes intuitively that the effort to combine the two designs into one cohesive contract package resulted in extra design development costs. Also, the design of the McClellan aerial and station was accomplished through the use of a variety of prime contractors who all reported to Sound Transit. This approach is difficult for contract administration, coordination among contractors and design integration. Additionally, it is the opinion of the auditors that this approach is not cost effective.

The auditors did not identify performance measures or the use of contract incentives. In addition, it was noted that the contracts staff are playing a smaller role in the construction contract administration process than is often typical on projects of this size and complexity.

Contract Management					
	Contract Management	Procurement Plan	Solicitations	Contract Administration	Close-out
Exceeds Standard					
Meets Standard					
Below Standard					

## Design Management

Design management appeared to be consistent with the audit criteria.

Sound Transit pursued objective technical oversight and advice at several critical junctures in the development of this project. A technical oversight panel of eminent professionals was assembled by Sound Transit on several occasions to review designs and the associated risks with the underground elements of the segment. This is a best practice.

Two other significant best practice observations were made. First, the tunnel and underground station design team was housed in a tight organization, i.e. co-located in the same location, to facilitate communication and coordination among various disciplines. Secondly, a significant contingent of engineers has been retained to provide design support during construction. These engineers are either on-site or committed to on-call service from around the world to promptly address inquiries. Although these practices may be costly, they are examples of best practice standards for large complex projects in that the invested cost will likely save construction dollars. The team effectively uses provisional sums, a tool box and project contingency to address known but not quantifiable pressures on the budget.

### **Design Management**







	Design Management	Standards & Directives	3 <sup>rd</sup> Party Interface	Disciplined Reviews	Customer Participation	Design Integration	Peer & Industry Review	Value Engineering
Exceeds Standard							⊙	
Meets Standard	⊙	⊙	⊙	⊙	⊙	⊙		⊙
Below Standard						⊙		

## Construction Management

The Central Link Project does have a construction manual which was revised in April 2005. The manual offers general guidance and references for day-to-day operations of the segment. It was also evident that an appropriately strong emphasis was placed on communicating and cooperating with other third party entities responsible for various aspects of the project. This was best demonstrated through the Project Management Manual (PMM) which was developed by the Link Department staff in concert with the City of Seattle to outline how the interfaces between the two entities will be governed. The PMM is a well developed umbrella guide. The Beacon Hill Segment enjoys the benefits of the PMM in its day-to-day operations.

Awareness for the required monitoring of data related to environmental permitting was easily expressed by the Beacon Hill team. Knowledge of the varied strict limitations was also conveyed with appropriately particular concern over those permits directly impacting production of the high overhead underground activities, e.g. discharge quality, noise variance.

### **Construction Management**

	Construction Management	CM Plan	Safety & Security	3rd Party Coordination	Contractor Responsiveness	Environmental Monitoring
Exceeds Standard						
Meets Standard						
Below Standard						

## Communication

Communication was effective on the project. Several standing meetings are scheduled each week to cover an array of subjects with participants invited as appropriate.

The close proximity of Sound Transit and Obayashi offices at the field site allowed for quick face-to-face interface as required. Additionally, City of Seattle resources were also regular visitors facilitating direct communication.







Additionally, the team used the partnering sessions as a means for effective communication; strong reliance and credence was placed on the partnering process to guide and gauge working relationship of stakeholders.

There was evidence that significant project concerns were elevated to the appropriate levels and that the appropriate levels of management were provided with vital information on project status. The team demonstrated responsiveness to contractor submittals and inquires by prioritizing inquires.

A minor concern was noted, in communications relating to the Central Link Project Schedule. The project schedule allows a more generous schedule for the tunnel contract while the contractor's actual work plan schedule is tighter. This was an appropriate strategy for managing project risk however, it made reporting interim contractor schedule status somewhat unclear.

Community Outreach was performed by Sound Transit and contractor staff. Many of the traditional tools are used to inform the community of project status and issues.

## **Communication**







	Communication	Planning	Project Status	Stakeholder Interface	Community Outreach	Tool Box
Exceeds Standard						
Meets Standard						
Below Standard						

## Human Resources

The staff on this team appeared qualified and had significant relevant experience. At the time of the review, it appeared that the project team had the resources it needs to manage the work load effectively. Many of the support functions such as project controls, real estate expertise, permitting assistance, are not selected by the project manager but matrixed from within Sound Transit. Nonetheless, the matrix appears to be working satisfactorily, thus far. As outlined above, the auditors noted that the scheduler and project control lead may be spread too thin.




Auditors did identify two opportunities for improvement. First, Sound Transit was not taking the opportunity to develop project managers through this challenging project. Although future underground Link projects are being planned, the auditors did not see evidence of Sound Transit staff being mentored. Second, although there was evidence that the deputy construction manager has had training in project management, there was no evidence that a structured program was in place to further train current staff in project management practices.

### **Human Resources**

	Human Resources	Organization	Staffing	Development	Staff Augmentation
Exceeds Standard					
Meets Standard					
Below Standard					

### Post-Project Reviews

A lessons-learned paper was published in the FTA depository specifically on the development and value of the test shaft to understand and manage risks. However, the team had not documented other important lessons that may prove useful in the future. There was a clear reluctance on the part of the team to document its experiences into lessons learned. This reluctance was aided by the fact that there is no Link Department requirement to formally gather and share lessons learned.

Lessons Learned			
	Lessons Learned	Phase close-out	Lessons-Learned Document
Exceeds Standard			
Meets Standard			
Below Standard			

## **CENTRAL LINK - RAINIER VALLEY/MARTIN LUTHER KING JR. WAY LINE SEGMENT (Rainier Valley/MLK Line Segment)**

### ***Project Background***

This segment is the second largest project reviewed. While for the purposes of this audit the segment is considered as a stand alone project, just like the Beacon Hill Line Segment, the Rainier Valley/MLK Line Segment is part of the larger Central Link Project.

The construction cost excluding betterments and third party work is budgeted at approximately \$133 million. While the project does not pose the same magnitude of technical challenges as the Beacon Hill Line Segment; it is fairly complex, particularly with regard to coordination. The Rainier Valley/MLK Line Segment is in a busy mixed-use district; and the work involves coordinating private and public utility contracts and managing traffic flow while minimizing community impacts.

Over four hundred fifty property interests were required to establish the right-of-way. The real estate budget associated with this segment is \$64 million. In the auditors' opinion, this segment is second among the projects audited in terms of complexity, difficulty and risk.

Table 6 provides a global budget perspective of the Rainier Valley/MLK Line Segment.

***Table 6 Rainier Valley/MLK Segment Budget Profile***

<b>C735 - Rainier Valley/MLK Segment</b>	
Admin	-----*
PE/Environment	\$871,929
Final Design	\$13,239,551
Construction Mgmt	\$9,421,202
Construction	\$133,250,000
Third Parties	\$10,392,535
Right-of-Way	\$64,004,651
<b>Total Working Budget</b>	<b>\$231,179,868</b>

\*Administrative costs are not captured at the segment level.

This project constructs an at-grade, light rail guideway in the median of a widened Martin Luther King Jr. Way (from South Walden Street to South Norfolk Street). The work encompasses relocating and replacing a significant number of utilities. The existing roadway will be reconstructed with new curbs, gutters, sidewalks, intersection signals, and pedestrian crossings. In addition, existing overhead utilities will be switched out to underground utilities through an agreement with the City of Seattle.

This work is taking place along an active six-mile corridor lined with commercial, residential and industrial buildings. The roadway is a major thoroughfare for an ethnically diverse community; more than eleven languages are spoken along the



corridor. Three stations are included along the segment at Edmunds, Othello and Henderson Streets.

In addition to the issues of third party coordination, permitting, construction conflicts with new developments, community and traffic impacts; the Rainier Valley/MLK Line Segment Team has had to respond to differing site conditions, soil contamination and numerous utility conflicts. RCI/Herzog, the joint venture construction contractor was selected through a best value procurement process.

### ***Findings and Assessment***

Measured against the audit criteria described in Section II, the project management systems being used on this segment generally meet audit standards. Exceptions were noted in four of twelve categories. Figure 2 below provides a summary view of the audit team's assessment results. A detailed discussion of observations and findings is included as Appendix 4.

**Figure 2**  
**Central Link –Rainier Valley/Martin Luther King**  
**Project Management Assessment**

	Project Integration	Scope Management	Cost Management	Schedule Management	Quality Management	Risk Management	Contract Management	Design Management	Construction Management	Communication	Human Resources	Lessons Learned
Exceeds Standard												
Meets Standard	○	○	○	○	○	○	○	○	○	○	○	○
Below Standard				○			○		○			○

## Project Integration

Overall we found that the project team's practices relating to project integration met the audit criteria.

Responsibilities, particularly during construction were understood by the team. The deputy construction manager leads an integrated team that includes matrixed support from Sound Transit resources to include project control, quality assurance, permitting and real estate as well as consultant support for construction management.




Three areas merit notice.

First, coordination of contractor and third party work is a significant challenge within this line segment's work. Although the Sound Transit cost for utilities is \$10 million, the extent of utilities work throughout the segment, including betterments, is over \$61 million and involves numerous public and private entities. Appropriate agreements have been developed to guide this coordination including most notably the same PMM described in the Beacon Hill Line Segment assessment, which provides similar benefits. Dedicated resources from Sound Transit, the City of Seattle, and other third parties are assigned to coordinate their respective work with areas sharing the same corridor. While unforeseen field conditions, e.g. contaminated soils, have challenged plans and production rates, the integration of the significant utilities effort into the line segment scope has been well coordinated.

Second, the roles and responsibilities as defined on this project presented the same cost and contingency management vulnerabilities as discussed earlier with regard to the Beacon Hill Line Segment. There was not a clear link between responsibilities for directing specific ancillary work and accountability for the associated budget. Again, given that the segment is part of the larger Central Link Project, rather than a project in its own right, this separation of responsibility was reasonable although not considered an ideal practice.

Third, also as described for the Beacon Hill Line Segment, the Link Project Management Plan that served as an important guide to project execution has not kept pace with the project's progression and requires immediate revision. The availability and use of the Link Project Control Procedures, Link Construction Manual and Link Quality Plan as appropriate was also noted.

### **Project Integration**

	Project Integration	Project Management Plans	Roles & Responsibilities
Exceeds Standard			
Meets Standard			
Below Standard			






## Scope Management

With regard to the scope management, the Rainier Valley/MLK Line Segment Team generally met the audit criteria. The project work activities are structured appropriately through the use of a well-conceived work breakdown structure. The project baseline were clearly defined in the Contract Unit Descriptions (CUD) and baseline documents were controlled appropriately.

The extent and location of soil contamination issues on the segment has hampered contractor production. The extent to which delays are directly attributable to soil contamination was a matter of dispute for which discussions have ensued for some time now. The nature of the issues prompted the Rainier Valley/MLK Segment Team to proceed with an extended soil boring effort to define probable boundaries to further areas of contamination. While this work was added scope, it should provide net benefits to the segment and help to limit further surprises in the field.

The construction contract scope had to be revised at a cost of approximately \$1.7 million to reflect late third party comments regarding pipe specifications to be applied to their infrastructure. Review of the change order documents indicate that the issues raised by the third party were known to the Rainier Valley/MLK Line Segment Team during the design phase - before completing the design and proceeding with procuring construction services. This deviation from good scope management practices is further discussed below under Design Management.

### **Scope Management**

	Scope Management	Work Breakdown Structure	Configuration Management	Change Control	Document Control
Exceeds Standard					
Meets Standard					
Below Standard					

An important standard for effectively managing scope is a clearly prescribed change process. The auditors found the project team was supported by an appropriate change control process. However, as noted below under contract management, the team had issued what appears as an inordinate number of work directives reflecting the inability to negotiate bi-lateral agreements for specific changes with the contractor.

## Schedule Management

Schedule management practices on the Rainier Valley/ MLK Line Segment fall short of best practice standards primarily because the management team had been operating without an approved contractor schedule since September 2004. While it is not entirely uncommon to have disagreements about an acceptable schedule, it is poor practice to allow this matter to remain unresolved for such an extended period.

The team had been working to ensure that the project is progressing despite these unresolved issues and credit for this effort is well-deserved. Further the team was continuing to work with the contractor to address the many aspects of the contractor's schedule that were unacceptable. The project team had also demonstrated good practices by developing and using ancillary schedule tools to monitor the progress of work in the absence of an agreed-to critical path schedule. Nonetheless, despite continuing this slow schedule development process of working with the contractor, the team did not demonstrate a plan to resolve the disagreement.

Reflections on the schedule specifications indicate that they could be refined to require more specific requirements concerning resource loading and Bases and Assumptions. More importantly, the enforcement of the specification was of concern to the auditors. See the discussion in Contract Management below.

### **Schedule Management**

	Schedule Management	Critical Path Methodology	Specifications	Earned Value	Forecasting	Tool Box
Exceeds Standard						
Meets Standard						
Below Standard						

At the time of the audit, the team reported that there was 53 days of negative float in the contractor's May 2005 schedule submission. While this situation was not of immediate concern to the Central Link Project Schedule, it signaled a continuing and unresolved dispute over the obligations of Sound Transit and the contractor with regard to the contractual completion date. The dispute centers on the contractor's right to complete early versus the specified contractual duration of 1,000 days which, in this case would indicate there is float in the schedule. In addition, the critical path for the contract appears to be changing frequently. Further, the contractor had reserved schedule rights on many bi-lateral changes meaning that schedule issues will remain unresolved until some future date.

## Cost Management

Cost management practices followed a similar pattern to what was observed on the Beacon Hill Line Segment. Overall, the practices that support cost management meet standards.

A variety of good practices were confirmed during the audit. The project follows the Link project control guidelines and uses the enterprise system to track and monitor costs. There is a disciplined and integrated cost forecast methodology. However, also like the Beacon Hill Line Segment, the team does not use earned value as a tool for monitoring and objectively quantifying current project performance.







**Cost Management**

	Cost Management	Cost Estimating	Budgeting	Trending	Earned Value	Forecasting	Contingency Management	Tool Box
Exceeds Standard								
Meets Standard								
Below Standard								

## Quality Management

Quality management practices met the standards with no significant exceptions. The clear understanding of the respective roles of project participants was easily and consistently conveyed by the project team.

There have been several Quality Assurance audits with no significant findings noted. In addition, regular surveillance visits have been conducted, again with no issues of note.

Quality Management						
	Quality Management	Quality Plan	Independence	Quality Control	Quality Assurance	Material Testing
Exceeds Standard						
Meets Standard						
Below Standard						

## Risk Management

Similar to practices on the Beacon Hill Line Segment, the Rainier Valley/MLK Line Segment Team demonstrated that risks were addressed daily. The identification of several continuing risks were quickly identified with correlations to how any combination of risks can impact the project's schedule and/or costs. These risks included coordination with third parties, maintenance of traffic flows and to a lesser degree, encountering additional contaminated soils.

The audit standards call for the use of formal risk tools such as the risk registers, and risk matrices that are commonly used in entities with superior risk management programs to keep track of progress in managing risks. These tools were not being used by the project teams. The informal manner that risks are addressed offers an opportunity for improved discipline.

### **Risk Management**

	<b>Risk Management</b>	<b>Planning</b>	<b>Identify &amp; Quantify</b>	<b>Response</b>	<b>Monitoring &amp; Control</b>
<b>Exceeds Standard</b>				⊙	
<b>Meets Standard</b>	⊙	⊙	⊙		⊙
<b>Below Standard</b>					

## Contract Management

Although the audit identified several good practices in the area of contract management, such as, the appropriate inclusion of elaborated special provisions and a best-value contracting strategy that acknowledged the need to contract with an experienced contractor; important gaps were identified between the audit criteria and the contract management practices demonstrated on the Rainier Valley/MLK Line Segment.

For example, apparently in order to meet the broader Central Link Project schedule, the segment construction contract was awarded prior to obtaining all stakeholder design comments. Given the realities of the situation as it relates to the Central Link Project as a whole, this may have been an appropriate decision, but it is not consistent with best practices. While this issue manifests itself as a \$1.7 million change order, its genesis is in scope and design management and their coordination with third parties.

More importantly, several audit observations indicate that the team has deviated from the best practices relating to enforcing the contract specifications and terms. For example, at the time of the review the construction contractor had been working for nine months without an owner-accepted schedule. Although this situation is not entirely uncommon in the industry, it is confirmation that the contract terms are not being effectively enforced. In addition, the project team has abandoned the contract terms of paying off the schedule and instead is paying the contractor based on a schedule of value. Paying from a schedule of values is a fairly common industry practice. It is a reasonable and practical response, however, in this instance, it does not conform to the contract terms. Contract terms should be revised to reflect the practices or Sound Transit should enforce the contract terms.

In addition, at the time of the review, Sound Transit had issued over 160 work directives for the contract. A work directive is in effect, a unilateral change where Sound Transit directs work to be performed on a time-and-material basis. Although work directives are a standard practice and allow work to progress despite disagreements, the volume is disquieting and often suggests that contractual relationships have deteriorated. The team is allowing unresolved contract disputes to linger longer than would be considered a best practice.

## **Contract Management**

	Contract Management	Procurement Plan	Solicitations	Contract Administration	Close-out
Exceeds Standard					
Meets Standard					
Below Standard					

## Design Management



The project met important audit criteria by following disciplined design reviews, performing constructability reviews at appropriate intervals and conducting peer review and formal value engineering. Given the coordination and technical issues on this project, the team demonstrated another good design practice by retaining design support through the construction.

In addition, during the design phase, the property acquisition process was managed and accomplished with resounding success. Working in coordination with design staff, the Sound Transit Real Estate Division secured timely access to over four hundred fifty parcels in support of the construction requirements. The timely relocation of scores of interests was also successfully accomplished. This effort was accomplished under strict federal guidelines and the scrutiny of varied interests throughout its course. Its success exemplifies strong planning, coordination and commitment of all involved.

Several opportunities to enhance design management are discussed below.

As in the Beacon Hill Tunnel Project assessment, Link used a variety of prime contractors to execute the design of this segment; there were six prime design contractors involved in this segment alone. This approach places the responsibility for coordinating the various design disciplines on the agency rather than a prime contractor and is costly to administer, and difficult to effectively manage.

One critical criterion is that appropriate standards and design directives are provided at the onset of design. In the case of wet utilities, there was uncertainty about how City of Seattle standards would apply as apparently there were differences in interpreting criteria between Seattle Public Utilities sub-entities. Sound Transit went forward with design even though the City of Seattle standards were not fully established. The contract was awarded prior to receipt of the City's final design comments. While this strategy may have been reasonable, it does not demonstrate a good practice.

### Design Management

	Design Management	Standards & Directives	3rd Party Interface	Disciplined Reviews	Customer Participation	Design Integration	Peer & Industry Review	Value Engineering
Exceeds Standard								
Meets Standard	○	○	○	○	○	○	○	○
Below Standard						○		

## Construction Management

While there were many good practices in place, other construction management practices need to be further developed. On the positive side, the audit found that there were well-defined references to guide day-to-day operations to include the Link Construction Manual, Link Project Control Procedures, Link Quality Plan, etc. The team also demonstrated several good practices relating to the management of third party work. For example, Sound Transit has assigned dedicated staff to regularly interface with the City of Seattle. In-turn, the City has also assigned staff specifically to support the segment under the PMM and specific construction services work agreements

There appears to be an effective process in place to monitor the environmental permitting process. A master permit register was established early and has been monitored regularly. Also, the team has responded effectively to concerns about unforeseen contaminated soils by performing additional soil explorations.

However, although the team has taken a number of steps to try to improve relationships with the contractor it has not effectively resolved issues that potentially could have an impact on cost and schedule.

Timely processing of pay estimates is an industry standard. The auditors noted that as of July 11, 2005, several pay estimates were in process. This is a serious concern in maintaining cooperative contractor relations. On the flip side, this project team measures its performance on turning around contractor requests for information and submittals. The team reports that response time is 7-10 days to obtain clarification, which is reasonable.

Construction Management						
	Construction Management	CM Plan	Safety & Security	3rd Party Coordination	Contractor Responsiveness	Environmental Monitoring
Exceeds Standard						
Meets Standard		⊙	⊙	⊙		⊙
Below Standard	⊙				⊙	

## Communication

The community outreach program for the Rainier Valley/MLK Line Segment demonstrates industry best practices. A total of five full-time individuals are dedicated to maintaining contact with the interests along the segment; three are Sound Transit employees while the construction contractor is providing two. Many forms of communication are regularly used to ensure the diverse community is aware of project developments.

The Rainier Valley/MLK Line Segment Team, along with the contractor have, instituted a Code of Construction Standards that was developed as a tool for communicating expectations regarding conduct in the community with construction crews working in the corridor.

Interestingly, the team related that establishing good relations with the community and other project partners is an important performance goal. However, the team was unaware of any form of measurement of their performance against this goal.

Project status reporting is generally first-rate. However, since the progress reports is focused on the larger Central Link and the overall master schedule, it does not always provide a clear view of the contract schedule status.

### **Communication**

	Communication	Planning	Project Status	Stakeholder Interface	Community Outreach	Tool Box
Exceeds Standard						
Meets Standard	○	○	○	○	○	○
Below Standard						






## Human Resources

As is the case for the Beacon Hill Line Segment, many of the support functions such as project controls, real estate, permitting assistance, etc., are not selected by the project manager but are matrixed from within Sound Transit. The matrix appears to be working satisfactorily, thus far.

The deputy construction manager appears to have the ability to secure the resources he needs to manage the project and has been able to make staff changes when necessary on the owner's team, and as necessary on the contractor. The CM consultant has also responded favorably to increasing work requirements; a number of additional CM positions have been filled with qualified staff as the specific needs have been identified.




However the auditors noted that given the schedule concerns on this project, the team does not have the scheduling expertise it needs to resolve the issues. Also due to the current contract management strategy of relying heavily on work directives, the audit team believes there may be a need to bring on more staff to carry out the unusually demanding number of administration and inspection activities that result from work directives.

## Human Resources

	Human Resources	Organization	Staffing	Development	Staff Augmentation
Exceeds Standard					
Meets Standard					
Below Standard					

## Post Project Reviews

### Lessons Learned

	Lessons Learned	Phase close-out	Lessons-Learned Document
Exceeds Standard			
Meets Standard			
Below Standard			

Although the Rainier Valley/MLK Line Segment Team was quick to articulate lessons learned and readily shares lessons informally with colleagues, it has not documented them.

Similar to the discussion with the Beacon Hill Line Segment Team, the Rainier Valley/MLK Line Segment Team was reluctant to document its lessons learned. The team conveyed a particular concern that such documentation would likely be used against Sound Transit in the event claims are brought forth by the contractor. In the opinion of the audit team, this concern is clearly, out weighed by the benefits to be accrued from a formal lessons learned.

## LYNNWOOD TRANSIT CENTER PROJECT

### *Project Background*

The Lynnwood Transit Center project included a major expansion and improvement of an existing park and ride facility in Snohomish County. The total project working budget is \$31.6 million. Table 7 below provides an overview of the working budget.

**Table 7 Lynnwood Transit Center Project Budget Profile**

<b>Lynnwood Transit Center Project</b>	<b>Working Budget</b>
Administration	\$ 1,842,790
Preliminary Engineering/Environmental	\$ 1,712,825
Final design	\$ 2,475,881
Construction Management	\$ 16,504
Construction	\$ 12,726,848
Third Parties	\$ 897,912
Right-of-Way	\$ 11,552,878
Contingency	\$ 396,334
<b>Total Project</b>	<b>\$ 31,621,972</b>

At the time of our audit, the project was substantially complete and forecast final cost is expected to be within the working budget. The project is the smallest in terms of costs and the least technically complex of the projects audited. Approximately 37% of the project budget or more than \$11 million was associated with acquisition of several real estate parcels. There were a number of active partners on this project including the City of Lynnwood, Community Transit and WSDOT. The schedule completion date was driven by the operations service change schedule.

The transit center scope was created by combining several projects envisioned in Sound Move.<sup>3</sup> The transit center expands parking in the existing lot by 400 stalls to a total of 1404 and has 20 bus bays. The center serves Community Transit and Sound Transit Regional Express service. The project constructed large passenger waiting areas, a ride share store, a customer service center, weather protection, safety improvements, lighting, public art, bike racks, lockers and arterial street improvements. In addition, the scope included the construction of coffee house and deli space. Improvements were also made to the storm-water drainage system to protect salmon habitat.

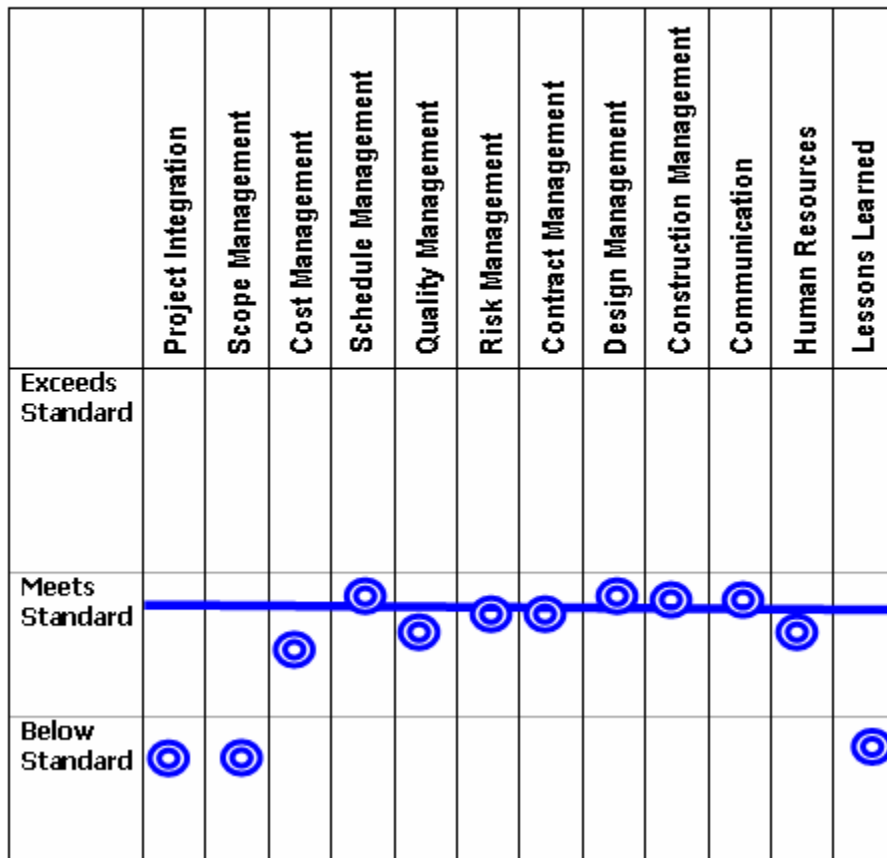
### *Findings and Assessment*

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<sup>3</sup> THE LYNNWOOD TRANSIT CENTER, AND THE LYNNWOOD PARK AND RIDE ENHANCEMENTS WERE COMBINED. FUNDS WERE ALSO TRANSFERRED FROM THE LYNNWOOD HOV ACCESS/46<sup>TH</sup> AVE W AND LYNNWOOD TRANSIT CENTER/PARK AND RIDE CONNECTOR. IN ADDITION, COMMUNITY TRANSIT PROVIDED AN ADDITIONAL \$500,000 FOR THE RIDE STORE SCOPE.

Overall, the audit found that the project management system supporting this project was evolving toward audit standards. Some of the important lessons learned in the development of this project are being applied to subsequent Capital Projects Department efforts. Figure 3 below provides an overview of the audit team's assessment of demonstrated project management practices.

**Figure 3**  
**Lynnwood Transit Center Project Management Assessment**



Below is a discussion of significant findings that represent deviations from the audit standards. A detailed discussion of observations and findings is included as Appendix 4.

## Project Integration

At the time that the Lynnwood Transit Center was being planned there was not a Project Management Plan (PMP) to guide the project delivery strategy. In 2003 a Regional Express PMP was developed that provided guidance for the later project activities. The audit team noted some inconsistencies in the guides that described team roles and responsibilities.

The project manager clearly was responsible for the entire breadth of the project during the design phase. However, the responsibilities for the project during construction appeared to be ostensibly turned over to the construction manager through delegations of authority. The project manager's responsibility for change management in construction was not clearly demonstrated. The construction manager appeared to take the responsibility for project progress including management of changes.

Additionally, based on a review of the versions of the Construction Manual in use at the time and the PMP, the project manager responsibilities were not clearly and consistently defined. The practice evident on this project was not consistent with Capital Project's stated current practice of having a single project manager responsible for a project.

### **Project Integration**

	Project Integration	Project Management Plans	Roles & Responsibilities
Exceeds Standard			
Meets Standard			
Below Standard	⊙	⊙	⊙

## Scope Management

### **Scope Management**

	Scope Management	Work Breakdown Structure	Configuration Management	Change Control	Document Control
Exceeds Standard					
Meets Standard		⊙	⊙	⊙	
Below Standard	⊙		⊙		

The project practices were consistent with best practices in terms of having a good work breakdown structure to define the division of activity, sound change order processes and document control. However, since the project baseline (configuration of scope, schedule and budget) was not established until after final design in 2003, the audit assessed overall scope management as needing improvement. Unless a baseline is clearly established it is difficult, if not impossible, to demonstrate control over the project scope, schedule and budget.

## Schedule Management

The Lynnwood Transit Center schedule management practices were also largely consistent with the audit criteria and demonstrated that the team used critical path methodologies and had appropriate schedule tools to manage the work.

Given that the project baseline was not established until late 2003, effective control of schedule performance is difficult as noted above.

The Lynnwood project management system did apply a limited earned value practice as a tool to measure and forecast progress. As discussed earlier, earned value is a best practice tool widely used in the private sector and public agencies with more advanced project management tools.

## Cost Management

Again, the auditors' fundamental concern with regard to cost management, is that the baseline cost was not established early in the project development. Without a clearly defined baseline it is extremely difficult to measure progress or to assess the effectiveness of the systems that support cost management.

### **Cost Management**

	Cost Management	Cost Estimating	Budgeting	Trending	Earned Value	Forecasting	Contingency Management	Tool Box
Exceeds Standard								
Meets Standard	○	○	○	○	○	○	○	○
Below Standard					○			

### **Schedule Management**

	Schedule Management	Critical Path Methodology	Specifications	Earned Value	Forecasting	Tool Box
Exceeds Standard			○			
Meets Standard	○	○	○	○	○	○
Below Standard				○		

Yet, we found that appropriate project control practices trending and cost forecasting were used on this project and the team demonstrated mastery of a comprehensive tool box of cost related tools to plan, integrate and monitor performance. Additionally, this is the only project audited that applied some form of formal earned-value measurements. Although the practice was not embraced by consultants and the project team as a whole, it was applied.

However, the auditors noted that the project did not have the benefit of a Capital Projects Department cost data base that provides an in-house resource to test cost estimate assumptions. Also a more formal and rigorous process for linking risks to contingency planning and budgeting would bring the project management system closer to a best practice standard.



## Quality Management

Overall the quality management process on this project was adequate given the project's scope and complexity.

Limited Sound Transit quality management resources were evident early in the project. In 2003, a quality assurance audit and separate quality oversight review were performed by consultants. The consultants were engaged by the agency because in-house resources were not available. The Quality Assurance audits led to revisions that were incorporated into an updated Quality Assurance Plan.

The design and construction contractors were responsible for quality control functions. During construction, the consultant Construction Management team was delegated the responsibility for Quality Assurance. There was evidence that quality non-conformance issues were appropriately documented and reconciled.

Quality Management						
	Quality Management	Quality Plan	Independence	Quality Control	Quality Assurance	Material Testing
Exceeds Standard						
Meets Standard						
Below Standard						






## Risk Management

The project team, to include the extended resources of the design and construction management consultants, demonstrated that risks were identified, quantified and well understood. Identified risks included: expectations of third parties, environmental permitting, insufficient budget, soils contamination and schedule flexibility.

The design consultants and construction manager both developed independent lists of risks for the project. These risks were also quantified to some extent lending perspective on potential impacts to schedule and costs. There was no evidence that these lists were subsequently monitored.

The project did not have a more formal project-specific risk plan to describe how risks would be managed. Although it is common for project teams to manage project risks effectively without the support of such formal tools, using best practices tools such as a risk register helps to document assumptions for the whole project team and provides a systematic method for reassessing appropriate budget contingency levels. In addition, the auditors noted that budget contingencies were not directly linked to risk assumptions.

### **Risk Management**

	Risk Management	Planning	Identify & Quantify	Response	Monitoring & Control
Exceeds Standard					
Meets Standard					
Below Standard					

## Contract Management

Contract management processes appeared fairly standard with documentation for changes and records of meetings in order. However, the project manager was not clear on his authority for changes, particularly as they related to construction.

Perhaps more importantly from a contracts perspective is the fact that the project close-out has not yet been completed although project construction was complete in early November 2004, and close-out was scheduled to be complete by January 2005. This lapse in time signals a need for greater discipline in addressing close-out functions.

## **Contract Management**

	Contract Management	Procurement Plan	Solicitations	Contract Administration	Close-out
Exceeds Standard					
Meets Standard	○		○	○	
Below Standard		○			○

## Design Management

At the time that Lynnwood was in design, Sound Transit did not have design criteria and standards to provide to its design consultant. However, for this project, Sound Transit used the City of Lynnwood standards as guides as appropriate. The team also took into consideration the transit operators preferences related to the bus bays, approaches and ancillary features. Sound Transit also invested in a full-scale mock-up of the bus facility to demonstrate design features to the partner operator agencies.

## **Design Management**

	Design Management	Standards & Directives	3rd Party Interface	Disciplined Reviews	Customer Participation	Design Integration	Peer & Industry Review	Value Engineering
Exceeds Standard								
Meets Standard	○	○	○	○	○	○	○	○
Below Standard							○	

Structured reviews of the designs at 60% and 90% were also held as was a Value Engineering study at 30%. There were no peer or industry reviews.

Another example of good design management practice is that the team engaged the consultant construction manager early enough to participate in the 90% review and development of the final contract specifications.

Design management practices generally met the audit standards.

## Construction Management

Construction management practices were in keeping with the audit criteria. The consultant construction management team developed their own project action plan that guided their day-to-day efforts. The team's safety and security program yielded excellent results with no lost-time incidents reported in construction.

Responses to contractor requests were quickly provided with an average turnaround of four-days indicated. Reviews indicated that contract administration was efficiently handled and well documented.

The CM consultant provided input to the finalization of contract documents based on the 90% drawing submittal, and the Sound Transit Construction Manager led a constructability review of the project.

## **Construction Management**

	Construction Management	CM Plan	Safety & Security	3 <sup>rd</sup> Party Coordination	Contractor Responsiveness	Environmental Monitoring
Exceeds Standard						
Meets Standard	○	○	○	○	○	○
Below Standard						

## Communication

Communication on this project met standards. The project used an executive advisory committee comprised of various project partners as well as status reports, project releases and public meetings to communicate project news and progress.

## **Communication**

	Communication	Planning	Project Status	Stakeholder Interface	Community Outreach	Tool Box
Exceeds Standard						
Meets Standard	○	○	○	○	○	○
Below Standard		○				

Third parties were included in formal reviews to ensure they were current with design developments. Weekly meetings chaired by the resident engineer were open to project stakeholders. The resident engineer was delegated authority to communicate with third parties. Although the team used a variety of appropriate communication tools; the team did not demonstrate that a communication plan had been developed to guide these efforts.

## Human Resources

Again the project manager was not consistently identified as the responsible party for all phases of the project. There was no staffing plan for the project and the project manager did not have a formal voice in the placement and removal of project management team members. However, the project manager noted that the project always had the resources it required. Sound Transit did make effective use of outside resources to augment the skills of the team.

## Human Resources

	Human Resources	Organization	Staffing	Development	Staff Augmentation
Exceeds Standard					
Meets Standard	⊙	⊙	⊙		⊙
Below Standard				⊙	

## Lessons Learned

The project team identified several important lessons that had been learned in executing this project and even pointed to several changes that were made to follow-on projects as a result. For instance, specific lessons on how to better manage cost risks associated with the potential for poor soils was reportedly immediately applied to the Federal Way Transit Center where it saved administration time and dollars. However, these lessons learned have not been documented and are not shared formally throughout the agency.

### Lessons Learned

	Lessons Learned	Phase close-out	Lessons-Learned Document
Exceeds Standard			
Meets Standard			
Below Standard	⊙	⊙	⊙

As described in the two above Link projects, the project team conveys a reluctance to document their lessons learned.

At the time that this project was completed, lessons learned policies had not been adopted by either Link or the Capital Projects department.

## FEDERAL WAY TRANSIT CENTER PROJECT

### *Project Background*

The Federal Way Transit Center 2005 baseline budget is \$39.5 million. Although from a technical point of view the project is fairly straight forward it has multiple project partners and is therefore somewhat complicated to manage.

The project was planned as part of Sound Move and the project budget adopted by the Sound Transit Board in 2001 combined two Sound Move projects totaling \$12 million and involved a series of additional budget transfers to create a 2001 baseline budget of \$30.6 million. Table 8 below is the current baseline budget.

**Table 8 Federal Way Transit Center Project Budget Profile**

<b>Federal Way Transit Center</b>	<b>Budget</b>
Administration	\$ 2,253,609
Preliminary Engineering/Environmental	\$ 1,695,383
Final design	\$ 1,811,801
Construction Management	\$ 2,024,740
Construction	\$ 22,398,423
Third Parties	\$ 2,066,963
Right-of-Way	\$ 6,846,785
Contingency	\$ 356,795
<b>Total Project</b>	<b>\$ 39,454,499</b>

The project is now configured as a transit center supported by parking. The 2001 combined scope included a new transit center with eight bus bays, passenger waiting area, plaza, drop-off area and a parking structure to accommodate 1,200 spaces. The first floor of the parking structure includes space for transit operations office, retail, a driver comfort station, and potentially public restrooms. Plans also included a pedestrian bridge linking the parking structure and bus platform. An area was set aside for transit oriented development. Closed Circuit Television Security was later added to the project scope consistent with current Sound Transit policy.

The transit center project objective is to create a new regional hub transit facility and to enhance the connections between the City of Federal Way and other metropolitan centers within the region. The project will construct a five-level parking structure on 23<sup>rd</sup> Avenue South at 317<sup>th</sup> Street in Federal Way. This project will link the Interstate 5 High Occupancy Vehicle lanes with the direct access HOV ramps under construction at 317<sup>th</sup> Street as part a companion project being managed by WSDOT. It will serve as a transfer facility for three Sound Transit routes. Pierce County Transit and King County Metro buses would also use the direct access ramps.

This project presented several management challenges. Foremost was the need to develop agreements with project partners that forged sound working relationships and solidified project scope. Sound Transit's multiple project partners include WSDOT, the cities of Federal Way and Kent, FTA, FHWA and King County.

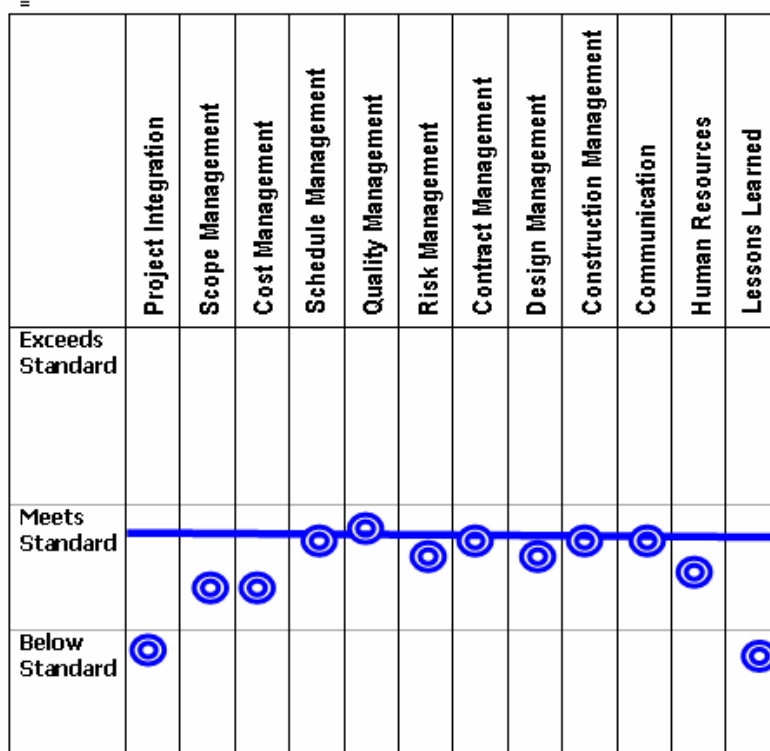
In addition to working effectively with project partners the team faced pressures on the budget and schedule due to real estate acquisition costs, storm water detention requirements and environmental clearance risks.

The center is scheduled to be open for operation in the first quarter of 2006. Like the Lynnwood project the schedule completion date is driven by the operator's service change schedule and has been coordinated with the opening of the companion HOV project discussed in the next section. The project team has forecast costs at completion within budget at \$39.5 million. Approximately 57% of the project costs are for construction related expenses. The next largest cost category is real estate at 17% of the budget. Design costs were approximately 9% of total costs at almost \$3.4 million.

### ***Findings and Assessment***

Overall, we found that the Federal Way Transit Center's project management team used standard practices generally consistent with audit standards. However, several significant observations are discussed below concerning areas identified as departures from the audit standards. Figure 4 below provides an assessment overview. A detailed discussion of observations and findings is included as Appendix 4.

**Figure 4**  
**Federal Way Transit Center Project Management Assessment**



## Project Integration

Like Lynnwood Transit Center, Federal Way was not guided by a project management plan. The consultant designer did have an internal plan to outline the designer's responsibilities but there is not a project plan identifying how the various elements of the project should be integrated. The Federal Way Transit Center project manager leads an integrated support team using staff matrixed from Sound Transit resources and outside consultants.

During construction, the day-to-day responsibility for managing the project largely shifts to the Sound Transit Construction Manager. The project manager's role is limited to monitoring activities. The Regional Express RE Manual and Capital Program Project Management Plan do not provide clarity on the precise role of the project manager during construction.

## **Project Integration**

	Project Integration	Project Management Plans	Roles & Responsibilities
Exceeds Standard			
Meets Standard			
Below Standard	⊙	⊙	⊙

## Scope Management

Since the project did not establish a baseline prior to entering final design, scope control was not a practical activity and it is difficult to assess how scope is being controlled. Therefore, the project as a whole did not meet scope management standards.

Notwithstanding the above overall assessment, many of the standard scope management practices and tools are being used to guide scope on this transit center project. These include a well-conceived work breakdown structure, and disciplined change control process that is understood by the management team.

## **Scope Management**

	Scope Management	Work Breakdown Structure	Configuration Management	Change Control	Document Control
Exceeds Standard					
Meets Standard		⊙	⊙	⊙	⊙
Below Standard	⊙		⊙		









## Schedule Management

The standard tools and methods for managing schedule were demonstrated by the project team. The only exception noted was that earned value was used for a limited time. Aside from that observation the schedule management appeared to be consistent with audit criteria.

To help ensure that the Transit Center and HOV facilities would be available to passengers simultaneously, the opening date of the transit center was linked to the companion HOV project. During construction the Sound Transit Construction Manager is responsible for administering the contract inclusive of the schedule but the project manager retains overall schedule responsibility. At the time of the review the team indicated that there was six weeks of float in the schedule as measured against the service change date.

Historical perspectives on scheduled completion projections of the Transit Center indicate considerable volatility. These changes are indicative of a floating baseline as discussed earlier. Once a baseline was established that included a coordinated completion with the companion HOV project, progress toward that date has been steady.

**Schedule Management**

	Schedule Management	Critical Path Methodology	Specifications	Earned Value	Forecasting	Tool Box
Exceeds Standard						
Meets Standard						
Below Standard						

## Cost Management

Like scope and schedule management, it is difficult to measure how costs are controlled when project baselines are not set. Since the budget base line was set very late in the process the overall cost management system does not meet standards.

Working without baselines distorts cost management practices. Examples include the following observations: the project did not apply design allowances because the design had been completed prior to the establishment of a baseline; although cost estimates were developed for each design submittal, it is not clear how adjustments to “budget” were directed; and finally, the construction contingency was set on the project at a Capital Projects department standard of 10%. The auditors noted that this standard does not allow the project managers to reflect actual project-specific risk.

Again, notwithstanding the above challenges, there was evidence of consistent and appropriate cost trending and forecasting processes at work on the project.

Finally, earned value practices were employed on a limited basis on this transit center project.

**Cost Management**







	Cost Management	Cost Estimating	Budgeting	Trending	Earned Value	Forecasting	Contingency Management	Tool Box
Exceeds Standard								
Meets Standard								
Below Standard								

## Quality Management

Based on current practices, quality management meets the audit standards. Roles and responsibilities with regard to quality are well understood. The Capital Projects department also provides independent resources to perform quality assurance audits.

However, early on in the project, there was not a quality plan for the project or department and quality management resources were limited.

## Quality Management






	Quality Management	Quality Plan	Independence	Quality Control	Quality Assurance	Material Testing
Exceeds Standard						
Meets Standard						
Below Standard						

## Risk Management

Consistent with our findings on the other audited projects, this team had tools to identify, quantify and respond effectively to risk events. The major risks to project completion were the site selection, zoning issues, ability to obtain property rights within budget and schedule constraints, and last but not least, managing expectations of project partners.

However, there was not evidence of a formal risk management process that contained a plan outlining the “who, what, when and where” for implementing risk management strategies. The team also lacked the formal monitoring and control tools used by more developed capital project management systems.

## Risk Management

	Risk Management	Planning	Identify & Quantify	Response	Monitoring & Control
Exceeds Standard					
Meets Standard					
Below Standard					

## Contract Management

Contract management practices appeared to conform to standards. The consultant construction management team appeared responsive to contractor needs and submittals, and documentation of contract administration efforts were well maintained.

The project team collaborated in the development of special provisions to augment the solicitation package standards.

## Design Management

The practices that support design management on this project were strong. First, Sound Transit has superior practices in place that involve the customers in design development including the use of a full scale mock-up for the bus operators. Secondly, structured reviews were used throughout the design development phase. There were also peer reviews and a value engineering study.

However, the team seemed to have difficulty finalizing the scope of work in concert with project partners prior to beginning final design. In a sense, project planning was being performed concurrently with design. Best practices dictate that master agreements with partners should establish scope limitations and agreed-to financial responsibilities early on in the process. Basic project parameters should be established long before final design. If not, design can become an expensive and prolonged process. There was ample evidence of a fluctuating planning basis for design.

## Design Management

	Design Management	Standards & Directives	3rd Party Interface	Disciplined Reviews	Customer Participation	Design Integration	Peer & Industry Review	Value Engineering
Exceeds Standard								
Meets Standard	○	○	○	○	○	○	○	○
Below Standard			○					

Also challenging design management was the fact that there were no Sound Transit design standards to help direct designers.

Although there were only four real estate transactions for the project, at least one acquisition proved difficult, and it was a protracted affair. There was no formal real estate acquisition and relocation plan developed. Rather, collaboration between the project manager and the Real Estate Division served to establish needs and timeframes for the activities. The informal approach is not a best practice and future projects will benefit from a structured approach.

## Contract Management

	Contract Management	Procurement Plan	Solicitations	Contract Administration	Close-out
Exceeds Standard					
Meets Standard	○	○	○	○	○
Below Standard					

## Construction Management

Construction management processes were consistent with the audit standard. The consultant construction management team performed a constructability review based on the 90% design submittal and contributed to the development of final contract documents.

The CM consultant also developed their own project-specific Resident Engineering Plan which was tailored to fit within the context of Sound Transit standards and expectations.

The team boasts that a four-day turn around time has been maintained for contractor requests for information, which was an indication that the team was working to be responsive to the contractor.

Review of documentation indicates the contract was being effectively administered.

Oversight by the Sound Transit Construction Manager was regular and “hands-on.” His leadership was evident.

## **Construction Management**

	Construction Management	CM Plan	Safety & Security	3rd Party Coordination	Contractor Responsiveness	Environmental Monitoring
Exceeds Standard						
Meets Standard	●	●	●	●	●	●
Below Standard						

## **Communication**

	Communication	Planning	Project Status	Stakeholder Interface	Community Outreach	Tool Box
Exceeds Standard						
Meets Standard	●	●	●	●	●	●
Below Standard						

## Communication

This project team used many of the standard tools to facilitate communication with the community, contractor and project partners including project status report, fliers, mailings and the like.

Contact with stakeholders was maintained through coordinated efforts between the project management team and the contractor.

## Human Resources

In the category of human resources, there are opportunities for improvement. As noted earlier under project integration, the breadth of the project manager's responsibility and accountability is not clearly and consistently articulated.

The project manager did not have a staffing plan for the project and although no specific problem was indicated, the project manager does not have a voice in the placement and removal of project staff.

Additionally, while the project manager received some general project management training provided by Sound Transit, there is no formal project manager training or development program.

### **Human Resources**

	Human Resources	Organization	Staffing	Development	Staff Augmentation
Exceeds Standard					
Meets Standard	⊙	⊙	⊙		⊙
Below Standard				⊙	

### **Lessons Learned**

	Lessons Learned	Phase close-out	Lessons-Learned Document
Exceeds Standard			
Meets Standard			
Below Standard	⊙	⊙	⊙

## Post-Project Reviews

The project team identified several important lessons that had been learned in executing this project. Interestingly enough, they were related to the identified project risks including site selection protocols and general partnering with stakeholders. However, consistent with all other audited projects, no lessons learned were documented.

## FEDERAL WAY HOV PROJECT

### *Project Background*

Since the fifth project reviewed is within the Washington State right-of-way, WSDOT is required to perform the engineering and construction administration services for this HOV project under agreement with Sound Transit. The project provides a direct-access interchange for bus and car pool access between the HOV lanes on Interstate-5 at South 317<sup>th</sup> Street. It consists of a roundabout, direct access ramps and a structure crossing over the southbound Interstate-5. The project objective is to allow faster, more reliable connections between the downtown Federal Way, the Federal Way Transit Center, and other urban areas. Table 9 below provides a perspective on the current working budget.

**Table 9 Federal Way HOV Budget Profile**

<b>Federal Way HOV</b>	<b>Working Budget</b>
Administration	\$ 1,857,418
Preliminary Engineering/Environmental	\$ 2,385,210
Final design	\$ 2,002,270
Construction Management*	\$ -
Construction	\$ 23,546,479
Third Parties	\$ -
Right-of-Way	\$ 1,486,182
Contingency	\$ 1,339,972
<b>Total Project</b>	<b>\$ 32,617,531</b>

*\*Construction Management is included in Construction costs.*

Development of this project with regard to its final configuration was influenced by the same dynamics, i.e. Sound Move and numerous project combination exercises, as discussed in the Federal Way Transit Center Project.

Also, the schedule of this project has been coordinated with the companion transit center in as far as it supports the opening of the center. However, earlier operation of the HOV facilities is desirable.

## Findings and Assessment

Our audit of this project is limited to assessing Sound Transit's management of the process. We did not review WSDOT's project management system nor did we assess the current project status.

Overall we found Sound Transit's oversight of the WSDOT design and construction activities were in keeping with audit standards. In several instances, Sound Transit demonstrated exceptional practices. The discussion below provides findings that represent departures from best practices. Figure 5 below provides an overview of the audit team's assessment against the audit criteria. Appendix 4 contains the audit team's detailed observations.

**Figure 5**  
**Federal Way HOV Project Management Assessment**

	Project Integration	Scope Management	Cost Management	Schedule Management	Quality Management	Risk Management	Contract Management	Design Management	Construction Management	Communication	Human Resources	Lessons Learned
Exceeds Standard												
Meets Standard		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
Below Standard	⊙											⊙



## Project Integration

Based on the review criteria, project integration practices could be further developed. Given the inherent challenges in managing a project with multiple partners, great emphasis should be placed on clearly defining project roles and responsibilities.

Based on inter-agency agreements, Sound Transit retained responsibility for real estate acquisitions on this project while WSDOT was responsible for design, permitting, the development of acquisition plans and construction management. An enormous amount of coordination, integration and the establishment of mutually-agreed standards are required to allow this strategy to run smoothly.

Sound Transit did not develop a project management plan to guide the execution of this project. Instead it relied on several separate inter-agency agreements. These separate documents, although well-thought out, did not sufficiently replace the integrated guidance of a good project management plan.

WSDOT did develop a project management plan that serves as a management tool for WSDOT activities during the construction phase. The WSDOT plan does not address design management and does not provide sufficient insight into Sound Transit responsibilities for real estate acquisitions. Interestingly, the WSDOT project management plan does not identify a role for the Sound Transit project manager. However, it does define the roles of Sound Transit's Program Manager and Construction Manager. This seems to support the auditor's concern, highlighted earlier in discussions on the other two Capital Projects Department projects, that during the construction phase, there is a lack of clarity about the project manager's responsibilities.

## **Project Integration**

	Project Integration	Project Management Plans	Roles & Responsibilities
Exceeds Standard			
Meets Standard			
Below Standard	⊙	⊙	⊙

## **Scope Management**

	Scope Management	Work Breakdown Structure	Configuration Management	Change Control	Document Control
Exceeds Standard					
Meets Standard		⊙	⊙	⊙	⊙
Below Standard	⊙		⊙		

## Scope Management

Sound Transit demonstrated that several fine scope management tools are at work on this project. For example, there is an appropriately structured work breakdown structure and solid document control processes. In addition, the WSDOT change control processes were modified to include appropriate levels of Sound Transit review and approval. However, since the project scope was not clearly defined until the adoption of the 2004 Sound Transit Budget the project did not meet audit standards for scope management.

## Schedule Management

The project team demonstrated best practices by establishing an important schedule management principle in the construction services agreement with WSDOT. Typically, WSDOT administers construction contracts using a contract duration based on “work days”. This principle makes it difficult to determine when any project completion date might be achieved as any given day might be declared a non-working day due to weather, or an entire season may shut down construction operations without penalty to the contractor. Instead, WSDOT agreed to adopt the principle that all days are working days. In effect, this principle allows the management team to focus on a specific calendar day determined by the contract duration. Standard WSDOT schedule specifications were also bolstered by special provisions.

The overall project schedule was subject to many changes. During the seven-year project lifespan, the forecast completion dates included 2006, 2003, 2004 and the current forecast of 2005. The changes were made because of revised estimates of design duration, funding delays, longer than anticipated times for real estate and related environmental clearances. The current base line schedule was not established until mid-2003.

While the auditors assume that WSDOT maintained an appropriate schedule, there was not evidence that Sound Transit used a master schedule to oversee the design phase. The eight-month delay in bringing the project to bid is largely attributed to real estate and environmental appeals. The number of changes in the project schedule raises reservations about the original schedule assumptions and forecasting methodology in use.

**Schedule Management**

	Schedule Management	Critical Path Methodology	Specifications	Earned Value	Forecasting	Tool Box
Exceeds Standard						
Meets Standard	⊙	⊙	⊙		⊙	⊙
Below Standard			⊙			

## Cost Management

It is difficult to assess the cost management of this project because the base line cost was not established until the adoption of the 2004 Sound Transit budget. Sound Move originally identified a project budget of \$25 million. Through merging several projects and amended scopes, a \$32.4 million budget was established. The current working budget is \$32.6 million.

The team demonstrated that they used a variety of tools to monitor WSDOT costs. WSDOT provides monthly project updates but meets weekly with the Sound Transit Construction Manager to review status and issues.

However, project risks are not formally linked to the forecast final costs. The original contingency for the design effort was set at a standard 10%. WSDOT's standard contingency of 4% was allowed for the construction contract and Sound Transit reserved additional construction contingency in its budget. Neither contingency was based on an assessment of project risks.

### **Cost Management**

	Cost Management	Cost Estimating	Budgeting	Trending	Earned Value	Forecasting	Contingency Management	Tool Box
Exceeds Standard								
Meets Standard								
Below Standard								

## Quality Management

	Quality Management	Quality Plan	Independence	Quality Control	Quality Assurance	Material Testing
Exceeds Standard						
Meets Standard						
Below Standard						

### Quality Management

Quality management practices during construction met the audit criteria. Quality Control is the contractor's responsibility and WSDOT oversees the contractor's efforts and performs materials testing. Sound Transit exercises Quality Assurance oversight through department resources in the form of surveillance and audits. Sound Transit's efforts are performed on a rotating basis among all department projects.

During design, Sound Transit deferred to WSDOT with regard to quality management. WSDOT standard processes of performing both quality control and quality assurance were determined acceptable by Sound Transit. This approach does not provide independence required for sound quality management practices.

## Risk Management

The Federal Way HOV team identified and understood the project risks. The risks identified related to site selection in concert with the transit center, the inherent safety issues related to construction activities in the median of a busy interstate, and managing project partner relations.

While the team demonstrated a good understanding of risks and was able to demonstrate how they are responding to those risks, they do not use formal tools to document, monitor and manage those risks.

Risk Management					
	Risk Management	Planning	Identify & Quantify	Response	Monitoring & Control
Exceeds Standard					
Meets Standard	○		○	○	
Below Standard		○			○

## Contract Management

	Contract Management	Procurement Plan	Solicitations	Contract Administration	Close-out
Exceeds Standard					
Meets Standard	○	○		○	
Below Standard					

## Contract Management

As WSDOT effectively served as the consultant for both design and construction services, contracts management was reflected through administration of the Sound Transit / WSDOT agreements.

Through collaboration, both WSDOT and Sound Transit maintained open communication through regular meetings and agreed-to reporting protocols. In addition, as discussed in Scope Management above, WSDOT adapted their change control process to include appropriate Sound Transit reviews and approvals.

Contract solicitations were not applicable given WSDOT's exclusive role on interstate improvements.

## Design Management

Design management practices generally satisfied the audit criteria and some good practices were demonstrated. For example, Sound Transit received design submittals per WSDOT standard cycles providing a best practice structure to ensure designs were appropriately progressing. The Sound Transit Construction Manager provided review comments as appropriate and was thus tied-into the design.

The area that needs some improvement was in coordinating third party interfaces. Although interface with third parties was clearly WSDOT's responsibility during construction, during design this coordination was a little more problematic. The project encountered a small wetland in the I-5 median that complicated the permitting issues. WSDOT was responsible for design, permitting and preparing real estate acquisition plans. Sound Transit was responsible for property acquisition. Unfortunately the standard practices at the two agencies were quite different. Since there was not a clear understanding about what standards would be used some calculation errors were made.

### **Design Management**

	Design Management	Standards & Directives	3rd Party Interface	Disciplined Reviews	Customer Participation	Design Integration	Peer & Industry Review	Value Engineering
Exceeds Standard								
Meets Standard	●	●	●	●	●	●	●	●
Below Standard			●					

### **Construction Management**

	Construction Management	CM Plan	Safety & Security	3rd Party Coordination	Contractor Responsiveness	Environmental Monitoring
Exceeds Standard						
Meets Standard	●	●	●	●	●	●
Below Standard						

## Construction Management

In the area of construction management, the Sound Transit Federal Way HOV project team met all of the audit standards through its monitoring of WSDOT activities. WSDOT served as the construction manager on this project and was responsible for day-to-day management of the construction activities. The WSDOT efforts were guided by the construction project management plan and the WSDOT construction manual. No exceptions to the audit criteria were identified.

The Sound Transit Construction Manager maintained close ties to the project in an oversight capacity. This role was demonstrated to be appropriate and effective.

## Communication

The review observed that Sound Transit's management of the communications process meets standards. Sound Transit Project Control standards were applied to the WSDOT effort in terms of project status reporting. Sound Transit project status reports were regular, timely and appear to be accurate.

The project used a host of devices to communicate status to the community including the WSDOT project web page and short-range radio broadcasts for commuters traveling along I-5 in close proximity of the project site. There was however, no project-specific communication plan that provided a guide for how communication would be developed and maintained over the life of the project.

### **Communication**

	Communication	Planning	Project Status	Stakeholder Interface	Community Outreach	Tool Box
Exceeds Standard						
Meets Standard	●	●	●	●	●	●
Below Standard		●				

## Human Resources

From Sound Transit's project management perspective, the breadth of the project manager's responsibility and accountability is not clearly and consistently articulated or understood. As discussed in the Integration Management Section, the role of the project manager was not recognized by WSDOT during the construction phase.

Sound Transit had a limited management team on this project and no staffing issues were identified.

### **Lessons Learned**

	Lessons Learned	Phase close-out	Lessons-Learned Document
Exceeds Standard			
Meets Standard	●	●	●
Below Standard	●	●	●

### Post-Project Reviews

Despite several well articulated lessons learned by the Sound Transit project manager, there are no documented lessons learned on this project.

The project team expressed the same issues discussed in previous project interviews, specifically concerns of contractor's use of information developed in lessons learned as evidence against Sound Transit in claims situation, and workload priorities dictate that lessons learned are deferred.

## SECTION V – RECOMMENDATION TABLE

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This section provides a proposed action plan that includes findings and associated recommendations to enhance the capital project management systems for specific projects, departments and Sound Transit as a whole. Responses to the recommendations from Sound Transit are incorporated as received; no edits have been applied. The recommendations are prioritized into three groups based on the audit team's view of the urgency of needed action by Sound Transit. The auditor's categorization of priorities for recommended Sound Transit actions are as follows:

Priority 1 – Immediately pursue

Priority 2 – Reconcile within two months

Priority 3 – Reconcile within four months

Priority	Findings	Recommended Action	Sound Transit Response
1	1.) Project manager roles and responsibilities during the construction phase were somewhat ambiguous on the audited Capital Projects Department projects, and there was some uncertainty regarding who was responsible for managing ancillary contract budgets and contingencies during the construction phase on both of the audited Link segments.	Clearly define the <b>roles and responsibilities</b> of personnel who function as "project managers". Ensure that policy and procedural guides are consistent in outlining the responsibilities, authority and accountability of project managers.	Capital Projects will clearly and consistently define project manager and construction manager roles and responsibilities. Communication and education efforts will be defined and implemented to clearly communicate roles and responsibilities to all involved.  For each Link project (e.g., Initial Segment, North Link, Airport Link), budget and schedule responsibility and accountability resides fully with the Project Manager. The recently updated Link Program Management Plan (PMP) places a strong emphasis on resource assignments, and although individual design and construction support contracts are managed by a variety of personnel, all changes to contract budgets and contingencies require the approval of the Link Project Manager.
1	2.) The Capital Projects Department projects audited did not have clearly defined project baselines of scope, schedule and cost until quite late into final design, or during the construction phase. The lack of an established baseline inhibited demonstrated control of the baseline and credible performance measurements.	Establish, document and implement a <b>project baseline configuration process</b> that defines scope, schedule and cost at the conclusion of preliminary engineering. This process should be applicable to all projects.	The Agency has recently adopted a Phase-Gate process that defines a series of checkpoints in the lifecycle of a project. Gate 3 of the Phase Gate process is to establish a baseline scope, schedule and budget.  There are specific criteria that must be in place before a baseline is established. The baseline is established through gate 3 at the conclusion of 30% (preliminary engineering) designs.  The process provides for exceptions only if finalizing third party agreements, funding partnerships, permitting waivers, real property transactions, or the like protract and preclude the ability to effectively establish a baseline at the 30% design point of time. In order to keep projects progressing to meet finite timelines, exceptions to the requirement to baseline at 30% may be granted.

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Priority	Findings	Recommended Action	Sound Transit Response
1	3.) The Rainier Valley/MLK Line Segment was challenged by a number of significant issues relating to contractor performance. While these issues are known and efforts to remedy them were continuing, these issues have been present for many months.	Foster a <b>project management culture that responds to issues with prompt recovery actions</b> as early as possible. Support this culture by instituting management protocols that require assessment of significant contract or project issues and the subsequent development of specific actions tailored to the particulars of the issue(s). These actions should have timelines assigned and monitored for definitive resolution. Immediately apply these protocols to the Rainier Valley/ MLK Line Segment issues.	A number of actions are being taken to address contractor performance concerns. Both Sound Transit and our Contractor have made changes in the organization structure on the jobsite to improve the oversight of construction and the administration of this contract. Sound Transit has provided additional staff to the construction management team.  Sound Transit and the contractor have engaged a third party facilitator to assist in addressing disputes between the agency and the contractor. The initial meeting with the facilitator occurred September 12. Sound Transit's goal for complete resolution of backlogged issues and dispute resolution is January 15, 2006.
1	4.) Each audited project cited current schedule and working budget objectives as the universal performance measurement. Additionally, several of the projects expressed the goal of minimizing impacts to communities and similarly, maintaining positive relations between Sound Transit and project stakeholders. However, aside from the project completion date and costs-at-completion (which in four of five cases were in the future), no performance measures were found on the projects.	Establish and regularly assess <b>specific performance measures</b> over a broad spectrum of areas for all projects that reflect Sound Transit's defined goals and objectives. Subject areas may include: schedule, including interim milestones as appropriate; budget; safety; quality; stakeholder relations; diversity participation; responsiveness to consultants and contractors; etc. WSDOT, in their quarterly report on performance and accountability entitled <i>Measures, Markers and Mileposts</i> , opens each report with a phrase well-understood by project management practitioners: "What Gets Measured, Gets Managed."	Sound Transit has recently engaged the services of a consultant to assist management in each department to develop appropriate performance measurements. Performance measurements will be identified for each department based on the business needs.

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Priority	Findings	Recommended Action	Sound Transit Response
1	5.) While the two Link segments pointed toward an outdated Central Link Project Management Plan (PMP) that afforded appropriate general guidance, none of the other projects developed a PMP. There were some contract-specific plans or manuals prepared by consultants for the transit center and HOV projects. But, they were narrow in their breadth.	Require the <b>development and use of PMPs</b> on all projects. The minimum standard for the PMP breadth should follow Federal Transit Administration guidelines. Key subordinate guides and procedures, e.g. Quality Plan, Construction Manual, Project Control Procedures, etc., should be developed in support of the PMP.	Capital Projects has issued a department-wide Project Management Plan. Further, the newly implemented agency Phase-Gate process requires an individual Project Management Plan for each project.  Link revised its Program Management Plan in July of 2005. To better support the management organizations for each of the Link capital projects (e.g., Initial Segment, North Link, Airport Link), Link is transitioning from a single, overall Program Management Plan to individual Project Management Plans for each project. Project Management Plans for each of the active Link project will be released by the end of 2005.
1	6.) The Rainier Valley/ MLK Line Segment team has not accepted the contractor's schedule submittal since October 2004. Once the schedule development issues are resolved, the update effort to reconcile at least eight months of progress and numerous contract changes will require exceptional insight and contract savvy. Expertise to effectively address the schedule deficiency issues has not been available.	In concert with Recommendation #4 above, <b>secure an appropriately qualified resource</b> to assist in the reconciliation of the continuing Rainier Valley/MLK Line Segment schedule development and maintenance disputes.	Link has hired an additional schedule consultant to assist with the evaluation of the contractors schedule and day to day monitoring of progress.  Sound Transit has collaborated effectively with the contractor to develop a functional schedule that is a vast improvement over previous efforts.  Consistent with the auditor's recommendations, Sound Transit has also hired a forensic scheduler to assemble an "as built" schedule for use in evaluation inefficiencies and delays. Target completion of the "as built" schedule is Nov. 15, 2005.

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Priority	Findings	Recommended Action	Sound Transit Response
2	7.) While each project team was actively engaged in risk management activities, their efforts did not follow any disciplined practice to document, monitor and manage project risks. Further, risk assumptions were not integrated into schedule and costs forecasting processes.	Define and implement <b>formal risk management practices</b> on all projects that are tailored-to-fit the specific project. Document the nature of identified risks and their potential impact(s) through the use of traditional risk management tools, e.g. risk registers. Integrate project risk assessments into established schedule and cost forecasting procedures.	<p>Sound Transit concurs with the audit recommendation that the risk identification process become the basis of a formal risk monitoring and evaluation program. Sound Transit aims to implement a formal risk monitoring plan by the end of 2005.</p> <p>To that end, a review of tools to facilitate a centralized process, documentation and delegation of roles and responsibilities for maintaining current risk information, management review, and reports will be implemented. Currently, the use of formal risk assessment is an evolving process in the transit industry in collaboration with the Federal Transit Administration (FTA).</p> <p>Capital Projects will develop a list of projects where a risk register would be appropriate to the scale of the project and the nature of the risks.</p> <p>To date, Link's work in this area has been recognized as industry-leading by the FTA and our transit peers. Link's formal risk identification processes have supported a range of management decisions, including adoption of design changes, construction of the Beacon Hill tunnel test shaft, revisions to bid documents, incorporation of risk mitigation measures into contracts (i.e., steel escalation provisions), and major scope decisions (i.e., First Hill station elimination).</p>

Priority	Findings	Recommended Action	Sound Transit Response
2	8.) Each project team easily identified several significant experiences where a learning process for future reference was at work. It was evident that many of these lessons were shared informally among colleagues and some lessons were incorporated into updated plans or standards. However, none of the audited projects documented their lessons learned. Project teams were reluctant to identify lessons learned over concerns of how they may be received by reviewers within and external to Sound Transit. Further, there are no lessons learned procedures in either the Capital Projects or Link Departments.	Institute a <b>formal lessons learned program</b> on all projects that gathers, documents, and shares institutional experiences at the close of each phase of the project life cycle, e.g. planning, environmental clearance/PE, final design, construction, start-up. Designate the responsibility for maintaining the lessons learned program to a corporate entity, e.g. program control or quality management, to promote objectivity and facilitate timely gathering, analysis and dissemination of lessons. This program should cultivate the principle that both personal and institutional growth and improvement are often the products of challenging experiences where the outcome is not as designed or desired.	<p>A Lessons Learned process would be beneficial for all ST project managers. Through Agency Project Control we will develop a procedure and the appropriate tools to implement a standard process across the agency.</p> <p>Although this was not formally documented, Capital Projects has applied lessons learned from earlier projects as evidenced in the auditor's review of Lynnwood vs. Federal Way.</p> <p>For the Initial Segment Project, Link applied several lessons learned into the Contract Documents as it related to various types of construction (i.e. tunnels, at-grade and aerial) for this Project.</p>
2	9.) The scope of the Federal Way Transit Center was subject to review, negotiation and re-definition on several occasions. While the dynamics of this particular case were unusual, it was evident that no Sound Transit standards for design of a parking structure were introduced as the foundation in determining what amenities were both included and excluded. Consequently, planning issues were being reconciled while final design was underway leading to less than ideal efficiencies.	Develop Sound Transit <b>criteria and standards for the design of all transit facilities</b> . These criteria and standards should effectively communicate the basis for design and costing of basic Sound Transit-funded facilities. From the standards and criteria, adopt and document a clear project vision that defines the fundamental scope, schedule and cost of each project before engaging project partners. Maintain the posture that additions or improvements to the Sound Transit standards proposed by project partners are only acceptable when additional funding sources are secured.	<p>During the Federal Way Transit Center design phase there was a guideline in place, "The Design Guidelines and Standards for Sound Transit Regional Express Transit Facilities for Bus Operations" dated February 2000.</p> <p>The guidelines and standards expressed in this document are currently used by the Regional Express program and were used by both the Lynnwood Transit Center and Federal Way Transit Center projects.</p> <p>In 2005 Capital Projects has undertaken an effort to consolidate a Design Criteria Standards Manual to address the types of transit facilities (stations, shelters) designed and constructed by the Capital Projects programs, Sounder and Regional Express. These design standards are near completion and will be used by all project managers within Capital Projects and included by reference in all design contracts.</p>

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Priority	Findings	Recommended Action	Sound Transit Response
2	<p>10.) The Lynnwood Transit Center Project applied a limited earned value measurement system during the design phase. Earned value is a standard practice in the project management profession and provides an integrated means to measure three variables:</p> <ol style="list-style-type: none"> <li>1. <i>The Planned Value</i> to include the physical work scheduled and the estimated value of this work</li> <li>2. <i>Earned Value</i>, or the physical work actually accomplished</li> <li>3. <i>Actual Costs</i> incurred to accomplish the earned value</li> </ol> <p>This system was not embraced by the project team or design consultant and it was not pursued during construction. All other projects did not apply any form of earned value practice.</p>	<p>Use <b>formal earned value practices</b> more effectively as tools to measure, assess and understand what progress a contractor, professional services consultant or project is achieving. As earned value is an excellent basis to forecast future performance and trends, incorporate earned value output into schedule and cost forecasting processes.</p>	<p>Both the Federal Way Transit Center and the Lynnwood Transit Center projects required Earned Value reports from the design consultants. These were regularly reviewed and analyzed by the project manager and project control. During construction, the RE's verified placement (progress) as a condition of approval for the contractors' monthly pay applications (earned values). The RE's followed standard forecasting and trend review practices, and furnished monthly estimated final costs and times to completion based on the RE's' analyses of issues, trends, potential change orders, and change orders. Earned Value tools are employed as a standard practice in Capital Projects.</p> <p>However, Capital Projects does not require resource and cost loaded schedules as a standard practice for all projects. The Department's deliberate practice on construction contracts is to not require that schedules be resource/cost loaded for unit price bid items. Such a requirement controverts the appropriate use and benefit of the contractor's required CPM progress schedule to construction management.</p> <p>Link's current project management practices effectively measure and assess each individual contract package together with the Project as a whole. In the case of the Beacon Hill construction contract (the critical path of the Project), for instance, cost and schedule progress is being related using tools and methods that are very much in line with best EV practices.</p> <p>Since adoption of a full EV program requires the imposition of common contract schedule structures and specifications at the outset, Link does not anticipate transition to a formal EV practices during the construction of the Initial Segment but is considering such a transition in connection with the North Link and Airport Link projects.</p>

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Priority	Findings	Recommended Action	Sound Transit Response
2	11.) The audited Link line segments enjoyed the benefits of a Link Department cost estimating database. This database was being used as a resource to cross-check cost values for odd and/or significant field change cost estimates. The Capital Projects Department did not maintain a similar cost database. Four of the five surveyed transit agencies identified the maintenance of capital costs as a best practice.	Expand the Sound Transit <b>cost estimating data base</b> to include current and historical data for projects in the Capital Projects Department. Develop the database so that the effective use by planners, designers and construction management staff is facilitated.	Capital Projects believes this would be a value added effort if implemented and would recommend that Agency Project Control take the lead for capturing and maintaining an estimating database that is populated from information on Link and Capital Projects contracts.
2	12.) Management of both Link segment design efforts had elements of multiple prime contractors. The Rainier Valley/ MLK Segment for example had six prime contractors, many with multiple sub-consultants. This contracting arrangement provided for unwieldy coordination and integration efforts. The arrangement also yielded higher costs for management.	Simplify the agency's <b>design management process</b> by shifting the responsibility for coordinating the various subordinate design disciplines (electrical, mechanical, architectural, etc.) from Sound Transit to a prime consultant.	Link concurs with this finding and our staff has taken steps to simplify our design management process for both Airport and University Link Projects.  For both of these Projects, the Link Project Director has instructed staff to procure a single prime consultant for Final Design to be responsible for coordinating the various subordinate design disciplines.
2	13.) The Central Link PMP referenced by the two audited line segments was dated September 2002. The project and its processes have evolved beyond what was reflected in the outdated plan.	Immediately <b>update the Central Link Project Management Plan</b> ; coordinate content of subordinate references, procedures and guides accordingly to ensure consistency.	The Link Project Management Plan was in the process of being updated during the PAC audit. The updated PMP was released in July 2005 but was not available to the PAC auditors. See also response to recommendation number 16.
2	14.) There was over 160 work directives issued to-date on the Rainier Valley/ MLK Line Segment. A work directive requires the contractor to proceed with a specific assignment on a time-and-material basis. The high volume was disquieting to the auditors as work directives can carry management and administrative liabilities. Contractor invoices reflect the work directives in that substantiation of time-and-material invoicing was voluminous. At the time of the project team interview, there were three contractor invoices in process.	Consider the <b>assignment of additional field inspectors and office engineering staff</b> to the Rainier Valley/MLK Line Segment construction management team to overcome the added requirements for field verifications of time-and material work, and administrative burdens associated with the large number of active work directives.	See response to finding #4. Link has provided additional staff to the Resident Engineer team to assist in closing work directives.  It should be noted work has been completed on the majority of these work directives and that interim payment has been made based on time and material invoices from the contractor. However, the contractor has failed to submit final invoices. In an effort to close these out, the Resident Engineer has been directed to offer lump sum settlements. Target completion for this effort is Dec 15, 2005.

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Priority	Findings	Recommended Action	Sound Transit Response
2	15.) Review of construction contract change orders and change control logs on the Federal Way HOV Project suggest that many experienced changes were the result of design coordination issues or design calculation errors. WSDOT performed both quality control and quality assurance functions as part of their design services agreement on the project. In 2003, a consultant recommended that Sound Transit need not regularly perform Quality Assurance audits of WSDOT design or construction services. Sound Transit quality management resources were quite limited in the early stages of the project.	Revisit the decision to forego <b>quality assurance oversight of WSDOT</b> design and construction services. Apply similar quality assurance attention to WSDOT HOV projects as applied to all other projects.	Sound Transit reserves the right to review and audit WSDOT design and construction documents and exercises that option when we deem it necessary.  The recommendation from the QA Auditor indicated that WSDOT was following its own requirements and kept good documentation on file.
2	16.) Four of the five transit agencies surveyed reported that establishing credible project budgets requires the application of adequate allowances and contingencies. With regard to contingencies, they added that a correlation to identified risks was essential for effective management. Of the five audited projects, there was mixed evidence on the application of allowances and contingencies.	In establishing early project budgets, ensure <b>appropriate design allowance and contingency</b> are incorporated based on an assessment of project scope, design development attained and risks. When awarding subsequent contracts, correlate contingencies to assessed risks rather than uniform allocations.	Capital Projects currently includes design allowances in its estimates in the early design stages and applies standards associated with risk for project contingencies.  Link applies a hierarchy of cost contingencies in the development of capital budgets. At each level, contingency assignments reflect an assessment of the risk levels that are aimed to be addressed. For instance, Link recommends varied levels of contract contingency to the Sound Transit Board at the time of contract award, ranging from 5 percent for selected systems procurements to as much as 15 percent for several contracts involving high-risk underground utility relocations. To date, the overall cost forecast for the Initial Segment Project is 6% below budget with all the major construction and procurement packages awarded.

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Priority	Findings	Recommended Action	Sound Transit Response
3	17.) It was observed that the Lynnwood Transit Center Project engaged an Executive Advisory Committee, comprised of project partners. Additionally, transit survey participants VTA and Metro-North have been successful in reducing pressure for scope and budget creep by engaging partners in standing panels to define and control project scope.	On all projects, <b>establish formal standing panels of project partners and stakeholders</b> to gain consensus on and enforce scope, schedule and budget commitments for projects.	<p>Both the Lynnwood Transit Center and the Federal Way Transit Center projects engaged an Executive Advisory Committee. When a project is complex in scope; has multiple partners and a number of design issues to address, this is an ideal way to proceed and matches the practice within the Capital Project program.</p> <p>For some of the smaller projects with straight-forward scopes of work, short schedules and less risk associated with the work, the addition of an Executive Advisory Panel would overly complicate project delivery. Capital Projects reviews its project organization and the program manager determines during concept 1) if an advisory panel is considered advisable; 2) if yes, who should be represented on the panel.</p>



Priority	Findings	Recommended Action	Sound Transit Response
3	<p>18.) A significant contract change was processed on the Rainier Valley/MLK Line Segment to incorporate late design comments received by the City of Seattle. Among the comments was designation of specific standards related to wet utilities that resulted in the specification of pipe that was different than that premised by designers. On a similar note, code interpretations of fire sprinklers in the Federal Way Transit Center led to a significant cost for their inclusion into the structure which was not originally believed to be required.</p>	<p>Secure and document <b>understandings about applicable codes, criteria and standards</b> to be applied to work on infrastructure owned by third parties, and/or new facilities in specific jurisdictions. These interpretations should be obtained as early as practical to ensure appropriate designs and costs are incorporated into the project baseline configuration.</p>	<p>Currently Capital Projects tasks the design consultant with identification of permitting requirements which includes documentation of applicable codes, criteria and standards to be applied to each project.</p> <p>In the case cited for Federal Way, originally sprinklers were included, but upon review with the building officials at 60%, it was agreed that they were not a code requirement. Subsequently, at the 100% final design level, the City Fire Marshall insisted on sprinklers, thereby impacting the costs.</p> <p>Link concurs with this finding and our staff makes every effort early in design to secure and document criteria and standards from our local jurisdictional partners.</p> <p>During design, Link and City staff were challenged to address over 7000 review comments related to designs for utility relocation and roadway reconfiguration work in Contract C735 (Rainier Valley). This volume of comments far exceeded similar reviews from City staff for other corridors within Seattle for the Initial Segment Project.</p> <p>To maintain the overall Project schedule, Link management made a deliberate decision to proceed with the award of Contract C735 before all the outstanding comments were addressed with the City. Since the award of Contract C735 (Rainier Valley), Link has revised the design criteria and standard specifications to incorporate these revised city and third party requirements. Link and the City of Seattle have also developed a joint Project Management Manual and a Construction Service Agreement that detail policy and procedure with regard to changes during construction.</p>

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Priority	Findings	Recommended Action	Sound Transit Response
3	19.) Three of the five surveyed transit agencies indicated that they regularly engage consultants to provide second-opinion cost estimates. Second opinion cost estimates were not found to be a standard practice on the projects audited.	Establish a standard that would require obtaining <b>second-opinion cost estimates</b> on complex and/or high risk projects, or project elements, at key intervals.	<p>Capital Projects currently uses an on-call estimating firm to obtain independent cost reviews on projects with high risks or complex scopes. We believe this is a best practice and would want to continue using independent cost reviews, value engineering and other reviews as deemed necessary for specific projects.</p> <p>Link routinely augments its own cost estimating efforts through the solicitation of independent cost estimates during the design phase. This was done for the E-3 Busway and the Beacon Hill tunnel construction contracts. In both cases, the independent cost estimate informed Link's final engineer's estimate. Further, Link has adopted the practice of developing independent risk assessments as a means for evaluating and refining its cost estimates.</p> <p>In both cases, the independent cost estimate informed Link's final engineer's estimate. Further, Link has adopted the practice of developing independent risk assessments as a means for evaluating and refining its cost estimates.</p>
3	20.) LACMTA and Metro-North both expressed that their preferred project delivery strategy is design/build. In the LACMTA case, this is particularly true for smaller transit facility projects. The parking structure within the Federal Way Transit Center may have been a viable candidate for a design/build execution. There was no evidence of such consideration. Also, there were no contracts which featured cost incentives within the five audited projects. While the Contracts Division indicated readiness to explore and support alternative contracting strategies, the established protocol was to await such requests from the Line of Business.	Establish a process that would ensure that <b>alternative contracting strategies</b> , e.g. design/build, and/or cost-incentive based contracting, etc., are considered systematically.	Capital Projects considered a number of procurement strategies for the Lynnwood Transit Center and Federal Way Transit Center projects. Furthermore, the agency's newly implemented Phase-Gate process requires the development of a Procurement Plan as described in the audit.

## CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

SEPTEMBER 21, 2005

Priority	Findings	Recommended Action	Sound Transit Response
3	21.) Transit agency executives in the project management best practice survey were enthusiastic about sharing practical and valuable advice from their experiences.	Consider hosting a transit capital <b>project management roundtable</b> of experienced transit agency executives that would allow Sound Transit to learn first-hand about the practices that have been successfully implemented on other properties.	Hosting roundtable workshops are beneficial to the agency and it should be noted that Sound Transit actively participates in a variety of roundtable workshops hosted by FTA and other transit agencies. And we are hosting a roundtable in October with other transit agencies to talk about best practices and other project management issues.  Sound Transit is firm believer in peer review and our agency has benefited from a number of reviews to learn first-hand about the practices that have been successfully implemented on other properties.
3	22.) The Beacon Hill Line Segment scheduler was also responsible for maintaining the Central Link Project Schedule, and was a key contributor to the Airport and North Link project schedules. While the line segment schedule alone was over 3,000 activities and was a rather complex tool, an average of one-day a week was being dedicated to this complex project. Similarly spread thin was the Link project control lead who was assigned to the two audited line segments. There was over \$600 million of work between the two segments which this lead was responsible to monitor and forecast costs.	Review the <b>workloads</b> of the Beacon Hill Line Segment scheduler and the single Project Control Lead for both audited Link segments to insure against diluting these key resources.	Link is in the process of filling the vacant scheduling position within the Project Control Division, either through recruitment of a Sound Transit employee or through mobilization of a full time consultant staff resource by the end of October 2005. Assignments for the new scheduling resource will include providing schedule support for the Beacon Hill contract.
3	23.) The two Link line segments reported that their efforts to ascertain the number of crews associated with specific elements of work were frustrated by not having a clear provision in the standard schedule specification that required the contractor to provide such data.	Review the standard <b>schedule maintenance specification</b> to strengthen provisions that provide greater insight into portrayals of productivity to include resource loading and bases and assumptions.	We recognized that the current standard schedule specification for Link construction contracts is in need of clarification and refinement. Improvement opportunities have been developed in conjunction with Link's construction management teams. An updated schedule specification will be incorporated into terms of new construction contracts (e.g., Airport Link). Link does not, however, concur with the audit recommendation that schedule specifications should in all instances require contractors to resource-load their schedules. We will address this on a case-by-case basis.

CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

SEPTEMBER 21, 2005

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## SECTION VI – AGENCY RESPONSE

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The following reflects Sound Transit's response to the audit:

"Sound Transit is constantly looking for opportunities to improve as we work to deliver quality projects and service to the region. The Sound Transit Board formed the Performance Audit Committee to improve our project delivery on behalf of the citizens of the Puget Sound region. We welcome the Capital Projects Management Systems Performance Audit Report as an opportunity to continue building on our successful track record. In this section we will add our perspective to our overall management of Capital Projects and adherence to FTA requirements and Sound Transit procedures. We have included our individual responses to the specific Findings and Recommendations in the Recommendations Table.

This audit examined five representative projects in 12 areas with 54 subcategories against criteria selected by the auditor. These criteria are not embodied in FTA requirements or Sound Transit's own established performance measurement standards but we accept these criteria as valuable information to aid Sound Transit in our efforts to improve our capital project delivery systems.

Sound Transit's large, more complex projects are subject to FTA requirements and guidelines which recognize the unique circumstances of each transit agency. Due to the many variables that exist the FTA does not have a prescriptive best management practices manual or handbook. Instead, the FTA requires each agency to develop its own specific set of program management plans and associated procedures to manage these capital construction programs. Sound Transit's program management tools have been accepted by the FTA.

Sound Transit is committed to the performance measurement and benchmarking principles called for in the audit. We have an initiative underway to establish performance measurement objectives in accordance with our mission and goals. In addition, we have independently contacted other agencies to get their advice and assistance on establishing formal performance measures. Several of these agencies are referred to in this report.

Sound Transit embraces the 11 Best Practices identified by the auditor. Overall, Sound Transit compared well with the practices of five of the best and most successful experienced transit agencies given our relative age and the complexities of simultaneously implementing substantial capital construction programs in three modes of transportation.

We believe this reflects the success of our recruiting, employment, and management practices. We are pleased that the audit fulfilled its purpose of identifying significant opportunities to continue building our track record.

Out of the 11 areas examined, the audit identified two in particular where Sound Transit will benefit from adopting recommendations: Maintenance of a Formal Lessons Learned Program and Development of Project Managers.

- Although we have been collecting lessons learned, we have not yet structured this as an agency-wide activity. Based on this audit report and the recent FTA emphasis on Lessons Learned, we are currently developing formal procedures to ensure that as we embark on our next phase of projects; we capture and convey these lessons learned to those project managers through a formalized process which should be in-place by the end of the year. These efforts will build on our strong foundation that is acknowledged in the audit.
- In regards to development programs for project managers, we will contact the agencies credited with Development of Project Managers as a best practice to learn how we might apply similar programs at Sound Transit. As the audit acknowledged, Sound Transit's project managers are qualified individuals who clearly demonstrate a dedication to successfully delivering capital projects. Sound Transit has earned a reputation for making rapid strides in project management and has undertaken numerous efforts to provide staff with project management training, including sponsorship of an agency-wide training course under the auspices of the University of Washington. This foundation will help as we implement greater formalization in this area. We will contact both agencies that were noted for their development of project managers in order to find out what they are doing and how it can be applied at Sound Transit.

Sound Transit was rated as "evolving" for the following six best management practices:

- Use of Project Management Plans
- Establishing Early Stakeholder Consensus
- Budget Flexibility through Adequate Contingencies
- Immediate Response to Significant Issues
- Maintenance of Cost Data for Local Transit Projects
- Risk Assessment Programs

There are some inconsistencies within the agency in regards to these practices. Some of the five audited projects have incorporated these best practices but they were not universally evident in each of the Departments or in all of the projects audited. Realizing that these are important indicators of performance, we plan to address them both at the Department and project manager level. We will review overall procedures for project implementation and make the necessary improvements to bring more project management consistency across the agency.

We feel it should be noted that Sound Transit projects vary in size from extremely complex \$300 million contracts down to \$5 million projects for new park-and-ride lots. A project's scope determines many of the procedures to be implemented by the project managers. Since we have three modes of transportation, we do not expect that each of the three modes will adopt exactly the same procedures because their program goals, requirements, stakeholders, and projects are substantially different. At this time, we will work to ensure that each mode addresses these areas in their procedures and that our project managers consistently apply the approved procedures for their area of responsibility.

Sound Transit appreciates the independent evaluation of our capital project management practices and we believe that this audit report has been fair and professional in its assessment of our program. “

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## APPENDICES

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## **APPENDIX 1**

### **AUDIT CRITERIA**

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#### **1. Project Integration**

**PMPs:** A comprehensive project management plan should be developed and maintained to guide project execution.

**Roles & Responsibilities:** Clearly delineated roles & responsibilities among team members and major project stakeholders should be documented.

#### **2. Scope Management**

**WBS:** A work breakdown structure should be developed and maintained; the WBS should be detailed to the work package level.

**Configuration Management:** The establishment of a configuration baseline of scope, schedule and cost should be developed as early as practical and thereafter maintained.

**Change Control:** Changes to scope, schedule or costs should be controlled through a clearly prescribed change process.

**Document Control:** All baseline documents should be rigorously controlled to ensure consistency among project stakeholders.

#### **3. Schedule Management**

**Critical Path Methodologies:** The use of critical path methodologies should be required of all project-level and contract-level schedules.

**Specifications:** Requirements for the development and maintenance of consultant and contractor schedules should be appropriately specified and enforced.

**Earned Value:** Contract specifications should be formulated to facilitate earned value measurements at the project and contract level of the WBS.

**Forecasting:** Schedule forecasting of major milestones and the critical path should be regularly performed based on performance to date, current status, and assessed path-forward plans.

**Tool Box:** A comprehensive tool box of schedule related perspectives should be employed to plan, integrate and monitor schedule performance.

#### **4. Cost Management**

## **APPENDIX 1**

### **AUDIT CRITERIA**

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**Cost Estimating:** The configuration baseline for project costs should be predicated on an elaborated cost estimate consistent with the evolution of design, and appropriate allowances; cost estimate refinements should be made concurrent with design development milestones submittals.

**Budgeting:** Project budgets should provide for contingencies commensurate with assessed risks.

**Trending:** The identification and documentation of cost variances should be an on-going exercise; projecting identified trends through the balance of the affected task(s) or project as a whole should involve review by all responsible parties.

**Earned Value:** Contract specifications should be formulated to facilitate earned value measurements at the project and contract level of the WBS.

**Forecasting:** Cost forecasting of project costs should be regularly developed and be predicated on detailed forecasting at the work package level of the WBS; earned value measurements should be considered in formulating cost forecasts.

**Contingency Management:** Assignment of contingency to any element of the WBS should be based on an assessment of risks; contingency draw-downs and adjustments should be meticulously documented.

**Tool Box:** A comprehensive tool box of cost related perspectives should be employed to plan, integrate and monitor cost performance.

#### **5. Quality Management**

**Quality Plan:** A project-specific Quality Plan (subordinate to the PMP) should be developed and maintained.

**Independence:** The Quality Management organization should enjoy independence from those responsible for production of project deliverables.

**Quality Control:** A comprehensive quality control process should be developed and engaged for all project elements.

**Quality Assurance:** Quality assurance plans should be designed to verify the effectiveness of quality control processes.

**Material Testing:** An independent materials testing laboratory should be engaged to determine the integrity of project materials on a scheduled and random sample basis, and to assist in specifically identified issues.

## APPENDIX 1

### AUDIT CRITERIA

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#### **6. Risk Management**

**Planning:** A project-specific Risk Plan (subordinate to the PMP) should be developed to outline how risks will be managed.

**Identification & Quantification:** Risk identification and quantification should involve individuals with specific experience and expertise in the nature of the risks inherent in the project scope, schedule and costs.

**Response:** A risk response strategy should be adopted for each identified risk; aside from determining an appropriate strategy, e.g. acceptance, mitigation, transfer or elimination, the strategy should identify a responsible individual for management of the risk.

**Monitoring & Control:** Regular review of project risks should be performed to ensure a current perspective of risks is maintained; a risk register should be developed and maintained to document the assessed nature of risks.

#### **7. Contract Management**

**Procurement Plan:** A procurement plan (subordinate to the PMP) should be developed and maintained.

**Solicitations:** Standard general terms and conditions should be used in preparing solicitations; special provisions should be used to specify exceptions to standard specifications and/or terms and conditions.

**Contract Administration:** Enforcement of contract specifications, terms and conditions should be the focus of successful contract administration.

**Close-out:** A prescribed contract close-out process should be developed and adhered-to to ensure all contractual obligations are addressed.

#### **8. Design Management**

**Standards & Directives:** The identification of appropriate standards and directives should be provided at the onset of the design effort.

**3<sup>rd</sup> Party Interface:** The early identification of the influence of 3<sup>rd</sup> Party infrastructure, real estate and related requirements, and the subsequent collaboration with those 3<sup>rd</sup> Parties to address and incorporate as appropriate those requirements into the design should be pursued as a priority.

**Disciplined Reviews:** Structured review of design deliverables should be established with clear criteria for each scheduled review; reviews should be

## **APPENDIX 1**

### **AUDIT CRITERIA**

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meticulously documented with each comment reconciled between the commenter and designer.

**Customer Interface:** Regular interface with the project customer, e.g. operations, maintenance, should be maintained to ensure the context of the design is consistent with customer plans and expectations.

**Design Integration:** Regular formal reviews of multi-disciplinary designs should be conducted to ensure coordinated designs.

**Peer/Industry Reviews:** Project designs should be afforded the benefit of formal peer and/or industry reviews.

**Value Engineering:** Formal Value Engineering studies should be performed in the early stages of design; such studies should be consistent with SAVE International processes.

#### **9. Construction Management**

**CM Plan:** A comprehensive Construction Management Plan (subordinate to the PMP) should be developed and maintained to define specific relationships, processes and references during construction.

**Safety & Security:** A well-defined standard for safety and security during construction should be established and enforced.

**3<sup>rd</sup> Party Coordination:** The CM Team should establish and maintain close working relationships with representatives from 3<sup>rd</sup> Party entities affected by construction; specific points-of-contact on both sides of those relationships should be made known.

**Contractor Responsiveness:** The CM Team should demonstrate a responsible approach to contractor submittals, inquiries and requests that is characterized by timeliness and decisiveness.

**Environmental Monitoring:** Monitoring of conditions related to environmental commitments and permitting criteria should be diligently documented.

#### **10. Communication**

**Planning:** A comprehensive communication plan (subordinate to the PMP) should be developed and maintained.

**Project Status:** Project status reporting should be regular, timely and accurate; information should be relevant to stakeholder interests; project status should be conveyed in easy-to-understand language and graphics.

## **APPENDIX 1**

### **AUDIT CRITERIA**

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**Stakeholder Interface:** Communication with project stakeholders should be maintained through every phase of the project.

**Community Outreach:** The CM Team should have experienced staff dedicated to mitigating the effects of the project, e.g. real estate acquisitions, construction, etc., on communities; regular outreach attempts, e.g. meetings, fairs, open house, etc., to businesses and residents should be made before, during and after the construction phase.

**Toolbox:** A variety of outreach devices, e.g. fliers, billboards, newspaper advertisements, radio spots, etc. should be employed to communicate with effected communities.

#### **11. Human Resources**

**Organization:** Project managers should be identified as the responsible party for all phases of the project; their authority and accountability should be commensurate with that responsibility.

**Staffing:** Project managers should have a comprehensive staffing plan for their projects; qualified individuals should be available for staff and management assignments; the project manager should have a voice in the placement and removal of project staff.

**Development:** Project managers should have training resources available for their project management development and related continuing education.

**Staff Augmentation:** Project managers should be able to obtain outside resources should specific staffing needs arise that cannot be met by internal recruitment

#### **12. Post-Project Reviews**

**Phase close-outs:** A review of lessons-learned should be conducted as soon as practical after the close of each project phase, e.g. planning, design, construction, start-up, completion.

**Lessons-Learned Documentation:** Lessons-learned insights should be incorporated into policies and procedures, standards and directives, and other related documents on an on-going basis; a continuing cataloguing of specific lessons learned should be maintained as reference for future projects.

**Appendix 2A**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

Response from DART, Dallas Texas

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*The following responses were derived from a conference call response from the following DART Capital Projects Management team members: Eduardo Ugarte, assistant vice president of facilities engineering, Brad Mason, project controls manager, John Gault, safety manager, Max Smith, construction engineering manager and Debra Hebisen, quality assurance manager.*

*The Overview of the Capital Projects Development within the Agency*

*Q1. The Design Phase*

*Description of DART. Forty-four miles planned, 22 miles in operation...currently proceeding in "Build-Out Two", which will provide 33 additional miles. Thirteen cities and two counties are involved.*

■ **What elements of this phase work best for you?**

"The system integration element of our design phase is working well. We take safety very seriously and our safety program reflects that commitment. Public participation is also an essential element of the design phase. The (15 member Board of Directors ...meets twice a month and is continually apprised of project progress. Public involvement at each phase of design and construction is further supported by our Marketing Department; which produces and distributes project updates to regional stakeholders."

■ **Describe the process utilized to develop and update pre-construction budget estimates.**

"Continuous project reviews: including, base-line cost and schedule. DART Design Control Board members, vice president and assistant vice-presidents participate in reviews and approve all significant program changes. Our design contingency budget starts to 20 percent."

■ **Describe the process utilized to "lock-in" scope, schedule and budget decisions.**

"The (well-refined) tools that we use at the engineering level are utilized to control scope, schedule and budget 'creep'. All changes must be documented and justified, with meaningful consequences and clear value. Issues that pass this process are presented to our Board for approval. We establish project baseline estimates. We utilize independent peer review to validated base estimates."

**Appendix 2A**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

Response from DART, Dallas Texas

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■ **Describe your project management philosophy.**

“DART is organized with project managers ...not a large staff but we have people who oversee consultants. We have consultants working in DART offices or within proximity to DART. We feel that this process works well. We place particular emphases on close coordination of DART and consultant work force. It has been our experience that this is very beneficial to the project and to relationships in general.”

■ **How do you manage scope, schedule and budget?**

“We utilize monthly reports, including constant monitoring of project expenditures vs budget. Once we have established a baseline we track progress and produce monthly baseline reports.”

■ **What management tools do you utilize to forecast measure and respond to (scope, schedule or budget) deviations from plan?**

See #5 above.

■ **Describe how you approach risk management.**

“The processes that we use are similar to typical FTA funded major capital projects; we develop a formal risk management program, conduct initial scoping workshops for schedule and budget and we develop a second workshop to identify and mitigate risk.”

■ **What types of programs do you utilize to promote staff development?**

“We provide tuition reimbursement and our human resources department is involved in a variety of staff development programs...we also promote attendance at professional seminars.”

■ **What performance measures are utilized to manage your capital development program?**

“None. One of the aspects that we look at is customer satisfaction. We take more of a global approach.”



**Appendix 2A**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

Response from DART, Dallas Texas

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- **Do you conduct project post-mortems to analyze what went right and right went wrong with completed projects?**

“Lessons learned are passed on to the general engineering contractor (GEC). Now we have a much better lessons learned program. We now have a web base formalized program..., which provides ease of access....we looking continuous improvements. Information can be passed on quickly. The program has been underway for six months.”

- **What do you consider the best practice aspects of your design program?**

“A lot of the strength is continuity...we have three different design firms but we see the same faces...tenured staff. We developed a set of design standards that are continually updated. Designers are familiar with these standards. We place priority of coordination with planning and design phases. Design submittals are reviewed early on for constructability.”

**Q2. *Describe Your Management of the Construction Phase***

- **Describe the organization structure and functional roles of your construction management team.**

“We use four construction managers: safety; utility coordinator (we consider this function a huge benefit); we have large projects. We utilize engineering managers assisted by consultants to manage program...we have office engineers, and inspectors that perform quality assurance. We have a consultant-managed field office. Contract specialist manages changes...and tracks percent completion. We monitor schedule on a monthly bases....where slippage is apparent we require the contractor to develop a recovery strategy. We are very schedule driven...‘we take no prisoners’. If we have a change, we typically do not allow the schedule to slip.”

“We have regular design meetings...it is easy to allow things to slip... we are religious about responding to RFIs...”

“We have a Resident Engineers Manual and project managers’ interaction with contractors that support a bi- weekly system of reporting...”

“Change control procedures....designs changes of \$25K or more require approval by a design committee and change control board. ‘We are blessed

**Appendix 2A**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

Response from DART, Dallas Texas

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to have a person to work with utilities because things don't happen quickly... you must anticipate utility coordination and work early to resolve planning and coordination.'...THU is the local electrical utility company...we had a master agreement with THU that did not cover all areas but provided a foundation. We improved the program by working early. We are blessed that we purchased a lot of right of way. Included within the purchasing rights were clauses that forces utilities to move utilities at their expense."

■ **What steps do you take to ensure that the risk associated with construction (scope, schedule and budget) are effectively managed?**

"Our Design Control Board sits on scope...Change Control Board also oversee results...most projects are managed to completion within the 10 percent construction budget contingency. Schedule analyst, construction managers, resident engineers and independent estimators review plans."

■ **What types of management reports or communications practices do you utilize to report on critical construction management and field activities?**

"Bi-weekly meetings using an Expedition-based report...just about everybody involved in CM has access to the Expedition program. Overall reports roll-up program statistics on time to respond to RFIs, etc"

■ **How do you manage safety?**

"DART has had a 15 million dollar workers comp and 7 million dollars in general liability claims. We have a program for commuter and light rail. Each contract that we put out includes a basic OSHA safety standard and we build upon that. We require that the contractors employ a dedicated safety manager. We use an owner controlled insurance program (OCIP). We take this seriously. We require that the claims be investigated and we act as claims quality assurance oversight. The insurance broker will provide a loss control specialist who will assist me. On the bigger workers comp claims we will hire an independent investigator. We now have the latitude to go to the right person in the organization. In phase two, we went from 15 to 20 million dollars of workers compensation claims..."

■ **How do you manage environmental compliance?**

"Most of our problems have to do with storm water. We turn our plan over to the contractor. It shifts liability to the contractor...he is required to have a qualified person to do biweekly inspection after significant rain. If the

**Appendix 2A**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

Response from DART, Dallas Texas

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situation changes in the field, he has to be a qualified person. We have a person to do quality assurance inspections. It has been a perennial sore point. Contractors look at it (quality assurance) as a necessary evil. City of Dallas has inspectors.”

■ **How do you manage general liability?**

“We use the same OCIP program, we are self insured up to the first three million dollars. From three to six million dollars we have additional coverage. Above that we use a combination of insurance sources”

**Appendix 2B**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Ken Kirse - Capital Projects Manager, Tri-Met, Portland, Oregon*

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*The Overview of the Capital Projects Development within the Agency*

*Q1. The Design Phase*

■ **What elements of this phase work best for you?**

“The design development process used throughout Preliminary Engineering works very well at TriMet. All jurisdictions that have a role in the project are represented through members on a Stakeholders Committee, Technical Advisory Committee, Citizens Advisory Committee or Project Managers Group. Representatives from ODOT, County, City, FHWA, Metro, and TriMet form these committees to establish the scope of the project. Weekly meetings are held through the Preliminary Engineering phase to provide direction needed to advance the design. Design options are evaluated based on benefit and cost and the timely decisions made by these committees keep the project focused and moving in the right direction.”

■ **Describe the process utilized to develop and update pre-construction budget estimates.**

“TriMet has a fulltime cost estimator whose job is to provide cost estimates for TriMet’s capital projects. TriMet has the benefit of having an ongoing program of constructing light rail extensions and bus facility improvements. Most of these projects have similar elements that allow us to develop a cost estimate database. Consultants are also used to provide cost estimates for the work that we do not have the expertise to price. Special structural work, unique geotechnical situations, tunneling and hazardous waste disposal are examples of cost estimates furnished by consultants”.

“Initial concept level budget estimates are based on a per route foot basis using pricing from similar projects. Adjustments are made for any unique pieces of a project not covered in the typical unit rates for previous similar work Updated estimates are produced at the 50% Preliminary Engineering (PE) and also at 100% PE. As the design develops, more detail is added to the estimates and the budget is refined. Cost estimates are typically updated during final design at the 60%, 95%, and 100% milestones.”

**Appendix 2B**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Ken Kirse - Capital Projects Manager, Tri-Met, Portland, Oregon*

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■ **Describe the process utilized to “lock-in” scope, schedule and budget decisions.**

“Prior to starting PE, the conceptual level estimates are used to develop a regional funding plan. Available regional funding plus anticipated FTA funding establishes the initial project budget. The major scope, schedule and budget decisions are then made in the PE phase. During PE, the scope becomes well enough defined so that the budget and schedule can be set. Assumptions for FTA approval to enter into final design and receipt of the full funding grant are key milestones in the schedule.”

■ **Describe your project management philosophy.**

“TriMet develops a Project Management Plan for major capital projects. This plan identifies the following goals that define the philosophy.

To implement a major transit system expansion that

- Supports established local land use goals,
- Optimizes the effectiveness of the transportation system,
- Honors and promotes environmental concerns,
- Reflects community values, and
- Maintains fiscal responsibility.

In addition, the project team is directed to achieve the goals of completing the project on time, within budget, and without litigated claims.”

■ **How do you manage scope, schedule and budget?**

“Once the budget has been established based on what the regional funding can support along with FTA funding, the scope and schedule must be managed to fit. Managing the scope and schedule to meet the budget is accomplished through the committee’s outlined in question one above. TriMet’s role is to furnish the best available scope, schedule and budget information to the decision-making groups. We then facilitate the decision-making meetings where scope is matched to budget. When scope increases due to budget pressures, adjustments need to be made.”

**Appendix 2B**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Ken Kirse - Capital Projects Manager, Tri-Met, Portland, Oregon*

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■ **What management tools do you utilize to forecast measure and respond to (scope, schedule or budget) deviations from plan?**

“A formal design review process with comment opportunity from all participating entities occurs at the 50% and 100% PE and 60%, 75%, and 95% design phase. Constructability reviews are held with construction contractors. Value engineering sessions are held with designers and contractors. Peer review meetings with participation from other transit agencies are used for specific areas of concern. The FTA Project Management Oversight (PMO) group provides oversight and review of plan changes as well.”

■ **Describe how you approach risk management.**

“TriMet sets the contingency based upon the anticipated risk for a particular element of work. Pieces of work with higher risk receive higher contingency. For example, underground work would have a higher contingency than roadwork. Each project is evaluated based on the anticipated risk and the contingency is determined based on that risk. The FTA risk assessment process is now used to measure the risk of a project in exceeding the budget. This is a thorough analysis of the project estimate along with the associated risks. This process compares TriMet’s assessment of risks to an independent panel of outside experts.

Risk is also controlled by the contracting methods. Design/build and Construction Management General Contractor (CM/GC) methods of contracting reduce risk by having real contractor pricing information along with a contractor who has ownership and buy-in of the design”

■ **What types of programs do you utilize to promote staff development?**

“TriMet supports many continuing education opportunities. Employees are encouraged to attend, and expenses are reimbursed for, professional seminars and short courses, professional organizations, and participation on committees. TriMet holds many continuing education classes in-house and contributes to work related college education expense. TriMet also has an in-house mentoring program where employees are encouraged to learn from their co-workers.”

“TriMet has a “Performance Management – Annual Evaluation”. Part of this evaluation is to develop a plan for professional growth. The employee states goals and objectives, meets with his supervisor and together identify specific development needs with a plan to address those needs.”

**Appendix 2B**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Ken Kirse - Capital Projects Manager, Tri-Met, Portland, Oregon*

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■ **What performance measures are utilized to manage your capital development program?**

“The answers to these questions provide a measure of performance:

- Was project delivered on time and on budget?
- Were there an excessive number of construction disputes?
- Was the contractor treated fairly and would he be willing to continue to do business with TriMet?
- “Were the design drawings clear and as a result few design related change orders?
- Are the end-users of the project satisfied with the result?
- Does the capital development meet the community goals and expectations?
- Does the capital improvement function as intended providing the desired result?”

■ **Do you conduct project post-mortems to analyze what went right and right went wrong with completed projects?**

“TriMet conducts “Lessons Learned” sessions on major capital improvement projects. Beneficial suggestions are documented and used as a resource for future projects.”

■ **What do you consider the best practice aspects of your design program?**

“Some best practice aspects of the design program include:

- Early coordination and ownership of all affected jurisdictions.
- Early coordination with the end-user of the facilities to be designed.
- A rigorous design review process that allows for comments at the design milestone dates and a process to resolve design issues.

**Appendix 2B**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Ken Kirse - Capital Projects Manager, Tri-Met, Portland, Oregon*

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- Establishment of an adequate budget for the project.
- Design the project to meet the budget.
- Early contractor involvement with the design through constructability reviews, value engineering and risk assessment.”

**Q2. DESCRIBE YOUR MANAGEMENT OF THE CONSTRUCTION PHASE**

- **Describe the organization structure and functional roles of your construction management team.**

“The organizational structure and roles of the construction management team are outlined in the TriMet Project Management Plan. The Interstate MAX Project included an update of this plan in 2002. Section B pages B-1 thru B-7 and Section K pages K-1 thru K-5 describe the organizational structure and the roles of the construction management team.”

- **What steps do you take to ensure that the risk associated with construction (scope, schedule and budget) are effectively managed?**

“Some of the steps are:

- Use a contracting method best suited to the project conditions. For certain projects, Design/build or CM/GC contracting can reduce risk.
- “Require contractors to submit a risk management plan.
- Require the contractor to provide a cost-loaded CPM baseline schedule and provide monthly updates.
- Require contractor to provide monthly reports identifying delays or impacts to the scheduled progress.
- Assemble a Change Control Board to review and approve cost for change orders.
- Resolve all disputes that may arise in accordance with the agreed-upon contract conditions.
- Provide adequate inspection and quality control oversight”.



**Appendix 2B**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Ken Kirse - Capital Projects Manager, Tri-Met, Portland, Oregon*

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■ **What types of management reports or communications practices do you utilize to report on critical construction management and field activities?**

“TriMet produces a monthly project report for large capital projects. This report is provided to all stakeholders including FTA and the PMO to track the progression of the project and point out highlights and major issues. The status of major contracts is shown with a description, schedule, contract amount, amount spent to date and change order information.”

“Construction contractors conduct and provide meeting minutes for weekly job meetings with TriMet. These meetings include issue resolution and schedule reviews. Monthly project wide construction safety meetings are held. Payment request meetings are held to verify amounts requested and scheduled progress.”

■ **How do you manage safety?**

“TriMet stresses that responsibility for safety rests with all project participants. Contractors are required to submit a Safety Plan for approval. Major projects will have a Safety Manager who will be responsible to develop, implement, and verify compliance of TriMet’s Safety Program. A safety incentive program has been used on past projects to provide monetary awards for high levels of safety performance.

TriMet has a System Safety Program Plan to document that the completed project incorporates the safety features needed for the safe operation of the facility. A check-off list of safety related items is developed that are required for the users of the new facilities.”

■ **How do you manage environmental compliance?**

“Agreements and permits with the many Federal, State, and local agencies are required. During final design, these agreements are put in place and all related construction work is detailed in the plans and specifications. Contractor compliance of these plans and permits is required through the construction contracts. The projects Resident Engineer and inspectors make regular field inspections to monitor contractor compliance. Many of the environmental agencies will conduct field inspections to document that the conditions of the permit are being followed”

**Appendix 2B**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Ken Kirse - Capital Projects Manager, Tri-Met, Portland, Oregon*

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■ **How do you manage general liability?**

“TriMet will either require contractors to provide the appropriate types and amount of insurance to adequately protect the project or provide an OCIP. Each project will be evaluated to determine the best method used to provide adequate insurance.”

*Documentation Request*

The following documents (that support the best practices of each interviewed transit authority) will be requested:

- Management tools, reports etc (risk registers, cost forecasting models, schedules and schedule specifications, change control procedures, monthly and quarterly reports) will be requested.

**Appendix 2C**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Dennis Mori - Executive Officer, Design and Construction, LACMTA,  
Los Angeles, California*

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*The Overview of the Capital Projects Development within the Agency*

*Q1. The Design Phase*

■ **What elements of this program work best for you?**

“The MTA has moved more toward a Design/Build delivery strategy. This is particularly true of smaller capital projects. We have been more effective in our delivery process with this strategy.”

■ **Describe the process utilized to develop and update preconstruction budget estimates.**

“There is a disciplined “GO/NO-GO process that balances scope, schedule and costs however costs dominate the triangle. A series of estimates are performed at the conclusion of Conceptual Design, PE, and Final Design (Interim and 100%). These estimates are used to judge the affordability of projects.”

“If costs are too high, design efforts are re-engaged to scale-down costs. Cost reductions are not uncommon.”

“MTA also regularly invites peer reviews of designs and their estimates (peers may be consultants and/or staff from other agencies). In addition, it is not uncommon for us to engage a second-opinion cost estimate to ensure accuracy. This usually means a reconciliation of costs is required but there are benefits accrued from such exercises”

“VE studies are also a standard practice. However, VE studies do not focus on capital cost but rather life-cycle costs.”

■ **Describe the process utilized to “lock-in” scope, schedule and budget decisions.**

Based on the emphasis on costs that Mori referred to, the triangle is locked in when the project is deemed affordable. The context for this approach is the fact that the MTA faces severe budget deficits

■ **Describe your project management philosophy.**

**Appendix 2C**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Dennis Mori - Executive Officer, Design and Construction, LACMTA,  
Los Angeles, California*

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“PM’s are expected to be active in their projects with a “hand-on” approach. At the same time, he expects a big picture view from his PMs.” Mori expects each PM to be versed in the dynamics of the triangle. He also expects PMs to delegate assignments to the appropriate working level. Mori expects change to occur with each project. However, he expects the changes to be anticipated, communicated, and managed fairly. Finally, Mori insists on transparency; all actions will see the light of day. Mori also explained that he is personally active on projects through meeting participation and/or regular briefings by PM's.

■ **How do you manage scope, schedule and budget?**

“Budget dominates as discussed above. Scope is controlled by annual work plans and regular forecasting of those plans. Managing scope creep is a PM priority.

Schedule flexibility is always built into project schedules with float between interfaces the key. Again, regular forecasting of performance is maintained.

As estimates are converted to budgets, and/or contracts are awarded, identification and control of risks are emphasized. Contingencies are assigned and closely managed.”

■ **What management tools do you utilize to forecast measure and respond to (scope, schedule or budget) deviations from plan?**

“Evolved project control procedures outline these requirements. Regular reviews of project performance are held at various levels to include the executive level. The Construction Division publishes a quarterly review of all projects.”

■ **Describe how you approach risk management.**

Together with the FTA, we have conducted complete risk assessments for our larger projects. We use a risk register that tracks each significant risk. There is a direct correlation between identified risks and contingencies to ensure proper and transparent management of contingencies. The register is also tied to schedule such that when a threat (or opportunity) lapses, we know there is a reallocation of contingency in the best case scenario or a further drawdown in a bad situation. We are now integrating our risk practices into our schedule and cost management procedures. These changes were just adopted in our recently revised forecasting procedure.

■ **What types of programs do you utilize to promote staff development?**

**Appendix 2C**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Dennis Mori - Executive Officer, Design and Construction, LACMTA,  
Los Angeles, California*

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“There is no formal PM training offered. However, PMs are encouraged to pursue advanced training through their affiliated professional organizations”.

Interesting to note that the organizations noted were not PM related, but rather technically orientated. Mori believes that a “PE” or “RA” (professional designation) is more important than formal project management training.

- **What performance measures are utilized to manage your capital development program?**

See the Quarterly performance report. Copy to be furnished

- **Do you conduct project post-mortems to analyze what went right and right went wrong with completed projects?**

“Yes. The Division has a Lessons Learned Policy that is enforced. Our lessons are also integrated into updates of our standards and specifications. Our lessons are not a secret but rather widely shared.”

- **What do you consider the best practice aspects of your design program?**

“The annual work plan. It has provided great insight into what is planned in the coming year and what resources are required. It has forced us to review increments of our lifetime budgets with the opportunity to adjust to the realities of how a project has progressed or not.”

**Appendix 2C**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from Dennis Mori - Executive Officer, Design and Construction, LACMTA,  
Los Angeles, California*

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**Q2. Describe Your Management of the Construction Phase**

■ **Describe the organization structure and functional roles of your construction management team.**

“Each project is structured to meet its unique objectives. Design/build projects are different from Design/Bid/Build etc. However, larger projects employ the IPMO model (co-location of staff or tight matrix).”

“A construction manager is usually designated as the lead in day-to-day operations during the construction phase. However, the PM is expected to be cognizant of operation and provide direction as required.”

“A matrix structure is employed on all projects. Larger projects always have a strong matrix while smaller projects usually have a weak matrix. Independence for safety, quality and project control is ensured.”

■ **What steps do you take to ensure that the risk associated with construction (scope, schedule and budget) are effectively managed?**

“A thorough scrubbing of the design documents is the best defense for risks. The scrub will identify the issues and how they can best be managed. Industry and peer reviews are also regularly used to test the degree of risks. Particular emphasis on third party interfaces is made; early intervention of impacted third parties is the norm.”

■ **What types of management reports or communications practices do you utilize to report on critical construction management and field activities?**

“Weekly meetings at various levels are held to communicate. The IPMO structure on large projects facilitates communication”

■ **How do you manage safety?**

“Well-trained staff that are dedicated to projects and enjoy independence”

■ **How do you manage environmental compliance?**

“Staff from the Planning Division who were responsible for the clearance of the EIS are maintained as a resources to the project.”

**Appendix 2D**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from VTA*  
*San Jose, California*

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*The Overview of the Capital Projects Development within VTA*

*Q1. The Design Phase*

■ **What elements of this program work best for you?**

Perhaps the most challenging element in program development is managing “scope creep” during the design phase. VTA has advanced a number of practices (trend reporting and change control boards) used during the construction phase and applied them during design to identifying trends that impact scope, cost and schedule. This formalized process assures that issues impacting the program cost and schedule are identified early so that VTA’s senior management can effectively deal with the issue.

Another tool that has been useful is involving VTA Board Members and other elected stakeholders on project Policy Advisory Boards (PAB’s), particularly those whose jurisdiction the project is within. The PAB’s are especially effective during design development, by engaging Board members early in conceptual engineering and environmental approvals and keeping the PAB’s aware of cost and schedule trends. (Reference SVRT Policy Advisory Board Agenda packet)

VTA also uses project development teams (PDT), with membership comprised of project team members and technical staff from stakeholder agencies (primarily cities), meeting as frequent as bi-weekly, to manage project issues during preliminary engineering and design that can impact scope, cost, and schedule.

■ **Describe the process utilized to develop and update pre-construction budget estimates. VTA has established procedures for updating contract estimates as design moves from conceptual engineering (10% design) to bid ready (100% design).**

On most design packages, current estimates are required to be submitted to VTA by the design consultant at 30%, 65%, 95% and the final Engineer’s Estimate that is used for bid comparisons. At 65% and 95% submittals, VTA has an independent estimating team (usually program/construction management consultant) validate quantities and unit prices to hopefully avoid bids coming in higher than the Engineer’s Estimate and budget. While we occasionally have some surprises, over the last ten years our bids usually fall 10% below the Engineer’s Estimate on rail and highway projects.

**Appendix 2D**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

*Response from VTA*  
*San Jose, California*

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- **Describe the process utilized to “lock-in” scope, schedule and budget decisions.**

VTA has been the project delivery agent for the County of Santa Clara's 1996 Measure B Transportation Improvement Program. One of our responsibilities was to recommend a baseline scope, cost, and schedule at the conclusion of preliminary engineering that was then approved by both the VTA Board of Directors and the County Board of Supervisors. Modifications to a project's baseline scope, cost, or schedule could only be approved by action of the Board of Supervisors.

VTA's highway project delivery adheres to the project development processes of the California Department of Transportation. Project scope is identified in two engineering technical reports: a Project Study Report typically completed at the conclusion of conceptual engineering and a Project Report which approves the project and is completed after preliminary engineering and environmental studies have selected a preferred alternative.

- **Describe your project management philosophy.**

VTA endeavors to accomplish the following:

- Active support for projects from top of organization
- Timely decision making
- "No surprises" reporting environment
- Realistic budgets and estimates
- Get good people/firms and let them do their job (accountability and empowerment too)
- Investment in front end project management activities pays off
- Recognition of the importance of project controls
- Recognition of the importance of QA, which include surveillances and audits of design development and construction administration processes
- Integrated teams of VTA and consultant staff that listen to each other and cooperate



**Appendix 2D**  
**TRANSIT CAPITAL PROJECTS MANAGEMENT QUESTIONNAIRE**

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- Construction division's primary organization is around projects and not around functions/disciplines
  - Strong focus on delivery of design deliverables
  - Create sense of team and foster open and honest communication
  - Emphasize identifying "lessons-learned" and communication of those to other project teams.
- 
- **How do you manage scope, schedule and budget?**
    - Timely and meaningful reporting at an Executive Level
    - Effective use of PM techniques: Project Management Plans, Contract Implementation Plans, Formal Value Engineering reviews at Conceptual and Preliminary Engineering stages, trending, risk management, contingency development, and cost containment
    - Scope control through practices such as the Design Development Board
    - Development of baseline budgets and schedules and regular status reporting
    - Twice-monthly review of schedule status by Group Managers
    - Appropriate use of project management software, i.e. development and use of tools to support the team and not the other way around
    - Training and support of staff to use project controls software tools
    - Constructability reviews at 65% design complete and bidability reviews at 95% design complete.
- 
- **What management tools do you utilize to forecast measure and respond to (scope, schedule or budget) deviations from plan?**

VTA purchased and installed SAP software in 1999 as an enterprise wide solution to our computing needs. The Project Systems (PS) module fell short of the VTA's Construction Division needs and an integrated suite of more

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specialized software that we call Project Controls Software Tools was implemented. VTA provides a web based portal to all of our project offices and makes the following software suite available to our staff and consultants.

- Contractor progress payments: Expedition with SAP
- Contract cost trending: Expedition
- Estimating: Timberline
- Monthly Cost Reporting: SAP with Business Warehouse
- Scheduling: Primavera Project Planner (P3)
- VTA's CommDisp: Web-based Design Tracking
- Heckle and Buck Report: Microsoft Access
- VTA's-PATS: Property Acquisition Tracking

■ **Describe how you approach risk management.**

No one approach is suitable to the rail, highway and facilities contracts that VTA implement. We have evolved over time and developed a number of approaches to managing cost, schedule and quality risks associated with projects. Some apply to all projects, while others only to larger projects and programs. Some examples are:

Program wide- Contract language is a defined risk area. VTA has a process of convening a monthly contracts group meeting consisting of VTA Counsel,

Contracts and Construction to review and improve contract language, and to coordinate new federal and state laws into contract terms and conditions.

VTA embarked on a construction contractor pre-qualification program. All contracts in excess of \$1.25 million require the prime to submit a pre-qualification questionnaire and to select from a list of VTA pre-qualified sub-contractors for specified work. The program has reduced the risk of selecting contractors and subs with records of poor performance.

\$10-25 million contracts- VTA conducts independent constructibility reviews at 35% and 65% to determine if there are problems with the design documents. Also, independent estimate checks and quantity takeoffs are also performed. VTA has also utilized unit price type contracts for the most

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part as a way of eliminating bidders risk on quantity overruns. While this type of contract transfers the risk of overruns to VTA, we feel over the last 10 years VTA has benefited from very complete unit prices.

\$ 25-60+ million contracts or programs- In addition to the steps above, we may place incentive bonuses on early completion, partnering language, and possible use of dispute resolution board. Also in very early stages of developing formal "risk registers" for various program elements and completing risk assessments on cost and schedule.

■ **What types of programs do you utilize to promote staff development?**

Aside from regular training programs for new software or upgrades, perhaps the most successful program is one our construction management staff conducts by training our in-house and consultant staff. Monthly seminars can range from concrete inspection to being a Resident Engineer/Inspector. Also, to foster teamwork between VTA staff and consultants, we also conduct "brown bag" seminars over lunch on a variety of topics.

VTA has also had great success in recruiting young civil engineering graduates by implementing a construction internship program with local universities. Students rotate through a program of assignments in surveying, CADD, design and construction inspection.

Individual engineering managers have developed and voluntarily participated in a mentor program for engineers in the early phases of their VTA career.

■ **What performance measures are utilized to manage your capital development program?**

VTA's Construction Division performance measures center around cost, schedule and quality. Design consultants are required to prepare a CPM schedule for their contract deliverables, in addition to 3-week horizon schedule reports. During design we develop a "heckle sheet" that is used to define submittal and contract advertising goals. Executive management monitors these reports closely. Consultants that don't perform well against budget and schedule, or that do not constructively address QC and QA review comments, tend not to rank well on future RFP's.

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During construction a 'buck sheet' is prepared that tracks schedule and cost performance of the contractor and construction management team. As an overall goal, we want all contracts to complete on time and with no more than 10% cost growth on change orders. On quality issues all non-conforming items need to be cleared and all punch list work completed before final acceptance.

■ **Do you conduct project post-mortems to analyze what went right and right went wrong with completed projects?**

Yes we do conduct these "lessons learned" reports. As a result we have implemented a number of changes to our contract documents and bolstered our reviews by VTA's Operations Division during the design development phase of light rail and bus and rail maintenance facility projects.

"Lessons-learned" that are identified during project activities before completion, such as QA audits and causes of contract change orders, are encouraged to be communicated in various management meetings. "Lessons learned" are also scrutinized for adding to checklists for QA surveillances, QA audits, constructability reviews and bidability reviews on future projects.

■ **What do you consider the best practice aspects of your design program?**

Excellent leadership in program management, coupled with a smart mix of VTA and consultant staff. VTA has benefited from experienced gained over the past 10 years implementing a \$1.4 billion rail expansion program and a \$ 600 million highway improvement program. Our approach to implementing the design and construction program was to hire a key number of staff with transit and program management experience. The Chief Construction Officer and former Rail Deputy Director both were previous Vice Presidents with a private construction management firm. So from the get go VTA had strong leadership in design and construction management. Our current Deputy Director comes from the State DOT and has critical knowledge of highway design standards.

Couple VTA's executive management experience with the ability to cycle VTA and consultant staff from the completion of one project to the start of design on the next project and you have the perfect environment for growing

and improving experienced staff and business processes. It addresses an industry wide need to get more construction experience for our design

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managers. In some cases we have been able to cycle VTA staff through 3 light rail project design and construction cycles. And some of this “homegrown” staff is now managing the next generation of rail extension projects.

*Q2. Describe Your Management of the Construction Phase*

- **Describe the organization structure and functional roles of your construction management team.**

Organization Structure [Ex. 1]

Matrix Organization organized by project, with representatives from multiple disciplines assigned to specific projects or contracts, but monitored by and adhering to standards established by discipline managers.

Integrated team of agency and consultant personnel working seamlessly together.

Project offices located close to the sites of major construction.

Project control engineers and contract administrators assigned to individual contract teams to provide immediate support to Resident Engineers/Inspectors.

Utility coordinators assigned to each project to provide liaison with utility companies, set priorities to support contract schedules, deal with discovery of unknown utilities.

Resident Engineer/Inspector

Authorized VTA representative to provide central role in administration of each contract.

Heads team of integrated disciplines and has overall responsibility for contract.

Supported by inspectors, office engineer, administrative aide, design support, project controls and contract administrator assigned to contract.

Draws on “pool” support for environmental, utilities, survey, document control, materials management, estimating, safety and QA/QC.

Project Manager

Overall scope, schedule and budget responsibility for project.

Directs the integrated design and construction team; approves staffing needs for both efforts.

- **What steps do you take to ensure that the risks associated with construction (scope, schedule, budget) are effectively managed?**

Scope

Contract Implementation Plan developed during final design establishes basic scope for each contract in the project, in conjunction with

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establishment of project budget; once established, changes require approval of Project Manager. [Ex. 2]  
Change Control Board reviews the necessity for and best management of every change whose absolute value exceeds \$50,000. [Ex. 3]  
Cooperative agreements with entities seeking scope increases to secure funding for such increases, including oversight and other associated costs (e.g. municipalities, railroads, utilities).  
Change order tracking from first recognition of all changes and potential changes, regardless of cost or schedule impact, via Contract Forecast Report. [Ex. 4]  
Part of required change order documentation is assignment of a basis code and justification memo ("Why is this change being issued?").  
Change order procedure requires participation of multiple disciplines to discourage unnecessary changes, while efficiently processing necessary ones. [Ex. 5]  
Contract General Conditions (GC-60, GC-65, GC-68) clearly define notice and filing requirements for change requests and claims, which prevents end-of-contract surprises. [Ex. 6,7,8]

**Schedule**

Contractor three-week look-ahead schedules are on the agenda of weekly contract progress meetings.  
Contractor CPM schedules are submitted and reviewed on a monthly basis.  
A project master schedule is maintained to reflect contractor schedules as well as input from project team members. The master schedule is communicated to management/project staff on a quarterly basis. [Ex. 9]  
A separate detailed right-of-way acquisition schedule is maintained and includes each parcel with the potential to delay construction contract award.  
"Heckle Sheet" keeps team focused on progress toward advertise for bid of individual construction contracts. "Buck Sheet" keeps team focused on progress toward completion of construction contracts. [Ex. 10]  
Project schedule risks are communicated from project controls to project managers during regular meetings. Project controls runs "what-if" schedules to assist project managers in working around obstacles and optimizing schedule performance.

**Budget**

Project contingency is set at the end of the Final Design phase or beginning of Construction phase to address perceived risk associated with the project based on past experience. General Manager, by Administrative Code, is delegated 15% above contract award amount for CCO approval. Consideration is given at time of contract award

**Appendix 2D**  
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request to VTA Board if the risks in an individual contract require a greater amount of CCO authority for the General Manager before awarding the contract.

Upon award, contingency is allocated to each contract to cover change order growth based on the perceived risk.

Field staff closest to contract issues maintains detailed trended forecasts to capture cost issues as early as possible. [Ex. 4]

An objective contingency tracking system is employed that takes into account field-generated trended forecasts as well as an additional contingency amount to cover changes not yet encountered. This provides a reading of project contingency remaining, after construction risks are addressed, to address non-construction risks. [Ex. 11,12]

For staffing costs, detailed staffing plans are prepared biannually and monitored against actual performance on a monthly basis. [Ex. 13]

For utility risks, VTA employs dedicated utility coordinators, enters into relocation agreements as early as possible, and uses potholing and modern utility detection techniques as early as possible to locate existing utilities.

Quantity overruns are addressed at an early stage with check estimates prior to bid, and change orders during construction if actual quantities exceed 125% of bid quantity.

Project cost risks are communicated from project controls to project managers during regular meetings.

Cash flow is managed using the Revenue and Expenditure Plan cash flow spreadsheet. [Ex. 14]

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- **What types of management reports or communications practices do you utilize to report on critical construction management and field activities?**

Management Reports

<b>Report</b>	<b>Frequency</b>	<b>Audience</b>	<b>Information Included</b>
Project Progress Report [Ex. 15]	Monthly	VTA Board, Public, Project Managers/Team	Milestones, cost, schedule, funding, construction progress/photos
Program Cost/Schedule Report [Ex. 16]	Monthly	Project Managers/Team	CHANGES IN FORECAST, BUDGET CHANGES, INCURRED COSTS, AMENDMENTS/CHANGE ORDERS, CONTINGENCY UTILIZATION
Heckle Sheet [Ex. 10]	Monthly	Project Managers/Team	Progress towards advertising/awarding construction contracts, budget/bid values
Buck Sheet [Ex. 10]	Monthly	Project Managers/Team	Progress towards completion of construction contracts, award costs, change order growth, percent complete
Revenue & Expenditure Plan, Semi-Annual Report [Ex. 17]	Semi-Annually	VTA Board, PMO	High-level progress reports, cash flow, and budget/schedule changes.
Staffing Plan Status Report [Ex. 13]	Monthly	Project Managers/Team, PMO	Actual performance against plan, explains variances over 5%.
Staffing Plan Update	Semi-Annually	Project Managers/Team, PMO	Name, utilization, rate, start and end dates for project team at the level of the individual.
Project	Monthly	Project	Remaining Project



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Contingency Analysis [Ex. 11]		Managers	Contingency after addressing construction risks, contracts trending over Board Authorization
Master Schedule Update [Ex. 9]	Quarterly	Project Managers/Team	Schedule status, critical path

Communication Practices

<b>Meeting</b>	<b>Frequency</b>	<b>Attendees</b>	<b>Information Covered</b>
Program Cost/Schedule Review [Ex. 18]	Monthly	Program Management Project Managers/Team	Cost/Schedule Issues, Construction Progress, Right-of-Way, Utilities, Soft Cost Issues
Change Control Board	Biweekly	Project Managers, Contracts, Discipline Managers	Change issues over \$50 K requiring approval before issuance/ negotiation.
Project Controls	Weekly/Bi-Weekly	Project Manager/Project Controls	Cost/Schedule Issues
Contractor	Weekly	Contract Management Team, Contractor	Schedule, changes, safety
Project Change Order Review	Weekly	Project Managers/Residents /Team	All pending changes & potential changes utilizing Contract Forecast Report
Project Progress	Weekly	Project Managers/Residents /Team	Progress of active contracts, points of interface between contracts, problems & issues

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▪ **How do you manage safety?**

Construction Division coordinates with VTA's Risk Management Department to address safety processes and individual contract safety reviews – either Risk Management or the Construction Division identifies a responsible party for program field reviews to supplement individual contract administration staff responsibilities

OCIP has also been established for majority of rail and highway construction projects.

OCIP administrators and/or VTA Risk Management provide full-time on-site safety monitoring of program.

OCIP provides Injury and Illness Prevention Program as a model for contractor safety programs. [Ex. 19]

OCIP Insurance Manual requires adequate coverage by OCIP and Contractor, and prompt claim filing and processing. [Ex. 20]

VTA provides special training as required.  
Work around operating light rail line (SC-40) [Ex. 21].

Work in and around local commuter rail operations (SC-41). [Ex. 22]

Contract Special Conditions reference safety requirements.  
Basic safety precautions (SC-13). [Ex. 23]

Additional unique safety requirements addressed as appropriate (e.g. SC-48). [Ex. 24]

▪ **How do you manage environmental compliance?**

Each project has a dedicated Hazardous Material Remediation contract, an on-call contractor qualified and insured to perform hazardous removal and disposal of known and unknown material.

Appropriate requirements of Environmental Impact Statement are incorporated into relevant contracts (SC-16). [Ex. 25]

Attempt to engage environmental regulatory agencies such as U.S. Fish and Wildlife, NOAA Fisheries, and California Department of Fish and Game early in project development to get their issues addressed in design, where appropriate. This aids to identify construction environmental windows early for full constructability considerations and our perception is that this has helped develop a constructive working

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relationship that has helped if permit amendments are needed during construction.

All mitigation measures, including construction mitigation measures and permit condition requirements, are documented in a Mitigation and Monitoring Plan that are tracked by a program environmental coordinator, who is reminding construction administration staff of compliance requirements.

■ **How do you manage general liability?**

Contract terms establish insurance limits required, whether OCIP or contractor-provided (SC-2). [Ex. 26]

Contract terms require contractor to protect property of adjacent owners and allow VTA to make repairs and back-charge contractor (GC-45, SC-13). [Ex. 27, 23]

For particularly sensitive work, contract terms require contractor to provide a Community Relations Officer (CRO) (SC-46). [Ex. 28]

CRO provides point of contact for community.

CRO has authority to stop or redirect work of contractor.

CRO was required on contract where piling was driven in proximity to residences, also where street improvements and embedded track were placed in congested downtown business district.

For sensitive work, project team videotaped existing conditions prior to commencing work. (Technique was used on both contracts described in 6.c.iii, above.)

EXHIBITS in Tabulated 3-Ring Binder

### Appendix 3 Document Review Log

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Assigned Document Number	Document Title	Date
<b>REFERENCE MATERIAL - GENERAL</b>		
RM-01	Agency Progress Report – Link Light Rail – December 2003	Dec 2003
RM-02	Agency Progress Report – Link Light Rail – June 2004	June 2004
RM-03	Agency Progress Report – Link Light Rail – September 2004	Sept 2004
RM-04	Agency Progress Report – Link Light Rail – December 2004	Dec 2004
RM-05	Agency Progress Report – Link Light Rail – February 2005	Feb 2005
RM-06	Agency Progress Report – Link Light Rail – April 2005	April 2005
RM-07	Agency Progress Report – Link Light Rail	May 2005
RM-08	Capital Project Program Overview – April 2005	May 2005
RM-09	Federal Way HOV Access Progress Review	May 2005
RM-10	Federal Way Transit Center Progress Review	March 2005
RM-11	Central Link Contract Unit Description	April 2005
RM-12	Central Link Contract Organization Chart	June 2005
RM-13	REX Quality Assurance Plan	Oct 2003

### Appendix 3 Document Review Log

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Assigned Document Number	Document Title	Date
RM-14	Capital Projects Program Management Plan	Jan 2005
RM-15	Capital Projects Resident Engineering Manual	Nov 2005
RM-16	Capital Projects Departmental Status Report	Aug 2005
RM-17	Capital Projects Organization Chart	April 2005
RM-18	Capital Projects Organization Chart	July 2005
RM-19	Environmental Compliance Division Activity Report (Random Samples)	Aug 2004
RM-20	Environmental Compliance Division Activity Report (Random Samples)	June 2005
RM-21	Capital Projects Chief Engineer's Policies/Procedures Review Umbrella Agreement RTA/WSDOT Construction Administration	Sept 2002
RM-22	Master Agreement for Civil Support Services WSDOT/RTA	April 1998
RM-23	Central Link WBS Rev 7	May 2005
RM-24	Phase Gate Process (Draft)	July 2005
RM-25	Regional Express QA Audit Task List	February 14, 2003
RM-26	Link Construction Manual	April 2005
RM-27	Citizen Oversight Panel "Sound Move Year 8"	April 2005

CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### Appendix 3 Document Review Log

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Assigned Document Number	Document Title	Date
RM-28	HR Specification Deputy Construction Manager	June 2004
RM-29	Sound Move Program Management Plan	Oct 2004
<b>REFERENCE MATERIAL for FEDERAL WAY HOV ACCESS PROJECT</b>		
FH-01	Project Schedule	May 2005
FH-02	Working Schedule	May 2005
FH-03	WSDOT Change Order Approval Matrix	
FH-04	Schedule/Budget History	
FH-05	WSDOT Project Summary Weekly Report	July 12, 2005
FH-06	WSDOT/RTA Agreement	May 4, 2004
FH-07	Change Order; Request No. 2	Sep 2004
FH-08	Puget Sound Energy/RTA Agreement	May 2004
FH-09	Project Profiles	Jan 2005
FH-10	Project Profiles	Mar 2005
FH-11	Project Profiles	May 2005
FH-12	Real Estate Status Report	July 2005

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### Appendix 3 Document Review Log

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Assigned Document Number	Document Title	Date
FH-13	Permit Status Profiles	
FH-14	WSDOT Invoice for Design Services	July 2004
FH-15	WSDOT Invoice for Construction Services	Feb 2005
FH-16	RTA/WSDOT Design Services Agreement	April 2002
FH-17	RTA/WSDOT Design CM Services Agreement	April 2004
FH-18	Project Management Plan (ST/WSDOT)	
FH-19	ST Board Motion M2000-77 Federal Way Transit Center Scope & Budget Baseline	Oct 2000
FH-20	2006 Budget Proposal	June 7, 2005
FH-21	QA Program Lessons Learned	April 11, 2003
FH-22	ROW Status Matrix	June 20, 2005
<b>REFERENCE MATERIAL for LYNNWOOD TRANSIT CENTER PROJECT</b>		
LC-01	Project Manual Developed by Inca Engineers	Undated
LC-02	Project Risk Assessment by KBA (CM)	Aug 2002
LC-03	Sound Transit Adopted 2004 Budget Pg. 157 of 292	

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Assigned Document Number	Document Title	Date
LC-04	Regional Express Project Control Policies and Procedures Desk Manual REPC – 09 Change Control Board REPC -10 Progress Reporting REPC -11 Cost Forecasting & Trending REPC -12 Contingency REPC -13 Project Baselining	May 2003
LC-05	Executive Advisory Committee	Nov 1999
LC-06	REX Construction Management Manual Section 2.2.3 REX Project Manager Role Definition Figure 2-3 REX Org Chart	March 2003
LC-07	REX Project Management Plan	Aug 2003
LC-08	RTA Quality Assurance Oversight Report Resumes: Howard, Peterson, Engler, Young, Eden, Dahl, Edwards	Dec 2003
LC-09	Construction Program Payment Checklist No. 20	Jan 2005
LC-10	Project Schedule by Phase Data Date	May 2005
LC-11	Monthly Narrative on Schedule Progress No. 20	Jan 2005
LC-12	CM Invoice (KBA)	Jan 2005
LC-13	Contact List	
LC-14	2006 Proposed Budget	Jun 2005
LC-15	NCR Log	Dec 2003



### Appendix 3 Document Review Log

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Assigned Document Number	Document Title	Date
LC-16	NCR No.4	May 2003
LC-17	Change Order Details	July 2005
LC-18	Weekly Construction Update	June 3, 2005
LC-19	QA Lessons Learned	April 11, 2003
LC-20	KBA Monthly Report	Jan 13, 2005
LC-21	ROW Status Matrix (See Fed Way HOV)	June 20, 2005
<b>REFERENCE MATERIAL for BEACON HILL LINE SEGMENT</b>		
BH-01	C710 Task 13 Eng DSDC Org Chart	Jan 2005
BH-02	C710 CM Team Org Chart	May 2005
BH-03	Program Cost Summary	June 2005
BH-04	CTR-Summary	July 14, 2005
BH-05	CTR-Detail	July 14, 2005
BH-06	Q/A Site Surveillance Report	Jan 21, 2005
BH-07	* 710 RE Audit	Jan 2005

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### Appendix 3 Document Review Log

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Assigned Document Number	Document Title	Date
BH-08	RE Weekly Report #53	July 1, 2005
BH-09	Inspector's Daily Report- Random Sample	May 2, 2005
BH-10	Inspector's Daily Report- Random Sample	June 20, 2005
BH-11	Obayashi Schedule Submittal	May 31, 2005
BH-12	Resumes RE Team of Managers, Lead Inspectors and Support	Undated
BH-13	Weekly Program Meeting #43	June 6, 2005
BH-14	Permit Matrix	July 7, 2005
BH-15	PB Change Management Log	July 14, 2005
BH-16	Real Estate Matrix	July 7, 2005
BH-17	VE Station Shift	June 30, 2005
BH-18	Risk Assessment – Final Report	April 2004
BH-19	Progress Monitoring Graphics	Various Dates
BH-20	ST Schedule Review	Sep 2004
BH-21	Link BCE	Sep 25, 2002

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**Document Review Log**

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<b>Assigned Document Number</b>	<b>Document Title</b>	<b>Date</b>
BH-22	Draft Community Outreach Plan	Jan 12, 2005

# **APPENDIX 4A**

## **SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

### **BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
PMP				
1.1	1.	Does the project have a project specific management plan?	Project has PMP. But no specific plan for the Segment. However, reference to other key guides, e.g. PMM, CM Manual, Policies & Procedures, also provides relevant direction.	Project references are well documented.
1.1	2.	Who prepared it?	The Project Team	
1.1	3.	What does it include?	Follows FTA standard	
1.1	4.	Is the Plan updated to include variations?	Yes, however, current edition dated 2002. Update planned for later this year.	The Link PMP requires immediate update.
1.1	5.	How is the Plan maintained?	Project Control Group has responsibility to gather updates from Project Team. The Director decides when to publish.	
1.1	6.	When was the Plan last issued?	See above.	
1.1	7.	What standards guide your project management efforts?	Segment Team identified 12 references to include: PMP, CM Manual, Quality Plan, PC Policies & Procedures, PMM, etc. Document precedents appear well understood.	
Organization				
11.1	8.	Describe your project organization.	DCM leads the team with integrated support from matrixed resources; include ST staff & consultants. CM consultant dedicated to BH.	Emphasize that BH is a Segment and NOT a Project.

**APPENDIX 4A**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
1.2	9.	How are authority, responsibility and accountability documented?	The CM Manual, in conjunction w/ PMP outline them; CM able to delegate all to DCM. RE relies on Subconsultant contract and CM Manual.	In construction, these are well understood. In cost, there is considerable gray area.
11.2	10.	How are resources made available to the project?	Assessed by team with DCM approving actions. This has NOT been an issue. Dedicated and expanded DSDC team exemplifies this.	The BH Team is well staffed. The commitment of design talent to promptly address issues is a wise investment.
11.1	11.	Who controls the resources?	DCM, in conjunction with Administrative Managers.	
11.3	12.	How are timely actions and quality services of project staff ensured?	RE and DCM review performance on on-going basis.	
11.2	13.	Is there a staffing plan?	PBCS has one.	
11.2	14.	How are performance issues managed?	This has not been a problem.	
11.1	15.	Are roles and responsibilities clearly delineated and documented?	See #9.	

**APPENDIX 4A**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
11.3	16.	What are the requisite experience, training and expertise levels of key team members?	The org is staffed with experienced personnel throughout. OE is an exception but qualified for specific functions he performs.	Seasoned staffing on the BH Segment Team is apparent.
11.2	17.	Is the PM involved in the appointment of key team members?	Yes, through approval process. DCM relies on recommendations from matrix leaders and RE as appropriate.	
11.3	18.	What Project Management training have key team members received?	Resumes do not indicate specific training or certifications.	
11.3	19.	What other training relevant to their assignments have key team members received?	Not addressed. However, DCM indicated he lectures at UW on regular basis on underground construction; implies further training.	
11.1 11.2 11.4	20.	What challenges or advantages are posed by the current organizational structure?	Advantage: the Segment Team is large and well-rounded with dedicated design support resources committed. Challenge: some matrixed resources are thinly spread, e.g. scheduler and project controls lead.	The availability of the assigned BH scheduler is likely to become an issue given his other program/project responsibilities. Likewise, the workload for the project control lead is extreme with her assignment to over \$450 million of construction work alone.

**APPENDIX 4A**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

Topic/Reference		Question	Observations	Finding
WBS				
2.1	21.	Who developed the project's WBS?	PC Group	
2.1	22.	Who is responsible for its maintenance?	PC Group	
2.1	23.	How is the WBS used?	Integrated into traditional functions.	The WBS is appropriately structured and used.
Scope Management				
2.2	24.	What is the scope of the project?	Tunnel approach structure (MSE), twin tunnels, one deep u/g station, aerial structure with flagship station. Complex, multi-discipline scope.	
2.2	25.	How is it documented?	Reference to the CUD first and other dox as well.	
9.3	26.	How is the scope controlled?	Management & administration of C0710 Contract is first front. Management of the host of other contracts and agreements also required. These include 3 <sup>rd</sup> Parties and other prime contracts.	An integrated management approach is required to coordinate 3 <sup>rd</sup> Party activities priorities.
Schedule Management				
2.2	27.	On what basis was the start and completion dates of the project determined?	Reference made to the approval of the BCE. ST developed construction phase schedules during design to determine and refine the CP; served as basis for contract duration of 1041 days.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
3.2 3.2	28.	How do you manage schedule?	Focused on C0710 contract; administer contract specification requiring monthly contractor. Coordination with other Segment operations.	
3.1	29.	Who is responsible for schedule performance?	DCM	
3.1	30.	Describe the project's critical path.	Sequential Excavation Mining Operations pace the CP. This is contrary to most underground tunneling contracts. EPBM operations constitute the secondary path.	Schedule focus is appropriately placed on the Sequential Excavation Method (SEM) operations.
3.1	31.	How did the project define durations and interfaces along the critical path?	See #27	
3.2	32.	Describe the strengths and weakness of the current scheduling specification applied to consultants and contractors.	The specification does not require resource loading or the development and maintenance of a bases and assumptions to the contractor's schedule.	Refinement of the standard scheduling specification is needed to strengthen ST perspectives.
3.2	33.	Are resources applied to the schedule?	No. The application of crews would be an asset	
3.2	34.	How are resources used in the schedule?	NA	



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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
2.3	35.	How are time-impact analyses of contract changes performed?	P&Ps outline requirements. Current major change is indicative of how schedule is considered in changes.	
3.4	36.	How often are forecasts of schedule performance performed?	At least monthly per P&Ps.	
3.4	37.	What float value does your project have today?	-43 days	
Budget/Cost Management				
4.2	38.	How was the project budget established?	Reference to BCE. Significant construction phase costs increases resulted from award of contract. Only two competitive bids received.	
4.6	39.	Were there allowances and/or contingencies provided?	Yes.	
4.6 4.7	40.	How were they applied?	In construction: \$8.5m in provisional sums; \$14m in Toll Box; \$20m in contingency	
4.5 6.4	41.	How are costs managed?	Reference P&Ps. There are no ties between project risks and cost forecasting.	A correlation between project risks and schedule and cost forecasts is needed.
11.1	42.	Who is responsible for cost performance?	Design Project Manager was responsible during design. During construction, the DCM is responsible for most costs in the segment.	A handover of day-to-day responsibilities occurred between phases.

**APPENDIX 4A**  
**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**  
**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
4.5	43.	How often are cost forecasts performed?	Monthly.	
4.5	44.	Who is involved?	PC Lead, RE, OE, DCM.	An integrated cost forecasting approach is in practice.
4.3	45.	How are they documented?	Various forms used.	
4.5	46.	How is cost status communicated to the project and management?	Standard reporting procedures are followed as outlined in PC Procedures and Agency Reporting guides.	
4.7	47.	What tools/reports are used in controlling costs?	Enterprise 1 system, PC Group standards - Trends, CTR, etc.	
4.7	48.	Are these ST standards?	Yes.	
Performance Measurement				
1.1	49.	What are the project's performance goals?	Schedule (June 2008) and budget (award value plus contingency) AND maintaining working relationships intact with stakeholders	There are no metrics for the intangible objectives related to maintaining positive relationships with the BH community and broad stakeholders.

# APPENDIX 4A

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
1.1 10.2	50.	Are these goals documented?	Yes, in the partnering agreement.	
1.1 10.2	51.	Who measures and analyzes performance?	Partnering facilitator.	
10.2	52.	How often is performance measured?	Per partnering agreement.	
10.2	53.	What standards are applied in determining performance?	Per partnering agreement.	
10.2	54.	At what level of the WBS is data gathered for measuring performance?	Global measurements. Performance has reported improved consistently through three measurements.	Strong reliance and credence is placed on the partnering process to guide and gauge working relationship of stakeholders.
6.3	55.	How are performance measures used to guide project management emphasis?	Not addressed.	
10.5	56.	Does your project use ad hoc reports for internal reporting?	Yes; they include progress graphics for various major work elements, e.g. tunneling, liner fabrication, etc.	
Design Management				
8.1	57.	How were Design Criteria, Standard Drawings and Directive Drawings used on this project?	All ST standards were applicable to the design process.	
8.3	58.	What review(s) of contractor designs were conducted?	Standard 30%, 60% and 90% reviews conducted. Constructability reviews were also performed.	McClellan portion contracted like C0735; Inefficiencies.

**APPENDIX 4A**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
8.5	59.	How were interdisciplinary efforts managed to affect an integrated design?	Design team was co-located to facilitate interaction and communication. Regular reviews of design elements were conducted.	Co-location of design team was an asset in developing the project.
8.4	60.	Who is the customer for the design and construction of the project?	Link Operations and Maintenance.	
8.4	61.	How are Operations and Maintenance needs and issues addressed?	O & M input was received through design reviews. O & M documented and monitored their concerns throughout design phase.	
4.1	62.	How were estimated construction costs of the design managed?	Structured reviews were followed with cost estimate updates. Cost differences were reconciled.	
8.7	63.	Was Value Engineering performed on this project? If so, what was the outcome?	Yes, at 30%. Outcomes not addressed.	
8.6	64.	Did you perform peer / industry reviews of the design?	Yes, a Technical Oversight Panel was assembled to review designs and associated risks. This panel was comprised of recognized u/g experts with international and local experience.	Objective technical oversight was emphasized. Valuable input was received and considered in final designs and risk strategies.
8.5	65.	How do designers gain input from ST construction staff?	Link CM staff maintained a dialogue with the Design Project Manager.	

# APPENDIX 4A

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
Construction Management				
9.1	66.	Does the project have an RE manual?	Yes, referred to as the CM Manual.	
9.1	67.	If yes, when was it last published?	Updated April 2005.	
11.1	68.	How are roles and responsibilities delineated?	See #9.	
8.5	69.	Has the CM team had input to the development of designs, contract packaging, contract specifications and special provisions?	Yes, see #65. However, the input was limited to the DCM and did not include the consultant CM Team.	
8.3	70.	Was a constructability review conducted on the project? If so, what were the outcomes?	Yes. See #64. A test shaft was constructed to test the constructability issues raised through panel reviews. The test shaft experience led to significant design changes and a host of prescriptive designs. Dewatering spec was missed leading to field changes.	Investments of nearly \$3m in the test shaft proved invaluable in defining appropriate design strategies and limiting competitive risk perceptions.
9.3	71.	How are interfaces with third parties managed?	Established agreements and dedicated staffing. RE has primary responsibility through team of assigned individuals who correspond to 3 <sup>rd</sup> Party counterparts. Also, the Seattle interfaces are governed by the PMM and individual CSA work authorizations with one city representative dedicated to issues related to BH.	Strong emphasis is placed on communication and cooperation with 3 <sup>rd</sup> parties.

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
9.3 10.3 10.4	72.	How are contacts with the community managed?	Dedicated staff by ST and contractor are assigned. Various traditional tools are employed including fliers, monthly meetings, and construction updates.	
5.1	73.	How is quality managed?	See Quality Section.	
9.2	74.	How is safety and security managed?	Contractor is staffed w/ safety manager per contract requirements and coordinates with ST staff. Weekly meetings are held. Emergency response and notification procedures are maintained. Regular reviews by first responders and risk management (insurance) professionals are also conducted. ST is preparing for a Safety Summit to be held soon for the entire Central Link Project. Security guard staffing is just beginning with arrival of TBM.	
9.1	75.	How are scope, schedule and costs managed?	See # 7.	
9.4	76.	How are contractor requests, e.g. information, changes, payments, responded to?	Weekly review with the contractor on requests and issues. Several venues facilitate these but RE Weekly Meeting is the principal means.	
9.4	77.	What are the average response times for requests?	Not certain. Emphasis is placed on priorities as promoted by the contractor. However, actual data is available via Expedition	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
9.4	78.	How are requests monitored?	See # 76.	
Permitting				
9.5	79.	How was permitting work planned?	A Master Permit List was established early and regularly monitored. Permits were grouped in several categories: environmental, working with resource agencies; owner furnished, usually complex and long-lead; and contractor secured.	Comprehensive planning for permits, and monitoring of their progress, was well executed.
9.5	80.	How was this plan integrated with the project schedule?	Regular interface between the Project Scheduler and Permits staff was maintained.	
9.5	81.	Who is responsible for identifying and securing required permits?	Master Permit List identified responsible parties to include Link resources, the Environmental Section of the Legal Division or the contractor.	
9.5	82.	What tools are used to monitor permit status?	Master Permit List	
8.2	83.	What are the challenges of securing permits on-time?	Securing timely 3 <sup>rd</sup> Party comments to complete designs before permits are definitively reviewed. In many instances, late design comments are from the same general entity that will review the permit(s). There are two Seattle entities to process permits through; they are not always coordinated.	
8.2 9.5	84.	What aspects of the permitting effort worked well?	Not addressed.	
8.2	85.	What aspects of the permitting effort require improvement?	The definition of permit needs can be improved. Integration into the project schedule earlier should be worked to identify time allowances for the permitting process; more time should be afforded to the process.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
Contracts				
7.1	86.	How was procurement planned?	<p>The process leading to the procurement of design services was not addressed. However, it was noted that ST awarded and administered several prime contracts for the two contract packages that eventually became the BH Line Segment.</p> <p>Link consultation with the Contracts Division on a two-step procurement approach helped define the construction procurement.</p>	Contractual arrangements for design services were complex and cumbersome. Pre-qualifying construction contractors was appropriate for the complexities inherent in the scope of work.
7.1	87.	Who developed the procurement plan?	In construction, Link defined their needs with Contracts providing support.	
7.3	88.	What kind of performance measures were incorporated into contracts?	Not demonstrated.	
7.3	89.	What processes are used to ensure contract documents are complete and consistent?	Checklists were used. The Design Project Manager spearheaded this effort.	
7.3 3.2	90.	Who developed the Special Provisions?	The Design Project Manager led the effort with significant input from the DCM and support from the Design Team.	
7.3	91.	How often are contracts reviewed to ensure that requirements are being met?	Not addressed.	



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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Change Management				
7.3 2.3	92.	How are contract changes governed?	Earlier referenced management guides.	
2.3	93.	What level of authority does the PM have in regard to changes?	Authority levels for the RE, DCM and CM of \$25k, \$50k and \$100k were cited.	
2.4	94.	How are changes documented?	Use of Expedition program prompts data and input that yields standard documentation.	
Risk Management				
6.2	95.	What are the critical risks facing the project?	Environmental Permitting; SEM Productivity Staging & Logistics; Geological Conditions Technical Expertise.	Critical Risks are well known and understood.
6.1	96.	How were they identified?	Through a formal Risk Assessment process.	
6.1	97.	Describe your process for assessing risks.	Traditional approach outlined: comprehensive; iterative; objective; Monte Carlo simulations; etc.	An appropriately tailored formal risk assessment was conducted.
6.1	98.	Was there a formal risk assessment for the project?	Yes. Facilitated by a specialty consultant.	
6.2 6.3	99.	How are risks monitored and managed?	Informally.	While the project was actively engaged in risk management activities, they did not use formal tools to monitor and manage risks; risks were not formally integrated into schedule and cost forecasts.

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
6.4	100.	What tools are used to monitor and manage risks?	None.	
6.4	101.	How often are risks reviewed?	Regularly, but not through the application of a formal procedure.	
6.3	102.	Who is responsible for the critical risks?	DCM	
Quality Management				
5.1	103.	Does the project have a Quality Management Plan?	The Central Link Project yes, but not the BH Segment. The contractor, in compliance with contract requirements developed a Plan.	
5.2	104.	What resources are dedicated to quality management?	The Link Project provides resources on a matrixed basis for QA purposes; their efforts are generally limited to Audits and Surveillance. The CM consultant has dedicated field inspectors whose principal duty is to monitor quality control efforts. Finally, the contractor has its own inspectors.	The roles of each tier of quality management are understood.
5.4	105.	How do you monitor quality standards?	See #104. Also, the requirement for CWP's assists in defining quality standards specific to planned work efforts.	
5.1 5.2	106.	Who is responsible for quality?	See #104.	
5.4	107.	Are quality assurance audits conducted?	Yes. There have been 8 NCRs to-date.	

# APPENDIX 4A

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
5.4	108.	If Findings from an audit are made, how are they reconciled?	Per the QA Plan.	
5.4	109.	What tools are used to monitor quality?	QA Surveillance, Audits, Regular meetings and Brown-Bag Lunches to share and develop inspection BMPs.	
Real Estate				
8.2	110.	Does the project have a Real Estate acquisition and relocation plan?	The Central Link Project yes, but not the BH Segment.	
8.2	111.	Who prepared it?	ST Real Estate Division in collaboration with Link and the Legal Division.	
8.2	112.	When was the Plan last issued?	Not addressed.	
8.2	113.	What risks are associated with the RE Plan?	Timeliness of acquisitions and temporary construction easements. Also, balancing needs with costs.	
8.2	114.	How were these risks identified and quantified?	Not addressed.	
8.2	115.	How many RE transactions does the project have?	97	

**APPENDIX 4A**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**BEACON HILL LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Post-Project Reviews				
12.1	116.	Describe your practice(s) to collect and analyze experiences gained during and after a project phase for use in continuous improvement processes.	A lessons-learned paper addressing the test shaft was published in the FTA's depository. In addition, several technical papers have been presented to professional organizations.	There is no Link Department procedure that requires lessons learned be assembled.
12.1	117.	What were the lessons learned from closure of any phase of this project?	See # 64 & 70.	
12.2	118.	How were these lessons documented?	They have not been documented. Staff is reluctant to document experiences.	
12.1	119.	Who was involved in the compilation and analysis of project practices in this regard?	NA	

**APPENDIX 4B**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
PMP				
1.1	1.	Does the project have a project specific management plan?	Project has PMP. But no specific plan for the Segment. However, reference to other key guides, e.g. PMM, CM Manual, Policies & Procedures, also provides relevant direction.	Project references are well documented.
1.1	2.	Who prepared it?	The Link Project Control Division	
1.1	3.	What does it include?	The PMP is comprehensive; follows FTA standard.	
1.1	4.	Is the Plan updated to include variations?	Yes, however, current edition dated 2002. Update planned for later this year.	The Link PMP requires immediate update.
1.1	5.	How is the Plan maintained?	The Project Control Group is responsible for updates	
1.1	6.	When was the Plan last issued?	See above	
1.1	7.	What standards guide your project management efforts?	The Segment Team identified the PMP, CM Manual, PC Policies & Procedures, PMM, and CSA work orders as relevant to guiding practices.	
Organization				
11.1	8.	Describe your project organization.	DCM leads the team with integrated support from matrixed resources; include ST staff & consultants. CM consultant dedicated to RV.	

# APPENDIX 4B

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
1.2	9.	How are authority, responsibility and accountability documented?	These are found in the CM Manual (updated within the past few months), the Link PMP, PMM and the contracts for CM services and construction.	Responsibility for construction is well understood. Responsibility for costs, to include contingency management, require clarification.
11.2	10.	How are resources made available to the project?	Assessed by the whole RV team with DCM approving actions. This has NOT been an issue. The consultant CM team has appropriately expanded to meet growing requirements.	The RV Team has appropriately grown thus far but likely will require more resources to effectively address increasing contract administration demands.
11.1	11.	Who controls the resources?	The DCM. Regular consultation with the CM on such issues is maintained.	
11.3	12.	How are timely actions and quality services of project staff ensured?	RE and DCM review performance on on-going basis.	
11.2	13.	Is there a staffing plan?	Carter-Burgess has one for their scope. A plan for the integrated team was not available.	
11.2	14.	How are performance issues managed?	The DCM holds the responsibility to ensure appropriate and compatible resources are engaged. Staff changes were initiated to match needs and resources.	

**APPENDIX 4B**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
11.1	15.	Are roles and responsibilities clearly delineated and documented?	See #9.	
11.3	16.	What are the requisite experience, training and expertise levels of key team members?	The DCM does not have extensive construction experience in leading a significant construction effort such as the RV. The CM and consultant RE do have applicable, large project experience.	
11.2	17.	Is the PM involved in the appointment of key team members?	Yes, through the approval process. DCM relies on recommendations from matrix leaders and RE as appropriate. The DCM is considered the Segment PM	
11.3	18.	What Project Management training have key team members received?	Not addressed.	
11.3	19.	What other training relevant to their assignments have key team members received?	Not addressed.	
11.1 11.2 11.3	20.	What challenges or advantages are posed by the current organizational structure?	There are significant issues confronting the project which the project team has been unsuccessful in resolving. These include: CWP planning and scheduling. While improvements on both examples are reportedly evident, the results of the protracted impasse in scheduling is far from being reconciled, and the issue becomes more entangled with each passing month.	The caliber of schedule expertise on the RV Team requires immediate strengthening.

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
WBS				
2.1	21.	Who developed the project's WBS?	The PC Group.	
2.1	22.	Who is responsible for its maintenance?	The PC Group.	
2.1	23.	How is the WBS used?	Controlling and monitoring activities.	The WBS is appropriately structured and used.
Scope Management				
2.2	24.	What is the scope of the project?	Six miles of LRT guideway and three stations through the Rainier Valley precipitating extensive utilities relocation and protection in advance of guideway construction. Undergrounding of utilities as part of a betterment program for Seattle is also included.	
2.2	25.	How is it documented?	Reference to the CUD.	



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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
9.3	26.	How is the scope controlled?	<p>Management &amp; administration of the C0735 Contract is the first front. In addition, given the large 3<sup>rd</sup> Party scope, coordination of the 3<sup>rd</sup> Parties is essential.</p> <p>During the design phase, the task was particularly challenging in that there were seven prime contractors involved in the RV Segment.</p> <p>All too many Work Directives have been issued placing ST at considerable risk.</p>	<p>An integrated management approach is required to coordinate 3<sup>rd</sup> Party activities priorities.</p> <p>CM administrative and inspection resources will need to be increased to support the high level of Work Directives.</p>
Schedule Management				
2.2	27.	On what basis was the start and completion dates of the project determined?	ST developed construction phase schedules during design to determine and refine the CP; served as basis for contract duration of 1000 days.	
3.2	28.	How do you manage schedule?	This has been a troublesome issue. The last accepted contractor schedule submission was September 2004 (nine months ago). While the Project Master Schedule is being maintained using the 1000 day contract duration, there is no detailed schedule to substantiate it.	A credible Level 3 schedule is needed to guide ST management.

# APPENDIX 4B

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
3.1	29.	Who is responsible for schedule performance?	The DCM.	
3.1	30.	Describe the project's critical path.	As of July 11, the CP was paced by Reach 1 activities. It was reported that the CP changes often, even weekly.	
3.1	31.	How did the project define durations and interfaces along the critical path?	See #27	
3.2	32.	Describe the strengths and weakness of the current scheduling specification applied to consultants and contractors.	The specification does not require a Bases and Assumptions to accompany each submittal. Resource loading provisions are not specific to define numbers of crews to support schedule production rates.	
3.2	33.	Are resources applied to the schedule?	No. ST has agreed to abandon payment off the schedule in favor of using a schedule of values as the contractor was unable to meet specification requirements.	
3.2	34.	How are resources used in the schedule?	NA	
2.3	35.	How are time-impact analyses of contract changes performed?	This is related to # 28. There are many changes and directives where schedule rights have been reserved by the contractor.	Further schedule adjustments will be required as changes are reconciled.

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
3.4	36.	How often are forecasts of schedule performance performed?	At least monthly per P&Ps.	
3.4	37.	What float value does your project have today?	-53 days when comparing the approved contractor baseline against the May (unaccepted) submittal. Note of the extent of schedule discrepancy in this Segment is not transparent in the Agency Progress Reports.	
Budget/Cost Management				
4.2	38.	How was the project budget established?	Reference to BCE.	
4.6	39.	Were there allowances and/or contingencies provided?	Yes.	
4.6 4.7	40.	How were they applied?	In construction: \$XX in provisional sums; approximately \$15m in contingency	
4.5 6.4	41.	How are costs managed?	Monthly reviews and application of standard procedures. Project risks are not correlated to cost forecasts.	
11.1	42.	Who is responsible for cost performance?	Design Project Manager during design, now the DCM. In this instance, the same person.	PM continuation from design thru construction is a good practice.
4.5	43.	How often are cost forecasts performed?	Monthly.	
4.5	44.	Who is involved?	PC Lead, RE, OE, DCM.	An integrated cost forecasting approach is in practice.

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
4.3	45.	How are they documented?	Various forms used.	
4.5	46.	How is cost status communicated to the project and management?	Not addressed.	
4.7	47.	What tools/reports are used in controlling costs?	Enterprise 1 system, PC Group standards - Trends, CTR, etc.	
4.7	48.	Are these ST standards?	Yes.	
Performance Measurement				
1.1	49.	What are the project's performance goals?	Promoting ST as a good neighbor, attaining S/D/M/WBE goals, meeting contract schedule and budget objectives, and maintaining relationships with partners. The Outreach staff do poll the effected community and stakeholders on a quarterly basis to determine the effectiveness of outreach efforts.	Although prominent in the mind of the DCM, there are no broadly published performance metrics for the objectives related to maintaining relations with the effected community and broad stakeholders.
1.1 10.2	50.	Are these goals documented?	No.	
1.1 10.2	51.	Who measures and analyzes performance?	The Project Team believes everybody measures performance. They cite contracting goals as an example, e.g. SBE/MBE participation measured monthly with pay estimate submittal. However, there is no formal measurement system in-place.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
10.2	52.	How often is performance measured?	NA.	
10.2	53.	What standards are applied in determining performance?	NA	
10.2	54.	At what level of the WBS is data gathered for measuring performance?	The Project Team relates that data is gathered at the detail level, e.g. tracking critical path activities.	
6.3	55.	How are performance measures used to guide project management emphasis?	Not addressed.	
10.5	56.	Does your project use ad hoc reports for internal reporting?	Not addressed.	
Design Management				
8.1	57.	How were Design Criteria, Standard Drawings and Directive Drawings used on this project?	ST standards and Seattle standards were applicable: Seattle standards related to utilities while the guideway was governed by ST standards. Seattle "standards" were not always published, but rather interpretations by distinct city entities. This gray area was complicated in that these entities did not always agree on applicable standards for services in close proximity.	Defining applicable Seattle design standards was a challenge.
8.3	58.	What review(s) of contractor designs were conducted?	Standard 30%, 60% and 90% reviews were conducted. Constructability reviews were also performed.	

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### SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
8.5	59.	How were interdisciplinary efforts managed to affect an integrated design?	Weekly meetings, various checklists and the above reviews were the means to integrate designs. There were six ST prime contractors contributing to the RV Segment, and some of these primes also had teams of sub-consultants. As a result, ST design costs were high and the task of managing the design was complicated.	ST's contracting strategy for design services complicated the design development effort and led to higher design related costs.
8.4	60.	Who is the customer for the design and construction of the project?	Link Operations, the utility infrastructure owners, and the end-users.	
8.4	61.	How are Operations and Maintenance needs and issues addressed?	Issues were addressed and reconciled through the Link Systems designer (LTK).	
4.1	62.	How were estimated construction costs of the design managed?	Structured reviews were followed with cost estimate updates. Cost differences were reconciled.	
8.7	63.	Was Value Engineering performed on this project? If so, what was the outcome?	Yes, at 30%. Outcomes not addressed.	
8.6	64.	Did you perform peer / industry reviews of the design?	Yes. A panel of experienced transit peers and consultants was convened to review designs and address constructability issues.	
8.5	65.	How do designers gain input from ST construction staff?	As designs progressed, interface with Link CM staff was maintained. Also, development of the construction schedule precipitated review of staging, sequencing and related issues.	

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Construction Management				
9.1	66.	Does the project have an RE manual?	Yes, referred to as the CM Manual.	
9.1	67.	If yes, when was it last published?	Updated April 2005.	
11.1	68.	How are roles and responsibilities delineated?	See #9.	
8.5	69.	Has the CM team had input to the development of designs, contract packaging, contract specifications and special provisions?	Yes. The input was from Link CM staff. However, the consultant CM Team did not have input as they were engaged after award of the construction contract. The CM consultant indicated that an opportunity for insightful input was lost by the ST contracting strategy that called for such timing.	
8.3	70.	Was a constructability review conducted on the project? If so, what were the outcomes?	Yes. See # 64.	
9.3	71.	How are interfaces with third parties managed?	The RV Team has individuals specifically assigned to utility entities and regularly interface with their representatives. The DCM is also the manager of the CSA's with the City of Seattle pertaining to the RV Segment.	The challenge for the first half of the RV Segment is related to the management of third party utility relocations.

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
9.3 10.3 10.4	72.	How are contacts with the community managed?	Three ST staff are dedicated to the six mile segment. In addition, the contractor has two individuals assigned to work with ST. Material prepared must be translated to cover eleven languages in the diverse community. There is a storefront office in the segment and a 24/7 hotline.	The outreach effort in the RV Segment is extensive and effective in reaching a diverse community.
5.1	73.	How is quality managed?	See Quality Section.	
9.2	74.	How is safety and security managed?	Three and one-half FTE's are dedicated to safety and security, one of which is furnished by the consultant CM. Emergency vehicle access throughout the segment is of particular concern. Liaison with SFD and SDOT provides direct input to planning for and managing lane closure changes and related issues. OCIP inspections are also common.	
9.1	75.	How are scope, schedule and costs managed?	See # 7.	
9.4	76.	How are contractor requests, e.g. information, changes, payments, responded to?	All requests are addressed in the RE Weekly Meeting. All requests and submittals are tracked through the OE.	
9.4	77.	What are the average response times for requests?	RFI response time is running 7-10 days thus far despite a heavy load; through July 5 there were 539 RFI's, 700 Clarifications and 604 Submittals.	
9.4	78.	How are requests monitored?	OE uses Expedition.	



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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
Permitting				
9.5	79.	How was permitting work planned?	A Master Permit Register was established early and regularly monitored. Permits were grouped in several categories: environmental, working with resource agencies; owner furnished, usually complex and long-lead; and contractor secured.	
9.5	80.	How was this plan integrated with the project schedule?	Project Controls group maintained regular interface with the Permits staff.	
9.5	81.	Who is responsible for identifying and securing required permits?	Reliance was on the Permits staff.	
9.5	82.	What tools are used to monitor permit status?	Master Permit Register	
8.2	83.	What are the challenges of securing permits on-time?	Securing timely 3 <sup>rd</sup> Party comments to complete designs before permits are definitively reviewed. In many instances, late design comments are from the same general entity that will review the permit(s). There are two Seattle entities to process permits through; they are not always coordinated. A \$1.7m change resulted from comments received from Seattle after the contract had been awarded. These changes precipitated many changes including specifying restrained joint pipe for \$470k. This issue was apparently not a Seattle standard but adherence to the pipe spec was precedent to issuing a permit.	

**APPENDIX 4B**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
8.2 9.5	84.	What aspects of the permitting effort worked well?	Not addressed.	
8.2	85.	What aspects of the permitting effort require improvement?	See # 57 regarding standards.	
Contracts				
7.1	86.	How was procurement planned?	See # 59 regarding design services.  A Best-Value procurement process was used to secure construction services.	Contractual arrangements for design services were complex and cumbersome.
7.1	87.	Who developed the procurement plan?	In construction, Link defined their needs with Contracts providing support.  ST staff involved in the procurement selection indicate that the relative weighting of criteria for quality versus costs, as established and as followed, inhibited the best-value selection process in as far as costs dominated the scoring against criteria; the winning proposal was approximately \$10m below the next proposed costs.	In establishing best-value procurement evaluation criteria, extensive modeling of potential results from proposed weighting of criteria should be performed to ensure appropriate flexibility is inherent in the process.
7.3	88.	What kind of performance measures were incorporated into contracts?	Not addressed.	
7.3	89.	What processes are used to ensure contract documents are complete and consistent?	A formal buy-off process was described that included the use of checklists.	

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
7.3 3.2	90.	Who developed the Special Provisions?	The Design Project Manager (who is now the DCM) led the effort. The SPs are extensive their breadth and detail.	
7.3	91.	How often are contracts reviewed to ensure that requirements are being met?	<p>In construction, the CM consultant is charged with this responsibility. As told, this is reviewed on an on-going basis. To-date, Contract Division staff have not played a significant role in this regard. The DCM advised that the RV Team intends to augment the role of contract administrators to participate in this regard as well as provide insight on the management of changes.</p> <p>As of July 11, there were several contractor pay estimates in process. This is a serious issue and essential to maintain contractor cash flow. If not reconciled and the process improved, contentious relations will result.</p>	Improvements in the processing of contractor payments are required.
Change Management				
7.3 2.3	92.	How are contract changes governed?	The PC Procedures are followed.	
2.3	93.	What level of authority does the PM have in regard to contract changes?	Authority levels for the RE and DCM of \$50k & \$100k were cited.	
2.4	94.	How are changes documented?	Through the Expedition program.	

**APPENDIX 4B**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

Topic/Reference		Question	Observations	Finding
Risk Management				
6.2	95.	What are the critical risks facing the project?	Real Estate access, 3 <sup>rd</sup> Party coordination, Maintenance of traffic flows. Identification and removal of contaminated soils, Escalation costs, Qualified labor resources.	Risks are well known and understood.
6.1	96.	How were they identified?	Risks were/are identified through peer reviews, intuition, the PMOC Risk Assessment, etc. This is an on-going effort.	
6.1	97.	Describe your process for assessing risks.	Informal processes dominate all risk management efforts.	
6.1	98.	Was there a formal risk assessment for the project?	No. However, a compilation and quantification of risks was performed in support of the BCE. Identified risks from this effort were/are not formally monitored.	
6.2 6.3	99.	How are risks monitored and managed?	Informally.	While the project team is actively engaged in risk management activities, they do not use formal tools to monitor and manage risks.
6.4	100.	What tools are used to monitor and manage risks?	The RE Weekly Meeting addresses risk regularly, and maintains a list of risks. Also, the RV Team indicated that the weekly engineering meeting with the contractor addresses risks.	
6.4	101.	How often are risks reviewed?	Regularly, but not through the application of a formal procedure.	

**APPENDIX 4B**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
6.3	102.	Who is responsible for the critical risks?	DCM	
Quality Management				
5.1	103.	Does the project have a Quality Management Plan?	The Central Link Project yes, but not the RV Segment. The contractor, in compliance with contract requirements developed a QA Plan.	
5.2	104.	What resources are dedicated to quality management?	The Link Project provides resources on a matrixed basis for QA purposes; their efforts are generally limited to Audits and Surveillance. The CM consultant has dedicated field inspectors whose principal duty is to monitor quality control efforts. Finally, the contractor has its own inspectors.	The roles of each tier of quality management are understood.
5.4	105.	How do you monitor quality standards?	See #104. Also, the requirement for CWP's assists in defining quality standards specific to planned work efforts.	
5.1 5.2	106.	Who is responsible for quality?	See #104.	
5.4	107.	Are quality assurance audits conducted?	Yes.	
5.4	108.	If Findings from an audit are made, how are they reconciled?	Per the QA Plan.	
5.4	109.	What tools are used to monitor quality?	QA Surveillance, Audits, Regular meetings and Brown-Bag Lunches to share and develop inspection BMPs.	

**APPENDIX 4B**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Real Estate				
8.2	110.	Does the project have a Real Estate acquisition and relocation plan?	The Central Link Project yes, but not the RV Segment.	
8.2	111.	Who prepared it?	ST Real Estate Division in collaboration with Link and the Legal Division. There were over 450 real estate transactions in support of the RV Segment. All required access was provided to the contractor in a timely fashion. Appropriate Right-of-Entry stipulations for those properties that were in condemnation were secured. Two parcel owners have been re-entered into negotiation with ST as segment requirements were altered due to minor scope changes.	Real Estate Acquisition and Relocation activities were well managed on the RV Segment; on-time access to over 450 parcels was provided to the contractor.
8.2	112.	When was the Plan last issued?	Not addressed.	
8.2	113.	What risks are associated with the RE Plan?	The large number of acquisitions and relocations.	
8.2	114.	How were these risks identified and quantified?	Not addressed.	
8.2	115.	How many RE transactions does the project have?	Over 450	

**APPENDIX 4B**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
RAINIER VALLEY/MLK LINE SEGMENT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Post-Project Reviews				
12.1	116.	Describe your practice(s) to collect and analyze experiences gained during and after a project phase for use in continuous improvement processes.	There are no established practices.	
12.1	117.	What were the lessons learned from closure of any phase of this project?	See # 57, 59 & 87.	
12.2	118.	How were these lessons documented?	They have not been documented.	
12.1	119.	Who was involved in the compilation and analysis of project practices in this regard?	NA	

**APPENDIX 4C**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
PMP				
1.1	1.	Does the project have a project specific management plan?	No. The design consultant did prepare a Project Manual which addressed their scope of work.	
1.1	2.	Who prepared it?	The design consultant, Inca Engineers.	
1.1	3.	What does it include?	Limited to final design issues.	
1.1	4.	Is the Plan updated to include variations?	No. This project was completed approximately two years ago.	
1.1	5.	How is the Plan maintained?	NA	
1.1	6.	When was the Plan last issued?		
1.1	7.	What standards guide your project management efforts?	ST references were being developed as the project was initiated. Early versions of the ST PMP, and later the Regional Express (REX) PMP (August 2003), the Construction Manual (March 2002) and early REX policies and procedures were also available.	



**APPENDIX 4C**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Organization				
11.1	8.	Describe your project organization.	The PM led the team with integrated support from matrixed resources. During construction, a REX CM oversaw day-to-day operations and assumed a prominent role with delegated PM authorities.	The PM did not demonstrate a posture consistent with the stated concept that the PM had continuous responsibility from design through construction. Inconsistent PM responsibilities were also noted in published references from the above concept.
1.2	9.	How are authority, responsibility and accountability documented?	See # 7.	
11.2	10.	How are resources made available to the project?	Administrative managers identified and assigned staff as required.	
11.1	11.	Who controls the resources?	Administrative managers. However, the PM indicated resource availability and quality was not an issue.	
11.3	12.	How are timely actions and quality services of project staff ensured?	See 10 & 11.	
11.2	13.	Is there a staffing plan?	No.	

**APPENDIX 4C**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
11.2	14.	How are performance issues managed?	See # 11.	
11.1	15.	Are roles and responsibilities clearly delineated and documented?	No. See # 8.	
11.3	16.	What are the requisite experience, training and expertise levels of key team members?	The PM and CM are both deep in relevant project experience.	
11.2	17.	Is the PM involved in the appointment of key team members?	PM options are limited due to Department size and resources available. See #11.	
11.3	18.	What Project Management training have key team members received?	No formal training indicated on resumes.	
11.3	19.	What other training relevant to their assignments have key team members received?	Other than academic training in engineering, no relevant project management training indicated.	
11.1 11.2 11.3	20.	What challenges or advantages are posed by the current organizational structure?	The project PM role was transferred as it moved into construction. While the Project Team conveys that the PM retains the helm, in effect, it is delegated to the CM.	
WBS				
2.1	21.	Who developed the project's WBS?	The PC Group.	

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
2.1	22.	Who is responsible for its maintenance?	The PC Group.	
2.1	23.	How is the WBS used?	Various logical uses conveyed.	The WBS is appropriately structured and used.
Scope Management				
2.2	24.	What is the scope of the project?	Development of Transit center to include 20 bus bays and expansion of park and ride capacity.	The project baseline configuration of scope, schedule and budget was not definitively established until late 2003.
2.2	25.	How is it documented?	Annual budget requests are only source of documentation.	
9.3	26.	How is the scope controlled?	Without a definitive baseline established, scope control is not a practical function. During construction, CM administers the construction services contract with formal change protocols overseen by ST CM.	
Schedule Management				
2.2	27.	On what basis was the start and completion dates of the project determined?	For construction, the schedule was developed by working backward from the operator's scheduled service change.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
3.2	28.	How do you manage schedule?	In construction, the consultant CM Team administered contract requirements that included CPM schedule requirements.	
3.1	29.	Who is responsible for schedule performance?	The ST CM, monitored and analyzed the consultant CM Team's scheduling review efforts.	
3.1	30.	Describe the project's critical path.	Project completed in fall 2003.	
3.1	31.	How did the project define durations and interfaces along the critical path?	Contractor developed the logic and durations based on contract milestone requirements.	
3.2	32.	Describe the strengths and weakness of the current scheduling specification applied to consultants and contractors.	The ST CM was comfortable with the schedule specification.	
3.2	33.	Are resources applied to the schedule?	No.	
3.2	34.	How are resources used in the schedule?	NA	
2.3	35.	How are time-impact analyses of contract changes performed?	The CM Team administered changes following ST requirements that include a time impact analysis.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
3.4	36.	How often are forecasts of schedule performance performed?	Reviews were performed monthly by the CM consultant in advance of pay estimate processing.	
3.4	37.	What float value does your project have today?	NA. See #30.	
Budget/Cost Management				
4.2	38.	How was the project budget established?	Original budget was established as part of Sound Move planning.	
4.6	39.	Were there allowances and/or contingencies provided?	Yes for contingencies.	
4.6 4.7	40.	How were they applied?	10% contingency applied to construction.	The contingency not reflective of identified risks.
4.5 6.4	41.	How are costs managed?	Monthly reviews and application of standard procedures. Project risks were not traced through cost forecasts. Cost estimates were produced with formal design reviews at 60% and 90%.	
11.1	42.	Who is responsible for cost performance?	Project Manager.	
4.5	43.	How often are cost forecasts performed?	The PM indicated that costs were regularly evaluated. PC procedures were in-place to assist process in construction.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
4.5	44.	Who is involved?	PC staff and PM during design. The ST CM was involved during construction with advice to the PM on an exception basis only.	
4.3	45.	How are they documented?	Per PC procedures to include Trends and Forecasts.	
4.5	46.	How is cost status communicated to the project and management?	Forecasts were used in formal reporting process to include the Agency Progress Report.	
4.7	47.	What tools/reports are used in controlling costs?	See # 45.	
4.7	48.	Are these ST standards?	Yes.	
Performance Measurement				
1.1	49.	What are the project's performance goals?	Meeting the service date change was a key objective as was the completion within the working budget.	
1.1 10.2	50.	Are these goals documented?	Yes, per the annual budgeting process.	
1.1 10.2	51.	Who measures and analyzes performance?	The PM and CM measured progress on a monthly basis for progress achieved and forecast.	
10.2	52.	How often is performance measured?	See # 51.	
10.2	53.	What standards are applied in determining performance?		

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
10.2	54.	At what level of the WBS is data gathered for measuring performance?	Assessments were global by the PM and CM. However, underlying Trends and Forecasts were based on contract level data. CM also regularly focused on the CPM schedule to substantiate forecast completion.	
6.3	55.	How are performance measures used to guide project management emphasis?	CPM assessments led to areas of emphasis until issues were resolved or critical sequences were completed.	
10.5	56.	Does your project use ad hoc reports for internal reporting?	No.	
Design Management				
8.1	57.	How were Design Criteria, Standard Drawings and Directive Drawings used on this project?	No ST standards were in-place to guide designs. Rather, City of Lynnwood guides were applied as appropriate. Also, service provider's preferences were considered.	
8.3	58.	What review(s) of contractor designs were conducted?	Standard 30%, 60% and 90% reviews were conducted.	
8.5	59.	How were interdisciplinary efforts managed to affect an integrated design?	Regular meetings were held to develop and maintain integrated designs.	
8.4	60.	Who is the customer for the design and construction of the project?	Community Transit and the City of Lynnwood.	

# APPENDIX 4C

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
8.4	61.	How are Operations and Maintenance needs and issues addressed?	A full-scale mock-up of the bus facility was made to review needs and preferences. Also, the project team maintained dialogue with Lynnwood representatives to gain their buy-in to the design elements.	ST invested in a full-scale mock-up of the bus facility to demonstrate design features to partner operator agencies.
4.1	62.	How were estimated construction costs of the design managed?	Structured reviews were followed with cost estimate updates.	
8.7	63.	Was Value Engineering performed on this project? If so, what was the outcome?	Yes, at 30%.	
8.6	64.	Did you perform peer / industry reviews of the design?	No.	
8.5	65.	How do designers gain input from ST construction staff?	ST CM was a reviewer in 60% and 90% design reviews.	
Construction Management				
9.1	66.	Does the project have an RE manual?	Yes, KBA developed a project-specific plan.	



**APPENDIX 4C**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
9.1	67.	If yes, when was it last published?	Project completed in 2003.	
11.1	68.	How are roles and responsibilities delineated?	See #7.	
8.5	69.	Has the CM team had input to the development of designs, contract packaging, contract specifications and special provisions?	Yes. The majority of input was from the ST CM. However, the consultant CM Team did have input focused on the 90% design submittal.	
8.3	70.	Was a constructability review conducted on the project? If so, what were the outcomes?	Yes. It was performed by the ST CM.	
9.3	71.	How are interfaces with third parties managed?	The RE is the point. Regular informal communication was the norm. Also, reliance on the terms of agreements was emphasized. During design, third parties were included in formal reviews to ensure they were aware of development and impacts to their infrastructure and or plans.	
9.3 10.3 10.4	72.	How are contacts with the community managed?	The project had an Executive Advisory Committee that was comprised of a broad stakeholder base. Also, regular mailings and media releases were provided during construction.	
5.1	73.	How is quality managed?	See # 105.	Quality Management roles and responsibilities were clearly conveyed.

# APPENDIX 4C

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
9.2	74.	How is safety and security managed?	Serious consideration for safety was articulated. Weekly toolbox meetings were conducted. In addition, the RE Manual outlined requirements that were adhered-to. The project had zero lost-time incidents.	There were zero lost-time incidents.
9.1	75.	How are scope, schedule and costs managed?	Expedition was used to track costs. The contractor was required to submit P3 schedules which were in-turn reviewed by KBA with oversight from ST. Also used 3-week look-ahead schedules tied to the CPM.	
9.4	76.	How are contractor requests, e.g. information, changes, payments, responded to?	Expedition is used.	
9.4	77.	What are the average response times for requests?	The CM indicated a 3-4-day turnaround on RFI's. RFI's are also addressed at the weekly construction meetings.	
9.4	78.	How are requests monitored?	Expedition is used to monitor requests.	
Permitting				
9.5	79.	How was permitting work planned?	The PM interfaced with Environmental Group (Legal).	
9.5	80.	How was this plan integrated with the project schedule?	The Environmental Group maintained this perspective as part of their agency-wide priorities list.	
9.5	81.	Who is responsible for identifying and securing required permits?	The Environmental Group took the lead.	

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
9.5	82.	What tools are used to monitor permit status?	See # 80.	
8.2	83.	What are the challenges of securing permits on-time?	Gaining responses from resource agencies.	
8.2 9.5	84.	What aspects of the permitting effort worked well?	The prioritization of agency-wide requests to approving agencies.	
8.2	85.	What aspects of the permitting effort require improvement?		
Contracts				
7.1	86.	How was procurement planned?		
7.1	87.	Who developed the procurement plan?		
7.3	88.	What kind of performance measures were incorporated into contracts?	There were none.	
7.3	89.	What processes are used to ensure contract documents are complete and consistent?	Quality reviews were conducted. Also followed a 'ready-to-ad' review protocol.	
7.3 3.2	90.	Who developed the Special Provisions?	The project team.	

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
LYNNWOOD TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
7.3	91.	How often are contracts reviewed to ensure that requirements are being met?	On a daily basis as the consultant CM Team was charged with administration of the contract. There were no special reviews intended to verify compliance.	
Change Management				
7.3 2.3	92.	How are contract changes governed?	Applicable ST and Department Policies & Procedures were followed.	
2.3	93.	What level of authority does the PM have in regard to contract changes?	Authority for changes was not clearly understood by the PM. The project team clarified that the CM has \$10k authority while the PM has \$25k provided they are within the Board allocated contingency.	PM's authority for changes not clearly understood.
2.4	94.	How are changes documented?	The project team follows ST protocols using Expedition. Contract administrators only provide review of assembled documentation	
Risk Management				
6.2	95.	What are the critical risks facing the project?	Third party expectations, the budget, lead-times for storm water vaults, schedule performance to make service change date.	Risks were known and understood.
6.1	96.	How were they identified?	There was no formal assessment of risks; the evolution of planning and design efforts exposed the risks. However, Inca did compile a list of significant risks which were contained in their Project Manual. The approximate fifteen risks were categorized by their potential to impact scope, schedule and cost. There was no evidence that these risks were regularly monitored thereafter. KBA also provided their perspective on construction risks which was documented.	Consultant teams provided their respective perspectives on project risks for ST advice.

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
6.1	97.	Describe your process for assessing risks.	Informal processes dominated all risk management efforts.	
6.1	98.	Was there a formal risk assessment for the project?	No.	
6.2 6.3	99.	How are risks monitored and managed?	Informally.	While the project team was actively engaged in risk management activities, they did not use formal tools to monitor and manage risks.
6.4	100.	What tools are used to monitor and manage risks?	No specific tools were used.	
6.4	101.	How often are risks reviewed?	Regularly, but not through the application of a formal procedure.	
6.3	102.	Who is responsible for the critical risks?	PM	
Quality Management				
5.1	103.	Does the project have a Quality Management Plan?	No. However, a Department Quality Plan was developed in early 2002 and the project was subject to its provisions.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
5.2	104.	What resources are dedicated to quality management?	<p>In 2003, the project was subject to a quality assurance audit and a separate quality oversight review, both performed by consultants. Consultants were engaged as Department Quality Management resources were limited. However, during construction, quality management resources were made available through the CM contract.</p> <p>The above audit and review did identify issues with appropriate recommendations for improvement. These recommendations led to revisions incorporated into an updated QA Plan and review of varied support processes to include document control.</p>	The project had limited agency-based Quality Assurance reviews.
5.4	105.	How do you monitor quality standards?	The designer and construction contractors were responsible for their quality control functions. The CM Team was responsible for QA functions during construction.	
5.1 5.2	106.	Who is responsible for quality?	See above.	
5.4	107.	Are quality assurance audits conducted?	See # 104.	
5.4	108.	If Findings from an audit are made, how are they reconciled?	Non Conformance Reports were reconciled during the construction phase per the REX QA Plan and Construction Manual.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
5.4	109.	What tools are used to monitor quality?	Design reviews and field inspections had established template reports to track reviews.	
Real Estate				
8.2	110.	Does the project have a Real Estate acquisition and relocation plan?	A formal plan was not developed. However, the Real Estate Division did collaborate with the PM to define required actions.	
8.2	111.	Who prepared it?	See above.	
8.2	112.	When was the Plan last issued?	All property was acquired by 2003.	
8.2	113.	What risks are associated with the RE Plan?	Costs associated with the major 5-acre acquisition.	
8.2	114.	How were these risks identified and quantified?		
8.2	115.	How many RE transactions does the project have?	7-8 parcels total.	
Post-Project Reviews				
12.1	116.	Describe your practice(s) to collect and analyze experiences gained during and after a project phase for use in continuous improvement processes.	There are no established procedures or practices. Although the project was substantially completed two years ago, no documented lessons learned have been assembled.	Lessons learned procedures have not been adopted by either the Capital Projects or Link Departments.

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
12.1	117.	What were the lessons learned from closure of any phase of this project?	The management of contaminated soils, i.e. payment provisions. This lesson was actually applied to the Federal Way Transit Center Project.	
112.2	118.	How were these lessons documented?	They have not been documented. Although not documented, lessons learned are regularly discussed among staff.	
13.1	119.	Who was involved in the compilation and analysis of project practices in this regard?	NA	



# APPENDIX 4D

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
PMP				
1.1	1.	Does the project have a project specific management plan?	No. The design consultant did prepare a plan addressing their scope of work.	
1.1	2.	Who prepared it?	The design consultant, KPFF.	
1.1	3.	What does it include?	Limited to final design issues.	
1.1	4.	Is the Plan updated to include variations?	No.	
1.1	5.	How is the Plan maintained?	NA	
1.1	6.	When was the Plan last issued?	Not addressed.	
1.1	7.	What standards guide your project management efforts?	ST and Capital Projects PMPs offer general guidance. There are also procedures that are useful.	
Organization				
11.1	8.	Describe your project organization.	The PM leads the team with integrated support from matrixed resources; includes ST staff & consultants. During construction, a Department CM oversees day-to-day operations with regular contact back to the PM.	The PM's standing is diminished in construction.
1.2	9.	How are authority, responsibility and accountability documented?	These are now documented in a series of references to include the RE Manual and Capital Department PMP. These references were not available at the initiation of this project.	There is ambiguity in the role of the PM as described in the cited references.

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
11.2	10.	How are resources made available to the project?	Not addressed specifically. However, the PM indicated that the project did/does not have resources issues.	
11.1	11.	Who controls the resources?	The PM indicated it is his responsibility.	
11.3	12.	How are timely actions and quality services of project staff ensured?	See 10 & 11.	
11.2	13.	Is there a staffing plan?	The CM consultant (Harris Associates) has one for their scope. A plan for the integrated team was not available. However, the annual budgeting process does identify resource (labor) requirements by phase; it can be monitored.	
11.2	14.	How are performance issues managed?	The PM holds the responsibility to ensure appropriate and compatible resources are engaged and performing. Again, there has not been an issue of this type.	
11.1	15.	Are roles and responsibilities clearly delineated and documented?	See #9.	
11.3	16.	What are the requisite experience, training and expertise levels of key team members?	Not addressed.	
11.2	17.	Is the PM involved in the appointment of key team members?	PM options are limited.	
11.3	18.	What Project Management training have key team members received?	Not addressed.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
11.3	19.	What other training relevant to their assignments have key team members received?	Not addressed.	
11.1 11.2 11.3	20.	What challenges or advantages are posed by the current organizational structure?	The project PM role was transferred as it moved into construction. While the Project Team conveys that the PM retains the helm, in effect, it is delegated to the CM.	
WBS				
2.1	21.	Who developed the project's WBS?	The PC Group.	
2.1	22.	Who is responsible for its maintenance?	The PC Group.	
2.1	23.	How is the WBS used?	Progress taking.	The WBS is appropriately structured and used.
Scope Management				
2.2	24.	What is the scope of the project?	Transit center to include a 1,200 stall, five- level parking structure and 8 bus bays. Accounts of challenges with project partners indicate that planning activities were being conducted / negotiated during final design.	The project baseline configuration of scope, schedule and budget was not definitively established prior to initiating final design.
2.2	25.	How is it documented?	Reference to the annual budget requests are general. Baseline was not established until after final design began.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
9.3	26.	How is the scope controlled?	Without a definitive baseline established, scope control is not a practical function. During construction, CM administers the construction services contract with formal change protocols overseen by ST CM .	
Schedule Management				
2.2	27.	On what basis was the start and completion dates of the project determined?	Working backwards, this project was linked to the HOV project to ensure complementary facilities were available to one another. Also, the regularly scheduled transit operator service change of February 2007 was key. Also see # 24 Finding.	
3.2	28.	How do you manage schedule?	In construction, the consultant CM Team administers contract requirements that include schedule requirements. However, this is only focused on the TC construction and does not include a perspective on the HOV project and/or transit operator's training duration.	
3.1	29.	Who is responsible for schedule performance?	The ST CM, monitors and analyzes the consultant CM Team's scheduling review efforts. However, the PM retains the responsibility.	
3.1	30.	Describe the project's critical path.	See # 37.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
3.1	31.	How did the project define durations and interfaces along the critical path?	Not addressed.	
3.2	32.	Describe the strengths and weakness of the current scheduling specification applied to consultants and contractors.	Not addressed.	
3.2	33.	Are resources applied to the schedule?	No.	
3.2	34.	How are resources used in the schedule?	NA	
2.3	35.	How are time-impact analyses of contract changes performed?	Not addressed	
3.4	36.	How often are forecasts of schedule performance performed?	Reviews are performed monthly by the CM consultant.	
3.4	37.	What float value does your project have today?	Approximately 6 weeks as measured against the anticipated Service Change Date.	
Budget/Cost Management				
4.2	38.	How was the project budget established?	Original budget was established as part of Sound Move planning.	

# APPENDIX 4D

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
4.6	39.	Were there allowances and/or contingencies provided?	Yes for contingencies. No allowances as design had been completed when the budget was baselined.	
4.6 4.7	40.	How were they applied?	In construction: 10% contingency was applied to the contract.	Contingency was not correlated to identified risks.
4.5 6.4	41.	How are costs managed?	Monthly reviews and application of standard procedures. Project risks are not traced through cost forecasts.	
11.1	42.	Who is responsible for cost performance?	Project Manager.	
4.5	43.	How often are cost forecasts performed?	The PM indicated that costs are evaluated on an on-going basis. Monthly formal reviews are performed consistent with procedures.	
4.5	44.	Who is involved?	Not addressed.	
4.3	45.	How are they documented?	Not addressed.	
4.5	46.	How is cost status communicated to the project and management?	Formal reporting is provided for inclusion into Agency Progress Report.	
4.7	47.	What tools/reports are used in controlling costs?	Use of the "Forecast Sheet" was indicated.	
4.7	48.	Are these ST standards?	Yes, they reflect a Capital Projects Dept. standard.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
Performance Measurement				
1.1	49.	What are the project's performance goals?	Physical completion by 2005; February 2006 operations (Service Change). Completion within the current working budget: \$39.5m. Maintaining positive working relations with Federal Way, Chamber of Commerce, and School District.	There are no performance metrics for the objectives related to maintaining relations with stakeholders.
1.1 10.2	50.	Are these goals documented?	No.	
1.1 10.2	51.	Who measures and analyzes performance?	The PM, and all staff, are reviewed annually on individual performance. These reviews are done by administrative supervisors.	
10.2	52.	How often is performance measured?	See # 51.	
10.2	53.	What standards are applied in determining performance?	Not addressed.	
10.2	54.	At what level of the WBS is data gathered for measuring performance?	NA	
6.3	55.	How are performance measures used to guide project management emphasis?	NA	
10.5	56.	Does your project use ad hoc reports for internal reporting?	Not addressed.	

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Design Management				
8.1	57.	How were Design Criteria, Standard Drawings and Directive Drawings used on this project?	Not addressed	
8.3	58.	What review(s) of contractor designs were conducted?	Standard 30%, 60% and 90% reviews were conducted.	
8.5	59.	How were interdisciplinary efforts managed to affect an integrated design?	Regular meetings were held to develop and maintain integrated designs. Checklists were used in the latter stages to maintain a current read on design progress and outstanding issues.	
8.4	60.	Who is the customer for the design and construction of the project?	Transit operators and the riding public.	
8.4	61.	How are Operations and Maintenance needs and issues addressed?	Issues were addressed and reconciled with transit operator partners.	
4.1	62.	How were estimated construction costs of the design managed?	Structured reviews were followed with cost estimate updates. Cost differences were reconciled.	



**APPENDIX 4D**

**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
8.7	63.	Was Value Engineering performed on this project? If so, what was the outcome?	Yes, at 30%. Outcomes not addressed.	
8.6	64.	Did you perform peer / industry reviews of the design?	Yes.	
8.5	65.	How do designers gain input from ST construction staff?	ST CM was a reviewer in 30%, 60% and 90% design reviews.	
Construction Management				
9.1	66.	Does the project have an RE manual?	Yes, Harris Associates developed a project-specific plan.	
9.1	67.	If yes, when was it last published?	Not addressed.	
11.1	68.	How are roles and responsibilities delineated?	See #9.	
8.5	69.	Has the CM team had input to the development of designs, contract packaging, contract specifications and special provisions?	Yes. The majority of input was from the ST CM. However, the consultant CM Team did have input focused on a nearly complete package.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
8.3	70.	Was a constructability review conducted on the project? If so, what were the outcomes?	Yes. It was performed by the CM consultant based on the 90% submittal.	
9.3	71.	How are interfaces with third parties managed?	The RE is the point. Agreements serve as an umbrella for specific coordination of commitments.	
9.3 10.3 10.4	72.	How are contacts with the community managed?	This is a joint responsibility of ST, the consultant CM and project partners.	
5.1	73.	How is quality managed?	Quality responsibility rests with the contractor. The consultant CM oversees contractor efforts and performs Materials Testing procedures. ST provides QA services through Department resources.	Quality Management roles and responsibilities are well understood.
9.2	74.	How is safety and security managed?	<p>A ST security review will be planned for late in the project to orientate its focus toward operations. Construction safety and security requirements are articulated in the contract; a project specific plan is in-place - the CM consultant monitors its implementation. ST's Safety Manager conducts regular reviews with Findings provided for PM reconciliation. OCIP representatives also performs quarterly reviews.</p> <p>Safety and security considerations (lighting, blind spots, railings, etc. were incorporated into designs based on general criteria.</p>	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
9.1	75.	How are scope, schedule and costs managed?	See # 7.	
9.4	76.	How are contractor requests, e.g. information, changes, payments, responded to?	Weekly meetings address on-going issues including contractor requests. The ST CM monitors requests based on perceived or stated priorities.	
9.4	77.	What are the average response times for requests?	PM and CM indicated a 4-day turnaround on RFI's. RFI's are also addressed at the weekly construction meetings.	
9.4	78.	How are requests monitored?	Expedition is used to monitor requests.	
Permitting				
9.5	79.	How was permitting work planned?	The PM interfaces with appropriate staff to A Master Permit Register was established early and regularly monitored. Permits were grouped in several categories: environmental, working with resource agencies; owner furnished, usually complex and long-lead; and contractor secured.	
9.5	80.	How was this plan integrated with the project schedule?	Not addressed.	
9.5	81.	Who is responsible for identifying and securing required permits?	The PM worked with ST resources (Legal Division) to identify permits requiring specialty assistance. The final designer also supported this effort.	Inherent ST expertise related to permitting was well used to define and secure permit needs.

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
9.5	82.	What tools are used to monitor permit status?	The initial list was maintained through regular updates.	
8.2	83.	What are the challenges of securing permits on-time?	The complexities (and politics) of securing land-use permits.	
8.2 9.5	84.	What aspects of the permitting effort worked well?	Judicious use of Essential Public Facilities determinations in securing permits.	
8.2	85.	What aspects of the permitting effort require improvement?	Clarifying code applicability in facility designs. Term sheets may be helpful.	
Contracts				
7.1	86.	How was procurement planned?	Not addressed.	
7.1	87.	Who developed the procurement plan?	Not addressed.	
7.3	88.	What kind of performance measures were incorporated into contracts?	Not addressed.	
7.3	89.	What processes are used to ensure contract documents are complete and consistent?	Formal checklists were applied. Now the Department has a Chief Engineer's Review Procedure to coordinate final reviews.	

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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT  
FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
7.3 3.2	90.	Who developed the Special Provisions?	The Project Manager and ST CM were focal points in the development of SPs. Final designer input was also instrumental.	
7.3	91.	How often are contracts reviewed to ensure that requirements are being met?	Not addressed.	
Change Management				
7.3 2.3	92.	How are contract changes governed?	Applicable ST and Department Policies & Procedures are followed.	
2.3	93.	What level of authority does the PM have in regard to contract changes?	Costs up to \$50k and any schedule change resulting in a completion date change.	
2.4	94.	How are changes documented?	Through the Expedition program.	
Risk Management				
6.2	95.	What are the critical risks facing the project?	The site selection process to link the TC with the HOV Project, Federal Way zoning issues (EPF), Right-of-Way Acquisitions, Partnering with project stakeholders.	Risks are well known and understood.
6.1	96.	How were they identified?	There was no formal assessment of risks. Evolution of planning and design efforts exposed the risks. Construction risks are minimal.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY TRANSIT CENTER PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
6.1	97.	Describe your process for assessing risks.	Informal processes dominate all risk management efforts.	
6.1	98.	Was there a formal risk assessment for the project?	No. See # 96.	
6.2 6.3	99.	How are risks monitored and managed?	Informally.	While the project team is actively engaged in risk management activities, they do not use formal tools to monitor and manage risks.
6.4	100.	What tools are used to monitor and manage risks?	No specific tools are used.	
6.4	101.	How often are risks reviewed?	Regularly, but not through the application of a formal procedure.	
6.3	102.	Who is responsible for the critical risks?	PM	
Quality Management				
5.1	103.	Does the project have a Quality Management Plan?	No. However, a Department Quality Plan was developed in early 2002 and the project was subject to its provisions	
5.2	104.	What resources are dedicated to quality management?	The Capital Projects Department provides resources on a matrixed basis for QA purposes. The CM consultant has dedicated field inspectors whose principal duty is to monitor quality control efforts. Finally, the contractor has its own inspectors.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
5.4	105.	How do you monitor quality standards?	See #104.	
5.1 5.2	106.	Who is responsible for quality?	See #104.	
5.4	107.	Are quality assurance audits conducted?	Department standards provide for audits.	
5.4	108.	If Findings from an audit are made, how are they reconciled?	Per QA Plan provisions.	
5.4	109.	What tools are used to monitor quality?	QA surveillances and audits are available.	
Real Estate				
8.2	110.	Does the project have a Real Estate acquisition and relocation plan?	A formal plan was not developed. However, required actions were identified and monitored.	
8.2	111.	Who prepared it?	ST Real Estate Division in collaboration with the PM. The final designer also contributed insight.	
8.2	112.	When was the Plan last issued?	Not addressed.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
8.2	113.	What risks are associated with the RE Plan?	Acquisition of property owned by the local school district. This transaction was characterized by protracted negotiations.	
8.2	114.	How were these risks identified and quantified?	Interface with school district representatives. No formal risk assessment was performed.	
8.2	115.	How many RE transactions does the project have?	Only 3 or 4 major fee transactions were required for the TC. Several other easements were also needed.	
Post-Project Reviews				
12.1	116.	Describe your practice(s) to collect and analyze experiences gained during and after a project phase for use in continuous improvement processes.	There are no established practices. However, numerous standards and guidelines have been, and continue to be, refined as a result of experiences gained.	
12.1	117.	What were the lessons learned from closure of any phase of this project?	See # 85 & 95.	
12.2	118.	How were these lessons documented?	They have not been documented.	
12.1	119.	Who was involved in the compilation and analysis of project practices in this regard?	NA	



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**SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT**

**FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE**

<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
PMP				
1.1	1.	Does the project have a project specific management plan?	ST did not develop a PMP but one was developed by WSDOT addressing the construction phase. WSDOT processes were applied to both design and construction phases. ST did not mandate an overall guide.	
1.1	2.	Who prepared it?	WSDOT	
1.1	3.	What does it include?	Two and one-half pages of text is included along with several attachments. Topics include: Organization, Scope, Pre-Construction, CM, Funding, Change Order Administration and Disputes Resolution.	
1.1	4.	Is the Plan updated to include variations?	File copy is undated.	
1.1	5.	How is the Plan maintained?	Not addressed	
1.1	6.	When was the Plan last issued?	See # 4.	
1.1	7.	What standards guide your project management efforts?	ST now relies on the Capital Project Department PMP for ST PM guidance. This reference was not available at the initiation of this project. Department procedures are also applicable.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
Organization				
11.1	8.	Describe your project organization.	Characterization of the project from the WSDOT representative was that WSDOT served as a consultant to ST. Both design and construction was/is led by WSDOT. The WSDOT PMP does not reference the ST PM but rather identifies the ST Program Manager as the contact above the ST CM.	The ST Project Manager was not included in the ST/WSDOT organization chart.
11.2	9.	How are authority, responsibility and accountability documented?	Project-specific descriptions of relationships are not documented. There are Department references which cover these in a generic fashion. However, it is understood that similar relationships exist as described in the TC whereby the ST PM leads the team and is assisted by an ST CM who manages day-to-day operations during the construction phase. WSDOT in-turn, through the designated project engineer, relates current construction activities regularly to the ST CM and serves as the consultant CM. However, as noted above, the WSDOT PMP does not recognize the ST PM.	
11.2	10.	How are resources made available to the project?	Required ST resources were determined by the PM in conjunction with administrative support managers. WSDOT, under the terms of their two agreements (design and construction services) determined their resources are met those needs accordingly. Resources were reported to not be an issue.	
11.1	11.	Who controls the resources?	See above.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
11.3	12.	How are timely actions and quality services of project staff ensured?	Not specifically addressed.	
11.2	13.	Is there a staffing plan?	Not for the project as a whole but WSDOT does maintain a staffing needs profile during construction which outlines projections.	
11.2	14.	How are performance issues managed?	Not addressed.	
11.1	15.	Are roles and responsibilities clearly delineated and documented?	See #9.	
11.3	16.	What are the requisite experience, training and expertise levels of key team members?	Not addressed.	
11.2	17.	Is the PM involved in the appointment of key team members?	The project is small with few ST positions. Staff are assigned by administrative managers from limited pools of resources.	
11.3	18.	What Project Management training have key team members received?	The PM did receive ST sponsored training related to project management. The training was general in nature.	
11.3	19.	What other training relevant to their assignments have key team members received?	Not addressed.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
11.1 11.2 11.3	20.	What challenges or advantages are posed by the current organizational structure?	The organization itself is similar to other Department projects. However, the WSDOT role as designer and construction manager does create its own dynamics; WSDOT for the most part applied its own standards in executing both services. Through the general umbrella agreement and project-specific agreements, ST provided oversight and generally did not mandate specific project management processes.	
WBS				
2.1	21.	Who developed the project's WBS?	The PC Group.	
2.1	22.	Who is responsible for its maintenance?	The PC Group.	
2.1	23.	How is the WBS used?	Progress taking.	The WBS is appropriately structured and used.
Scope Management				
2.2	24.	What is the scope of the project?	Design and construction of direct access ramps for buses and HOV lanes on I-5. This project supports the Federal Way Transit Center to enhance transit connections.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
2.2	25.	How is it documented?	Various references are available including annual budget requests and Project Schedule and Budget History Table.	
9.3	26.	How is the scope controlled?	Scope was blended with other projects identified in Sound Move during the early planning phases. Changes related to the site selection of the TC and related linkages to I-5. Scope as presently known established in 2004 annual budget.	
Schedule Management				
2.2	27.	On what basis was the start and completion dates of the project determined?	The project schedule was subject to large variations with swings of several years noted; over seven years, completion dates were forecast for 2006, 2003, 2004 and now are forecast for 2005. Variations were due to changed estimates of total project duration, funding delays, protracted right-of-way acquisitions, and environmental clearance delays.	The current schedule baseline was not established until mid-2003 as part of the 2004 budgeting process.
3.2	28.	How do you manage schedule?	In construction, WSDOT administers its contract for construction using a contract duration of 304 days as its basis. ST was successful in having WSDOT adopt the principle that all days are working days. PS&E completion was delayed 8 months from the original plan. Insight on how the schedule change was managed was not clear.	ST established an important principle in schedule management with WSDOT by promoting the concept that all days are working days.

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
3.1	29.	Who is responsible for schedule performance?	The ST CM, monitors and analyzes WSDOT's assessment of schedule. However, the PM retains the responsibility.	
3.1	30.	Describe the project's critical path.	Not addressed.	
3.1	31.	How did the project define durations and interfaces along the critical path?	Not addressed.	
3.2	32.	Describe the strengths and weakness of the current scheduling specification applied to consultants and contractors.	The standard WSDOT specification was applied to construction. It was bolstered by special provisions which were developed by WSDOT project staff. ST provided input on the issue.	
3.2	33.	Are resources applied to the schedule?	No.	
3.2	34.	How are resources used in the schedule?	NA	
2.3	35.	How are time-impact analyses of contract changes performed?	WSDOT standards require a schedule assessment of proposed changes. However, documentation of these assessments were not reviewed.	
3.4	36.	How often are forecasts of schedule performance performed?	WSDOT reviews contractor schedules monthly and advises the ST CM in regular meetings of variances and issues.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
3.4	37.	What float value does your project have today?	The substantial completion forecast is October 2005 which infers little, if any project float exists. However, as the HOV is tied to the Transit Center, and that facility is due to be on-stream in February 2006, there is a comfortable cushion of float between the two projects.	
Budget/Cost Management				
4.2	38.	How was the project budget established?	Sound Move identified \$25m for this project. Scoping and merging of original Sound Move projects, and various changes and corrections to estimated costs led to the current budget of \$32.6m. This value was adopted as part of the 2004 annual budget.	
4.6	39.	Were there allowances and/or contingencies provided?	Construction contingencies were established at 4.6% (\$1.2m). Contingency for the design effort was established at 10% (\$163k). This latter contingency was reduced in half by transfer into other design agreement accounts.	
4.6 4.7	40.	How were they applied?	See above.	
4.5 6.4	41.	How are costs managed?	WSDOT provides monthly reviews based on their standard procedures. Project risks are not traced through cost forecasts.	
11.1	42.	Who is responsible for cost performance?	Project Manager.	

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Topic/Reference		Question	Observations	Finding
4.5	43.	How often are cost forecasts performed?	The PM indicated that costs are evaluated on an on-going basis. Monthly formal reviews are performed consistent with procedures. The ST CM also meets weekly with his WSDOT counterpart to review progress and issues to include cost status.	
4.5	44.	Who is involved?	The WSDOT PE and his staff are keys to the process. The ST CM is also a participant.	
4.3	45.	How are they documented?	Not addressed.	
4.5	46.	How is cost status communicated to the project and management?	Formal reporting is provided for inclusion into the Agency Progress Report. A perspective of how the original budget values have varied is not provided. The current working budget is shown as \$32.6m.	
4.7	47.	What tools/reports are used in controlling costs?	The WSDOT PMP identified ST examples to include a monthly cost report. ST PC also use standard tools to monitor costs in concert with the PM.	
4.7	48.	Are these ST standards?	Yes, they reflect a Capital Projects Dept. standard.	
Performance Measurement				
1.1	49.	What are the project's performance goals?	Meeting current schedule and cost objectives. Also continuing to develop a growing partnership with WSDOT.	



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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
1.1	50.	Are these goals documented?	The PM's personal performance evaluation does cite the above goals. His annual review takes into account progress against those goals.	
1.1 10.2	51.	Who measures and analyzes performance?	In the context of the personal performance evaluation, the PM's supervisor.	
10.2	52.	How often is performance measured?	See # 51	
10.2	53.	What standards are applied in determining performance?	Not addressed.	
10.2	54.	At what level of the WBS is data gathered for measuring performance?	NA	
6.3	55.	How are performance measures used to guide project management emphasis?	NA	
10.5	56.	Does your project use ad hoc reports for internal reporting?	No.	
Design Management				
8.1	57.	How were Design Criteria, Standard Drawings and Directive Drawings used on this project?	WSDOT standards were applied.	
8.3	58.	What review(s) of contractor designs were conducted?	WSDOT standard reviews were conducted and made available to ST. These reviews were generally consistent with ST standards.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
8.5	59.	How were interdisciplinary efforts managed to affect an integrated design?	WSDOT practices were applied to include the 10-week review cycle leading to the AD Date. ST also conducted regular meetings to review progress.	
8.4	60.	Who is the customer for the design and construction of the project?	WSDOT's customer was ST.	
8.4	61.	How are Operations and Maintenance needs and issues addressed?	WSDOT processes account for O & M issues. The facility will also be delivered to WSDOT.	
4.1	62.	How were estimated construction costs of the design managed?	Structured reviews were followed with cost estimate updates. Cost differences were reconciled.	
8.7	63.	Was Value Engineering performed on this project? If so, what was the outcome?	Yes, per WSDOT standards.	
8.6	64.	Did you perform peer / industry reviews of the design?	No.	
8.5	65.	How do designers gain input from ST construction staff?	Similar to ST practices, WSDOT design reviews included construction staff. ST CM staff also were included in the reviews.	

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Construction Management				
9.1	66.	Does the project have an RE manual?	Yes, WSDOT's Construction Manual was used.	
9.1	67.	If yes, when was it last published?	This manual is a statewide standard and regularly maintained.	
11.1	68.	How are roles and responsibilities delineated?	See #9.	
8.5	69.	Has the CM team had input to the development of designs, contract packaging, contract specifications and special provisions?	Yes, through the WSDOT development process. ST CM input was also provided through the design reviews. Additionally, ST was successful in securing special provisions addressing schedule management. See #28	
8.3	70.	Was a constructability review conducted on the project? If so, what were the outcomes?	Yes. It was performed by WSDOT as a standard practice.	
9.3	71.	How are interfaces with third parties managed?	The WSDOT Project Engineer is the point person.	
9.3 10.3 10.4	72.	How are contacts with the community managed?	WSDOT, serving as the CM, assumes the day-to-day lead in this regard. The ST CM is also appraised of community issues during weekly review meetings.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
5.1	73.	How is quality managed?	Quality responsibility rests with the contractor. WSDOT oversees contractor efforts and performs Materials Testing procedures. WSDOT, through regional and HQ resources, also performs QA functions per their construction standards. ST provides QA through Dept resources for the performance of surveillance and audits.	Quality Management roles and responsibilities are well understood.
9.2	74.	How is safety and security managed?	Safety and security requirements are articulated in the WSDOT's construction contract; a project specific plan is in-place.	
9.1	75.	How are scope, schedule and costs managed?	The WSDOT PMP outlines provides that standard WSDOT practices will be used and that regular reporting to ST will be provided. Further, the WSDOT change process was modified to include ST review and approval of construction contract changes.	
9.4	76.	How are contractor requests, e.g. information, changes, payments, responded to?	WSDOT manages this function with oversight provided by the ST CM.	
9.4	77.	What are the average response times for requests?	Not addressed.	

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Topic/Reference		Question	Observations	Finding
9.4	78.	How are requests monitored?	The ST CM monitors WSDOT practices. This is reviewed weekly.	
Permitting				
9.5	79.	How was permitting work planned?	WSDOT led this joint effort. The project encountered a small wetland in the I-5 median which complicated permitting issues further.	The interfaces of design, real estate and permitting were complicated by the split responsibilities between ST & WSDOT. Standard practices differed between the two organizations such that calculation errors were made.
9.5	80.	How was this plan integrated with the project schedule?		
9.5	81.	Who is responsible for identifying and securing required permits?	The WSDOT RE was responsible.	
9.5	82.	What tools are used to monitor permit status?	WSDOT monitoring was relied upon.	
8.2	83.	What are the challenges of securing permits on-time?	See # 79. Coordinating between disciplines supporting the permitting process. Also, identifying requirements in advance, e.g. wetlands.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
8.2 9.5	84.	What aspects of the permitting effort worked well?	This area was a challenge.	
8.2	85.	What aspects of the permitting effort require improvement?	See #83.	
Contracts				
7.1	86.	How was procurement planned?	Working in the I-5 Right-of-Way dictated working with WSDOT.	
7.1	87.	Who developed the procurement plan?	Separate design and construction services agreements were negotiated by both parties.	
7.3	88.	What kind of performance measures were incorporated into contracts?		
7.3	89.	What processes are used to ensure contract documents are complete and consistent?	WSDOT's standard 10-week review cycle was applied to the contract package. This process employs a number of specific reviews by various WSDOT entities and is a well documented. Checklists and sign-offs are included.	
7.3 3.2	90.	Who developed the Special Provisions?	These were developed by WSDOT with input from ST. See # 28 and 32; schedule management requirements were included as Special Provisions.	

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## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
7.3	91.	How often are contracts reviewed to ensure that requirements are being met?	ST oversaw the design effort through regular progress meetings and reviews of design and cost estimate submittals. Amendments to the design services agreement were necessary to extent the design duration and adjust budget values by tapping into set-aside contingency. During construction, weekly meetings between ST and WSDOT serve as the main means to monitor performance and issues.	
Change Management				
7.3 2.3	92.	How are contract changes governed?	Applicable ST and Department Policies & Procedures are followed.	
2.3	93.	What level of authority does the PM have in regard to contract changes?	Costs up to \$25k. Increasing levels are held by the Program Manager, Deputy Director and Director.	
2.4	94.	How are changes documented?	Through the Expedition program.	
Risk Management				
6.2	95.	What are the critical risks facing the project?	The site selection process to link the TC with the HOV Project, construction activities in the I-5 median, working with project partners.	Risks are well known and understood.
6.1	96.	How were they identified?	Through development of planning and design efforts.	
6.1	97.	Describe your process for assessing risks.	Informal processes dominate all risk management efforts.	

# APPENDIX 4E

## SOUND TRANSIT CAPITAL PROJECTS MANAGEMENT SYSTEMS PERFORMANCE AUDIT

### FEDERAL WAY HOV PROJECT TEAM INTERVIEW QUESTIONNAIRE

Topic/Reference		Question	Observations	Finding
6.1	98.	Was there a formal risk assessment for the project?	No.	
6.2 6.3	99.	How are risks monitored and managed?	Informally.	While the project team is actively engaged in risk management activities, they do not use formal tools to monitor and manage risks.
6.4	100.	What tools are used to monitor and manage risks?	No specific tools are used.	
6.4	101.	How often are risks reviewed?	Regularly, but not through the application of a formal procedure.	
6.3	102.	Who is responsible for the critical risks?	PM	
Quality Management				
5.1	103.	Does the project have a Quality Management Plan?	No. WSDOT standards for quality control were/are applied for design and construction activities.	
5.2	104.	What resources are dedicated to quality management?	The Capital Projects Department provides resources on a matrixed basis for QA purposes. Surveillance of construction is planned and conducted on a rotating basis among all Department projects. WSDOT has field inspection resources available to the RE.	



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5.4	105.	How do you monitor quality standards?	WSDOT, serving as the CM, performs routine QC per Construction Manual requirements. ST has QA role.	
5.1 5.2	106.	Who is responsible for quality?	See above.	
5.4	107.	Are quality assurance audits conducted?	Department standards provide for audits. However, these have only applied to the construction phase, coinciding with the arrival of full-time ST Quality Management staff dedicated to the Department. A consultant's conclusion in early 2003 that ST need not regularly perform QA audits of WSDOT design or construction services was evidently taken as sound advice as no audits were conducted of the design.	ST Quality audits were not performed on the WSDOT design package. Review of field generated contract changes indicates that a more aggressive quality management posture by ST may have prevented a number of the changes.
5.4	108.	If Findings from an audit are made, how are they reconciled?	Per Department standards.	

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Topic/Reference		Question	Observations	Finding
5.4	109.	What tools are used to monitor quality?	For ST, QA surveillances and audits are available. WSDOT is using their own standard inspection templates for construction.	
Real Estate				
8.2	110.	Does the project have a Real Estate acquisition and relocation plan?	A formal plan was not developed. However, ST was charged with the responsibility to acquire needed real estate based on WSDOT design certifications. This split of responsibilities did pose interface problems.	ST acquisition of Real Estate based on WSDOT design certifications posed difficulties due to differing standards.
8.2	111.	Who prepared it?	Although a formal plan was not developed, the ST Real Estate Division did collaborate with the PM and WSDOT to define needs and requirements.	
8.2	112.	When was the Plan last issued?	NA	
8.2	113.	What risks are associated with the RE Plan?	See #110.	
8.2	114.	How were these risks identified and quantified?	The differing survey standards were not identified until the two systems were paired. The risk was not anticipated.	
8.2	115.	How many RE transactions does the project have?		

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<b>Topic/Reference</b>		<b>Question</b>	<b>Observations</b>	<b>Finding</b>
Post-Project Reviews				
12.1	116.	Describe your practice(s) to collect and analyze experiences gained during and after a project phase for use in continuous improvement processes.	There is no established procedure within the Capital Projects Department for Lessons Learned. However, ST advises that numerous standards and guidelines have been, and continue to be, refined.	
12.1	117.	What were the lessons learned from closure of any phase of this project?	See # 79 and 110.	
12.2	118.	How were these lessons documented?	They have not been documented.	
12.1	119.	Who was involved in the compilation and analysis of project practices in this regard?	NA	

## **Appendix 5**

### **Interview List**

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#### **Project Teams**

##### Central Link - Beacon Hill Line Segment

Joseph Gildner, Construction Manager  
Richard Sage, Deputy Construction Manager  
John Critchfield, Resident Engineer  
Richard Capka, Office Engineer  
Shelley Lloyd, Project Administrator  
Madeleine Greathouse, Project Control Lead

##### Central Link - Rainier Valley/MLK Line Segment

Richard Conte, Construction Manager  
Tony Raben, Deputy Construction Manager  
Robert Whedon, Resident Engineer  
Mike Roberts, Assistant Resident Engineer  
Norm Holt, Assistant Resident Engineer  
Nannette Stephens, Document Control Clerk  
Madeleine Greathouse, Project Control Lead

##### Lynnwood Transit Center Project

Hank Howard, Project Manager  
Jerry Dahl, Construction Program Manager  
Susan Peterson, Business Services Manager  
Linda McMichael, Document Control Coordinator  
Dan White, Capital Projects Quality Assurance Manager

##### Federal Way Transit Center Project

Vicki Youngs, Community Connections Program Manager  
Dan Eder, Project Manager  
Jerry Dahl, Construction Manager  
Susan Peterson, Business Services Manager

##### Federal Way HOV Project

Dan Eder, Project Manager Capital Projects  
Jerry Dahl, Construction Manager  
Susan Peterson, Business Services Manager  
John Chi, WSDOT Project Engineer

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### **Interview List**

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#### **Individual Interviews**

Agnes Govern, Capital Projects Department Director  
Jim Edwards, Capital Projects Department Deputy Director  
Christine Engler, Capital Projects Construction Program Manager  
Ellen Gustafson, Contracts Division Manager  
Jan Bondor, Human Resources Manager  
David Hawkins, Senior Program Controls Engineer