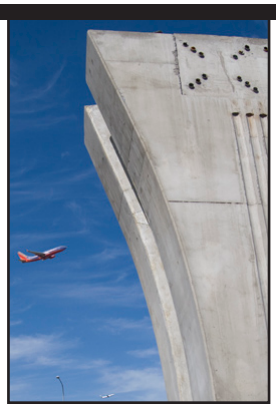
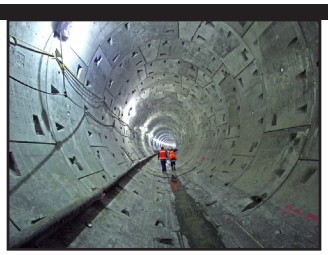
# Performance Audit Report

## Sound Transit

## Link Light Rail Project

**Report No. 1000005**





October 4, 2007

**Washington State Auditor Brian Sonntag, CGFM**

# A letter from State Auditor Brian Sonntag

**Brian Sonntag, CGFM**
**Washington State Auditor**

Using the authority given to us by the people of Washington under Initiative 900, we are pleased to issue this performance audit that calls for significant improvements to Sound Transit's management of construction projects.

We contracted with Talbot, Korvola and Warwick, LLP, which conducted its field work from January through June 2007. We set the scope of the audit and provided oversight. TKW and its subcontractor have many years of experience and a solid reputation in construction management practices. We are satisfied with the firm's work and its recommendations.

The selection of Sound Transit for a performance audit stemmed in part from a provision of I-900, which directed us to look at the largest, costliest agencies first. The audit also was prompted by citizen concerns over Sound Transit's escalating project costs, construction delays and long-term debt.

This audit focused on how effectively Sound Transit managed capital construction projects and how that management affected the agency's ability to finish projects on time, within budget and to complete what it promised.

Multibillion-dollar construction and capital costs encompass most of Sound Transit's budget. Its light rail project has been one of the most expensive local government public works projects in recent years, so it made sense to look first at Sound Transit's construction management.

As the audit points out, Sound Transit is a different agency than when it began in 1996. It struggled in its infancy and has learned many lessons along the way. This audit makes significant and constructive recommendations intended to improve the agency's efficiency and effectiveness as it moves forward.

# Contacts


**Washington State Auditor**
Brian Sonntag sonntagb@sao.wa.gov

**Director of Performance Audit**
Linda Long longl@sao.wa.gov

**Deputy Director of Performance Audit**
Chris Cortines cortinec@sao.wa.gov

**Deputy Director of Performance Audit**
Theo Yu yut@sao.wa.gov

**Director of Communications**
Mindy Chambers chamberm@sao.wa.gov

**Performance Audit Communications**
Kara Klotz klotzk@sao.wa.gov

**Public Records Officer**
Mary Leider leiderm@sao.wa.gov

Main phone number 360) 902-0370

Efficiency hotline (866) 902-3900

Web site **www.sao.wa.gov**


**Americans with Disabilities**

In accordance with the Americans with Disabilities Act, this document will be made available in alternate formats. Please call (360) 902-0370 for more information.


**Cover photos by Elizabeth Trunkey/ Sound Transit**

# Our audit authority

Washington voters approved Initiative 900 in November 2005, giving the State Auditor's Office the authority to conduct independent performance audits of state and local government entities on behalf of citizens. The purpose of conducting these performance audits is to promote accountability and cost-effective uses of public resources.

The State Auditor's Office engaged Talbot, Korvola and Warwick, LLP to conduct this performance audit in accordance with Government Auditing Standards. Those standards require that the auditor plan and perform the audit to obtain sufficient, appropriate evidence that provides a reasonable basis for the findings and conclusions based on the audit objectives. The audit team believes that the evidence provides a reasonable basis for the findings and conclusions based on the audit objectives.

In planning the audit, the auditors gained an understanding of internal controls that relate to audit objectives. The results of the internal control work did not impact the nature, timing or extent of the audit procedures.

No privileged or confidential information was omitted in this report.

*The complete text of Initiative 900 is available at www.sao.wa.gov/PerformanceAudit/PDFDocuments/i900.pdf.*

# After the performance audit

The release of this audit report triggers a series of actions by the Sound Transit Board of Directors. The Board is required to take the following actions:

- Hold at least one public hearing within 30 days of this report's issuance to receive public testimony on the report.
- Consider the findings and recommendations contained in this report during the budgeting process.
- Issue an annual report by July 1 detailing the Board's progress in responding to the State Auditor's recommendations. The report must justify any recommendations the Board did not respond to and detail additional corrective measures taken.

Follow-up performance audits of any state or local government entity or program may be conducted when determined necessary by the State Auditor.

*Notices of public hearings are posted with the report at www.sao.wa.gov/PerformanceAudit/audit_reports.htm.*

***Mission Statement***

*The State Auditor's Office independently serves the citizens of Washington by promoting accountability, fiscal integrity and openness in state and local government. Working with these governments and with citizens, we strive to ensure the efficient and effective use of public resources.*

# Objectives and scope

**Cost savings**

The audit identified **$5 million** unnecessary expenses and fines.

The audit contract cost **$455,560**.

### Overall conclusions

The audit identified three overarching findings:

1. Sound Transit was unable to complete the Link Light Rail Line at the cost and within timeframes communicated to voters in 1996.
2. Sound Transit initially lacked procedures for land acquisition, environmental compliance, permitting and construction management, contributing to its inability to meet project costs and timeframes communicated to voters in 1996.
3. Sound Transit has extensively improved its construction planning and management processes since 2002.

### Objectives

The audit was conducted from January through June 2007 and was designed to answer these questions:

Is Sound Transit effectively planning, designing and managing its Link Light Rail Project in order to:

1. Minimize all costs associated with the project, including, but not limited to engineering, land acquisition, environmental review, permitting and construction?
2. Minimize unnecessary change orders and delays that result in extra costs?
3. Ensure the light rail project most closely resembles the project that was communicated to voters in 1996?

If the answer to the above questions is no, what are the resulting financial and non-financial costs and what can be done to reduce those costs?

Additionally, Initiative 900 directs the State Auditor's Office to address the following elements:

1. Identification of cost savings.
2. Identification of services that can be reduced or eliminated.
3. Identification of programs or services that can be transferred to the private sector.
4. Analysis of gaps or overlaps in programs or services and recommendations to correct them.
5. Feasibility of pooling the entity's information technology systems.
6. Analysis of the roles and functions of the entity and recommendations to change or eliminate roles or functions.
7. Recommendations for statutory or regulatory changes that may be necessary for the entity to properly carry out its functions.
8. Analysis of the entity's performance data, performance measures and self-assessment systems.
9. Identification of best practices.

### Scope

Auditors reviewed data from 1996 through 2007 that pertained to the Link Light Rail project contained in Sound Move, the original project voters approved in 1996. Data included land acquisitions, engineering, contract awards, contract management and cost estimating. The Tacoma Link was not reviewed as part of the audit.

This audit's scope did not include a review of Sound Transit's long-term financial viability or effectiveness.

# About Sound Transit's Link Light Rail

Sound Transit's Link Light Rail project is one piece of the 10-year Sound Move Regional Transit Long-Range Vision approved by voters in 1996. The pieces of the Sound Move 10-year project are:

- Commuter rail
- Link Light rail
- High-occupancy vehicle expressways with regional buses
- Transportation facilities and community connections that support buses, trains and park-and-ride lots

The estimated cost for Link Light Rail contained in the 10-year vision is $3.6 billion (in 2007 dollars; the figure was $2.6 billion in 1995 when the budget was adopted). The Link Light Rail project is paid for through local voter-approved taxes, federal grants, bonding and rider fares. Local taxes include a 0.3 percent motor vehicle excise tax and a 0.4 percent retail sales tax in Snohomish, King and Pierce counties.

Sound Transit, as an agency, refers to the Sound Move 10-year project as Sound Transit, Phase 1. The end date for Link Light Rail has been extended to 2009, at which time the second phase of Sound Transit is planned to commence.

As stated in the audit report, the intent for Sound Move's Link Light Rail project was a 25-mile starter system with 26 stations (plans included Central Link, Tacoma Link and two provisional stations in North Seattle subject to receipt of additional funding sources) that connect areas of high employment to local bus, commuter rail, the Seattle Monorail and the Seattle Waterfront street car. That vision has since been revised to shortening the Link Light Rail Line and reducing the number of stations as described in the audit report.

Several factors have affected the 1996 vision of Link Light Rail, including management issues, lack of procedures for managing projects and contracts, input from stakeholders, lawsuits, trade strikes and environmental and regulatory setbacks with the physical site locations.

As of March 2007, the Link Light Rail plan consists of four segments:

### Initial Segment

A 13.9-mile light rail line between downtown Seattle and the City of Tukwila with 12 stations. The initial segment is scheduled to begin service in July 2009.

### North Link

North Link will connect four urban centers — Downtown Seattle, Capitol Hill, the University District and Northgate — to the Initial Segment. North Link is expected to be completed by 2030.

In July 2005, the Sound Transit Board designated the link to the University of Washington as the "preferred segment" of the North Link. University Link is a 3.15-mile extension from downtown Seattle to the University of Washington, with stations at Capitol Hill and on the University campus near Husky Stadium. Construction is expected to begin on in late 2008 or early 2009, with operations beginning in 2016. Construction from the University to Northgate is not yet funded.

### Airport Link

The Airport Link is a 1.7-mile extension of the Initial Segment to Sea-Tac International Airport. Light rail service to Sea-Tac Airport is scheduled to start in late 2009.

### Tacoma Link

The 1.6-mile Tacoma Link was completed in August 2003 with five passenger stations in downtown Tacoma. It serves the University of Washington Tacoma campus, the Washington State History Museum, the Museum of Glass, the Convention Center, downtown offices and the Broadway Theater District. At the Tacoma Dome Station, the line connects to a regional transportation hub that includes Sounder commuter train service. This link was not reviewed as part of the audit.

### Other projects

In addition to construction of actual rail lines, other projects support light rail. Sound Transit completed a retrofit of the Downtown Seattle Transit Tunnel and its existing stations in September 2007 for joint use by light rail trains and buses. Sound Transit also has a 25-acre operations and maintenance facility at Airport Way South in Seattle.

# Findings and associated recommendations

The audit identified three overarching findings:

- Sound Transit was unable to complete the Link Light Rail Line at the cost and within timeframes communicated to voters in 1996.
- Sound Transit initially lacked procedures for land acquisition, environmental compliance, permitting and construction management, contributing to its inability to meet project costs and timeframes communicated to voters in 1996.
- Sound Transit has extensively improved its construction planning and management processes since 2002.

| Findings | Associated recommendations |
|---|---|
| Sound Transit has not commissioned annual, independent, comprehensive performance audits limiting the ability to identify and address budget, schedule, and scope issues. | 1a. We recommend Sound Transit initiate annual comprehensive performance audits, incorporating a process of review and reporting on the status of actions and progress on previous report recommendations.<br>1b. We recommend the Citizen Oversight Panel ensure annual comprehensive performance audits are conducted and reported to the public and the Board when they have not been performed. |
| Sound Transit has not fully implemented a formal knowledge management procedure and database increasing risk in the future of higher costs, decreased efficiency, and missed timelines. | 2. We recommend Sound Transit require formal documenting and sharing of lessons learned within the agency and implement appropriate procedures. |
| Sound Transit's Real Estate Division should continue to proactively address all lessons learned as identified in 2006 to increase its effectiveness and mitigate potential cost and schedule impacts in the future. | 3. We recommend Sound Transit continue to proactively address all lessons learned associated with its Real Estate Division to ensure that there is no repetition of previous issues that can result in negative budget and schedule ramifications. |
| Perceived conflict of interest occurred on a $734,000 change order to a consultant contract to manage $95 million construction contract. | 4. We recommend Sound Transit ensure that it obtains all declarations of non-conflict from any consultants being considered to provide dispute evaluation, assessment and negotiation services, or other services which are of a sensitive nature. |
| Sound Transit has no formal procedures for evaluation of consultant performance potentially resulting in risk of delays in construction and added costs. | 5. We recommend Sound Transit implement quarterly consultant/supplier performance evaluations into the management of consultant contracts and follow-up to ensure expectations of contracts are being met. |
| Sound Transit has not formalized tracking of RFI response times in the Link Construction Manual resulting in risk of project delays and claims. | 6. We recommend Sound Transit incorporate metrics into construction management procedures for tracking of response times for RFIs. |
| Sound Transit should continue to follow a risk management plan to assure cost probabilities are not exceeded. | 7. We recommend Sound Transit ensure that the risk management planning for the University Link is followed and the risk assessment is updated and managed as appropriate. |
| Sound Transit does not stipulate the frequency and format of "second-opinion" cost estimates, decreasing the ability to compare and validate cost predictions. | 8. We recommend Sound Transit continue to utilize "second-opinion" cost estimates for high risk and complex projects and refine the process to allow for clear comparison and validation against capital cost predictions. |
| Sound Transit has not consistently applied estimating guidelines resulting in variations in quality and content of independent cost estimates for change orders. | 9. We recommend Sound Transit improve requirements for change order Independent Cost Estimates and provide an estimating framework. |
| Sound Transit's documentation and presentation of change order data/information not following best practices limits the ability to demonstrate fully the receipt of fair market value. | 10. We recommend Sound Transit ensure that the Best Practice guidelines are followed to ensure that information can easily be obtained. |
| In two identified instances, known scope omitted from Sound Transit contract documents minimizing competitive pricing. | 11. We recommend Sound Transit improve scope verification procedures and processes prior to finalizing Information for Bid documents. |
| Sound Transit has provided inadequate provisional sums for known risk items resulting in larger than expected costs. | 12. We recommend Sound Transit improve quantification of risk items included in contracts as Provisional Sums to reduce potential impacts for delays and cost increases. |

# Findings and associated recommendations, cont.

| Findings | Associated recommendations |
|---|---|
| Sound Transit's classification of change order sources is not to FTA guidelines and may limit the ability to effectively assess changes to contract scope. | 13. We recommend Sound Transit implement a process to classify change order sources to acquire performance measurement data and a basis for understanding changes on all projects. |
| Current Washington State law limits Sound Transit's current procurement strategies, which may limit best value, increase project risk and soft costs, and result in longer delays. | 14.a. We recommend that the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.<br>14.b. We recommend that Sound Transit, if permitted by changes instituted by the Legislature, consider the use of alternative project delivery methods. |
| Sound Transit does not use milestone payment incentives resulting in the potential risk of higher administrative costs and limiting contractor performance opportunities. | 15. We recommend Sound Transit, as appropriate, use a milestone payment strategy on future contracts, particularly those that significantly impact public access and traffic flow. |
| Sound Transit's environmental assessment strategy did not fully estimate the number and extent of hazardous and contaminated sites and materials resulting in unnecessary/underestimated costs. | 16. We recommend Sound Transit:<br>• ensure that access to structures and properties for due diligence inspection and testing is negotiated early in the real estate acquisition process.<br>• ensure that the investigation and sampling plan is designed to obtain a comprehensive and representative sampling of materials to allow quantification of hazardous materials/ contamination requiring abatement.<br>• ensure that adequate time for testing, data compilation, and reporting of findings is factored into the project schedule.<br>• ensure available survey findings and volume estimates are incorporated into bid documents and made available to the successful bidder immediately following contract award.<br>• attempt to obtain screening level subsurface data from as many commercial properties along a planned route segment as possible.<br>• consider investigation techniques that require minimal access issues and site disruption.<br>• conduct subsurface investigations of public right of way adjacent to known or suspected contaminated sites during the design phase of projects in order to have a better understanding of potential presence, nature, and extent of contamination.<br>• conduct additional remedial investigations of known contaminated sites after properties are acquired and prior to the initiation of the RFB process. Incorporate the information gained into the Clean-up Action Plans and contract documents.<br>• Assure Clean-up Action Plans provided to the contractor provide estimated limits and volumes of contaminated soil and excavation boundaries, including recommended setbacks from structures and utilities. |
| Unit prices agreed to were higher than typical industry-wide costs. | 17. We recommend Sound Transit:<br>• ensure that unit prices are consistent with industry standards.<br>• ensure that, for unit cost pay items, a rate for segregation and handling of uncontaminated soil is provided. |

# Findings and associated recommendations, cont.

| Findings | Associated recommendations |
|---|---|
| Cleanup procedures for unanticipated soil contamination were inefficient resulting in additional costs. | 18. We recommend Sound Transit, given the potential for repeated encounters with unanticipated contamination along a major commercial thoroughfare:<br>• ensure that each construction team includes an appropriate number of Hazmat-trained individuals to allow work to continue when contamination is encountered.<br>• ensure that a contingency response plan which defines the roles, responsibilities, and standard procedures to be implemented is in place. |
| Sound Transit's regulatory clean-up levels were improperly determined resulting in unnecessary costs. | 19. We recommend Sound Transit:<br>• develop a contingency plan to allow work to continue when suspected contamination is encountered in the right of way.<br>• ensure that health and safety monitoring is available to evaluate and ensure that construction workers are adequately protected during excavation of suspected contaminated soil. |
| Limited contractor liability resulted in stormwater pollution fines to Sound Transit. | 20. We recommend that Sound Transit:<br>• implement a plan to require contractors on future phases of construction to sign as co-permittee on Stormwater Permits.<br>• continue efforts to educate contractors and raise awareness of stormwater compliance issues using independent technical consultants and the ongoing program of joint weekly compliance inspections. |
| **Total unnecessary expenses and fines:** | **$5,088,000** |

# Legislative Recommendations

This report contains two recommendations for the state Legislature:

- **Recommendation 14a:** We recommend Sound Transit pursue a strategy of identifying the most suitable project delivery method and seek legislative approval where appropriate.
- **Recommendation 14b:** We recommend the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.

# I-900 cross-reference table

| Initiative 900 Elements | Correlating audit recommendations |
|---|---|
| Identification of cost savings | 9, 12, 14, 16, 17, 19, 22, 23 |
| Identification of services that can be reduced or eliminated | The audit's scope of work focused on construction activities that are not conducive to either outsourcing or eliminating. However, significant opportunities for increased efficiency and effectiveness were identified. |
| Identification of programs or services that can be transferred to the private sector | |
| Analysis of gaps or overlaps in programs or services and recommendations to correct gaps or overlaps | 3, 8, 11, 16, 17 |
| Feasibility of pooling information technology systems | 2 |
| Analysis of the roles and functions of and recommendations to change or eliminate them | 3, 23 |
| Recommendations for statutory or regulatory changes that may be necessary for Sound Transit to properly carry out its functions | 14 |
| Analysis of performance data, performance measures and self-assessment systems | 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 17 |
| Identification of best practices | 2 through 23 |

# Sound Transit Link Light Rail Project

# Performance Audit

**September 2007**

Talbot, Korvola & Warwick LLP
Certified Public Accountants & Consultants

4800 SW Macadam, Suite 400
Portland, Oregon 97239-3973
(503) 274-2849
FAX (503) 274-2853
E-Mail: tkw@tkw.com

TKW Talbot, Korvola & Warwick LLP
Certified Public Accountants & Consultants

4800 S.W. Macadam, Suite 400 • Portland, Oregon 97239-3973
503/274-2849 • Fax 503/274-2853

September 2007

Mr. Brian Sonntag
Washington State Auditor
Washington State Auditor's Office
3200 Capitol Boulevard SW
Olympia, WA 98504-0031

We have completed our performance audit of Sound Transit's Link Light Rail Project. This report contains our detailed analysis and conclusions based on our review.

We wish to express our appreciation to Sound Transit employees and managers and those persons from other organizations we spoke with for their cooperation and assistance during this analysis.

**Talbot, Korvola & Warwick, LLP**

# Table of Contents

# Introduction

**Link Light Rail Project**
**Performance Audit**

# INTRODUCTION

On behalf of the Washington State Auditor's Office (SAO), Talbot, Korvola & Warwick, LLP (TKW) in conjunction with PlanB Consultancy and SECOR International Inc., conducted a performance audit of Sound Transit's Link Light Rail Project. This report outlines the analysis and conclusions based on our work.

## AUDIT PURPOSE AND OBJECTIVES

### Project Purpose

In November 2005, voters approved Initiative 900, giving the Auditor's Office authority to conduct independent, comprehensive performance audits of government agencies, including local government, on behalf of citizens. The intent of conducting these performance audits is *"…to ensure accountability and guarantee that tax dollars are spent as cost effectively as possible."* Each performance audit shall examine the economy, efficiency and effectiveness of the policies, management, fiscal affairs and operations of state and local governments, and shall include nine specific elements:

1. Identification of cost savings.
2. Identification of services that can be reduced or eliminated.
3. Identification of programs or services that can be transferred to the private sector.
4. Analysis of gaps or overlaps in programs or services and recommendations to correct gaps or overlaps.
5. Feasibility of pooling information technology systems within the department.
6. Analysis of the roles and functions within the department and recommendations to change or eliminate departmental roles or functions.

7. Analysis of departmental performance data, performance measures, and self-assessment systems.
8. Recommendations for statutory or regulatory changes that may be necessary.
9. Identification of best practices.

**Objectives**

The Auditor's Office commissioned this audit with the intent of answering the following specific questions:

Is Sound Transit effectively planning, designing and managing its Link Light Rail Project in order to:

1. Minimize all costs associated with the project, including, but not limited to engineering, land acquisition, environmental review, permitting and construction?
2. Minimize unnecessary change orders and delays that result in extra costs?
3. Ensure the light rail project most closely resembles the project that was communicated to voters in 1996?

If not, what are the resulting costs — both financial and non-financial — and what can be done to reduce those costs?

## PROJECT APPROACH AND METHODOLOGY

**Evaluation Criteria and Standards**

Conceptually, the best way to determine the efficiency and effectiveness of an organization and its functions is to compare actual practices with both agreed upon standards and specific criteria. Many sources of criteria were available for the areas reviewed including:

- Sound Transit policies and procedures
- Revised Code of Washington (RCW)
- Federal Transit Administration (FTA) policy
- FTA Construction Project Management Handbook

- Code of Federal Regulations (CFR)
- Relevant national studies
- Association for Advancement of Cost Engineering (AACE)
- American Society of Professional Estimators (ASPE)
- Royal Institute of Chartered Surveyors (RICS)
- Private subject matter expert consultant best practice guides
- Sound Transit Agreements
- Private high-tech manufacturers
- Various environmental requirements
- Federal Clean Water Act (as applicable)
- Federal Endangered Species Act (as applicable)

However, for certain areas under review, no specific standards exist to allow for meaningful comparison. In those situations, the performance audit team determines specific criteria on which to base efficiency and effectiveness. Criteria that typically apply include:

**Public Accountability Criteria**

A primary criterion for the responsiveness of a governmental organization to its mission is public accountability. This responsibility has been expressed completely yet succinctly by the Comptroller General, United States General Accountability Office, in the Government Auditing Standards, the "Yellow Book," which sets forth public sector evaluation criteria familiar to all federal, state, and local government auditors. This public accountability criterion, an underlying premise of our study approach, states:

> *Our system of managing public programs today rests on an elaborate structure of relationships among all levels of government. Officials and employees who manage these programs need to render an account of their*

*activities to the public. While not always specified by law, this accountability concept is inherent in the governing process of this nation.*

*The need for accountability has caused a demand for more information about government programs and services. Public officials, legislators, and citizens want and need to know whether government funds are handled properly and in compliance with laws and regulations. They also want and need to know whether government organizations, programs, and services are achieving their purposes and whether these organizations, programs, and services are operating economically and efficiently.*

* * *

*Public officials and others entrusted with handling public resources:*

*... are responsible for applying those resources efficiently, economically, and effectively to achieve the purposes for which the resources were furnished. This responsibility applies to all resources, whether entrusted to public officials or others by their own constituencies or by other levels of government.*

*... are responsible for complying with applicable laws and regulations. That responsibility encompasses identifying the requirements with which the entity and the official must comply and implementing systems designed to achieve that compliance.*

*... are responsible for establishing and maintaining effective controls to ensure that appropriate goals and objectives are met; resources are safeguarded; laws and regulations are followed; and reliable data is obtained, maintained, and fairly disclosed.*

*... are accountable both to the public and to other levels and branches of government for the resources provided to carry out government programs and services. Consequently, they should provide appropriate reports to those to whom they are accountable.*

**Efficiency, Effectiveness, and Economy Criteria**

The efficiency, effectiveness, and economy of a governmental operation are inherent responsibilities of

those charged with its management. The overall "effectiveness" of an organization is the determination of how well predetermined goals and objectives for a particular activity or program are achieved. Effectiveness signifies the result of effort rather than the effort itself. It is sometimes characterized as impact, results, or outcome. Efficiency focuses on the maximization of output at minimal costs or the use of minimal input of resources for the achievable output. Economy signifies the acquisition of resources of appropriate quality and quantity at the lowest reasonable cost.

**Legal Requirements**

Legal requirements include any purpose or goals prescribed by law or regulation. Statutes, rules, and ordinances establish a measure for evaluation.

**Prior Years' Performance**

Historical information on accomplishments, services provided, timeframes, etc. provide the audit team with a basis to determine whether a program or activity is meeting or exceeding expectations.

**Performance of Similar Organizations**

Information gathered on operations, service delivery methods, results, etc. of similar organizations provide a basis for comparison. Although organizational differences may prohibit direct comparisons,

information obtained can assist an audit team with identifying other effective methods to provide services.

In the absence of specific, measurable, and realistic criteria, a performance audit team may assess an organization and its activities using these factors as a baseline. In addition, a variety of criteria based on team members' extensive experience working with governmental and private sector organizations and professional literature are applied.

**Methodology**

To gain a comprehensive understanding of the Sound Transit program areas under review, we interviewed various individuals in Project Controls, Environmental, Real Property, Construction Management, and Contracts Divisions of the Link Department, the Executive Department, and the Environmental Division in the Legal Department as well as soliciting information through the use of questionnaires. We also had the opportunity to tour various aspects of the Link Light Rail Project.

The focus of our objectives evolved as the audit progressed. The final scope and focus is the product of our initial study orientation and the identification of significant issues and opportunities not recognized or whose significance may not have been fully appreciated prior to commencement of work.

Information provided during interviews became one source for observations found within this report. The information

gained from these individuals and from other corroborative sources provided insight into the issues, needs, and expectations surrounding the study and was invaluable in reaching the conclusions and recommendations presented within this report. However, not all of the issues raised by Sound Transit personnel fell within the scope of this project. Where possible, those issues have been addressed through means other than this report.

We also evaluated numerous documents and files. Included in this review was information relevant to program operations, specific goals, objectives, and expectations, organizational charts, job descriptions, regional information, project plans and specifications, national publications, and other relevant documents.

## AUDIT TEAM PERSPECTIVE

Our team began this audit with an expectation of governmental excellence, a benchmark that all organizations should have as a primary objective. Holding governmental entities to the highest standards of efficiency and effectiveness serves the best interests of both the citizen and government. When those expectations are not met, we attempt to identify opportunities to move toward an organization's own vision of excellence. However, this vision must be recognized, accepted, and internalized before significant organizational change can occur.

It is for this reason that many of the observations found within this report are *exception-based*. That is, they are

oriented toward resolving problems or concerns. Although many aspects of operations are performed efficiently and effectively, the greatest benefits to an organization are typically derived from the identification of methods to achieve excellence.

## SCOPE LIMITATIONS

In contrast to the limited compliance review portion of this audit, audit team assessments of efficiency and effectiveness contained within this report are qualitative in nature and rely on documented information. The criteria and standards described above were used extensively throughout this study. Likewise, quantitative and qualitative analyses were undertaken as appropriate to understand the particular issue being addressed.

This audit does not cover operations, planning, designing, or management of projects outside the Link Light Rail Project including the Regional Bus Express Program, the Sound Commuter Rail Program, or the Tacoma Link Light Rail Project or the operations component within Link itself. This audit also did not evaluate any unsettled contract claims nor make any statements as to their content.

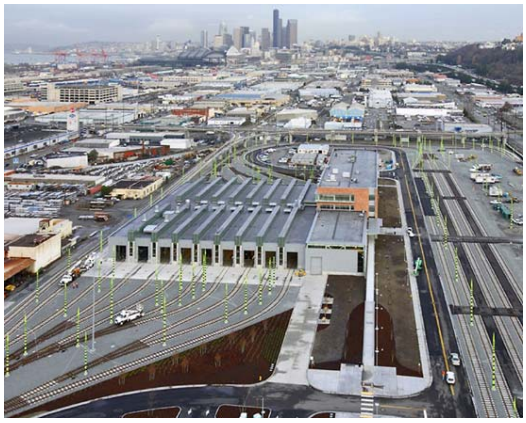
## STANDARDS

This audit was conducted from January 2007 through June 2007 and was conducted in accordance with generally accepted government performance audit standards.

## COMPLIANCE

As part of our audit, we examined compliance with applicable state statutes and department rules and regulations as they pertained to the specific objectives of the performance audit. Sound Transit reported several environmental violations of discharge of stormwater and failure to properly develop and implement adequate stormwater pollution prevention plans to the Washington Department of Ecology[1]. No other compliance issues were identified. For those items we did not specifically test for compliance, nothing came to our attention that would indicate significant instances of non-compliance.

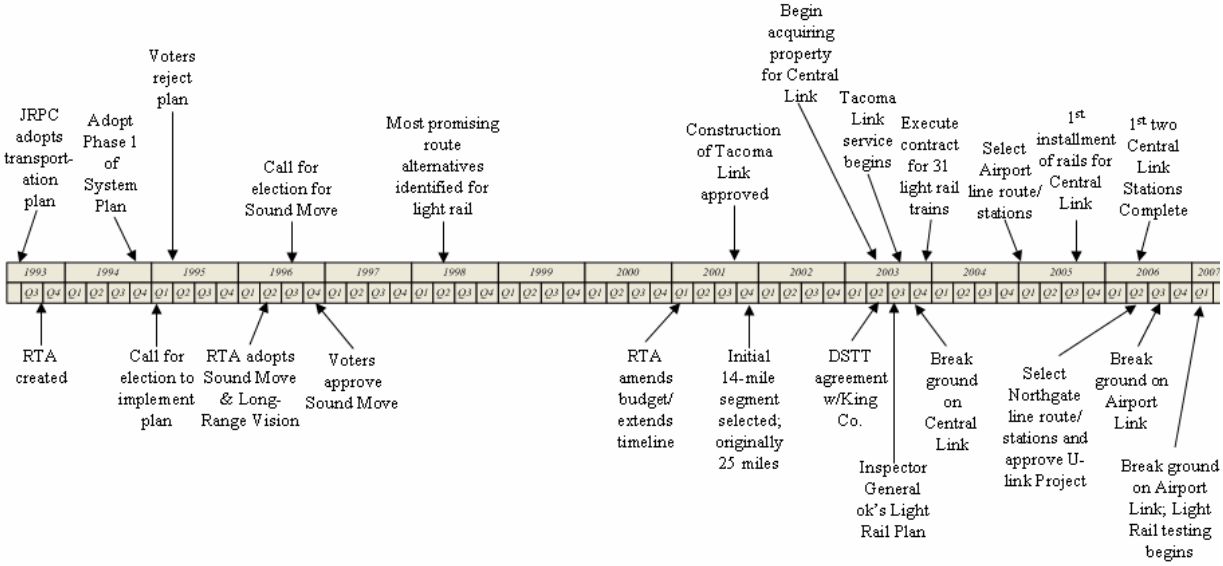
[1] See section titled *Limited Contract Liability Resulted in Stormwater Pollution Fines to Sound Transit* (Recommendation 21) for additional detail.



# Sound Transit

## Link Light Rail Project
## Performance Audit

## HISTORY OF SOUND TRANSIT




***Sound Transit Mission:***
*Plan, build and operate regional transit systems and services to improve mobility for Central Puget Sound.*

In April 1990, the Washington State Legislature passed the High Capacity Transportation Systems Act[2] to provide "*a system of public transportation services within an urbanized region operating principally on exclusive rights of way, and the supporting services and facilities necessary to implement such a system.*"

As a result, the Regional Transit Project was initiated, sponsoring three studies exploring high capacity transit technologies that could be implemented within the Puget Sound Region.

The first study, the Rail Transit Technology and Design Guidelines[3], examined a variety of transit technologies including:

[2] Chapter 81.104 RCW.
[3] Prepared by Gannett-DeLeuw in 1990.

- Personal Rapid Transit (high and low speed)
- Intermediate Transit (high and low speed), including monorail, automated guideway, and light rail systems
- Large or Heavy Rail Transit (high speed)

The second study, the Rail Technologies and Design Guidelines - Update Report[4], analyzed specific Regional Transit Project requirements including:

- System capacity
- Vehicle loading density
- Travel time
- Speed and train performance
- Use of the Downtown Seattle Transit Tunnel (DSTT)
- Use of the I-90 floating bridge
- Environmental-community fit
- At-grade crossings

The updated study recommended including Large/Heavy Rail Transit as viable technology options for the area.

The third study, Transit Technology Overview[5], restated the goals and criteria of the Regional Transit Project and made recommendations relating to various technologies, including bus, rail (i.e., light/heavy/commuter rail), and other guideway technologies (i.e., monorail, personal rapid transit).

In 1992, the legislature recognized that existing transportation facilities in the central Puget Sound area were inadequate to address mobility needs of the area, and

[4] Conducted by Parsons Brinckerhoff/Kaiser Engineers in 1991.
[5] Conducted by Parsons Brinckerhoff/Kaiser Engineers in 1992.

passed RCW 81.112 authorizing the establishment of regional transit authorities. The legislature envisioned a new authority that would be more effective than several local jurisdictions working collectively at planning, developing, operating, and funding a high capacity transportation system.

In 1993, after recommendations by the Joint Regional Policy Committee (JRPC) to adopt a $13.2 million transit system plan for the region and form a regional transit authority, Snohomish, Pierce, and King County councils voted to create the regional transit authority, later renamed Sound Transit.

Sound Transit is governed by an 18-member Board of Directors consisting of locally elected officials and the Secretary of the Washington State Department of Transportation. It is charged with establishing policies, providing direction, and performing oversight to Sound Transit. The Board held its first meeting in September 1993.

Sound Transit began developing a regional transit system and financing package and, in 1994, presented a $6.7 billion rail and bus transit proposal to the voters. Voters rejected the plan in March 1995.

Following the "no" vote, Sound Transit conducted various outreach activities including public meetings and hearings to educate and listen to citizen's concerns, obtained input

from a variety of interest groups, and worked with community leaders throughout the region to develop a plan that would be more likely to receive voter approval. In May 1996, the Sound Transit Board passed Resolution 73 adopting the *Regional Transit Long-Range Vision (Vision)* and *Sound Move, the 10-year Regional Transit System Plan* (*Sound Move*).

The *Vision* outlines the region's transportation goals and objectives beyond the 10-year focus of *Sound Move*. Its goals include providing a public transportation system that ensures long-term mobility, preserving communities and open spaces, contributing to the region's economic vitality, and preserving the environment.

The objectives of the *Vision* include:

- Keeping the region moving by:
  - Increasing the percentage of people using public transportation and transit.
  - Reducing the average time it takes to make a trip by transit.
  - Increasing transit speeds and improving the reliability of transit service.
  - Making it easier to use transit.
  - Supporting commute trip reduction programs such as rider-sharing, or vanpooling.
- Offering cost-effective and efficient transportation solutions.
- Creating a regional transit system that provides social, economic, and environmental benefits by:
  - Helping to limit urban sprawl, maintaining open spaces, and protecting natural resources.
  - Supporting the creation of communities that are easy to reach and use on foot, by bicycle, on transit, and by people with disabilities.

  - Increasing transportation options that use less energy, consume less land resources, and produce less pollution.
- Developing equitable transportation solutions by offering transit services that benefit areas within the region in proportion to the revenues they generate.
- Creating a financially feasible system.
- Offering regional services that work well with other transportation services by working with local public transportation providers and WSDOT to coordinate services and develop a single-fare structure.

*Sound Move* is the implementation plan for the first 10 years of the *Vision*, often referred to as Phase 1 of the plan. It outlines a public transportation system that would cost an estimated $3.9 billion (in 1995 dollars) to implement Phase 1 including:

- Building a regional rail system composed of commuter and light rail lines:
  - Commuter Rail — an 81-mile commuter rail system including 14 stations that provides a fast, dependable, and easy to use system with two-way rush-hour service using existing tracks between Everett, Seattle, Tacoma, and Lakewood.
  - Light Rail — a 25-mile starter system with 26 stations (including Tacoma Link and two provisional stations in North Seattle, subject to receipt of additional funding sources) connecting high employment areas and connections to local bus services, commuter rail, the Monorail, and the Waterfront Streetcar.
- Building High Occupancy Vehicle (HOV) expressways with regional express buses that would travel from one population center to another. The HOV expressways would include special access ramps to make it easier for transit and carpool vehicles to reach and use HOV expressways more quickly. The regional express buses would be scheduled to work with local transportation entities

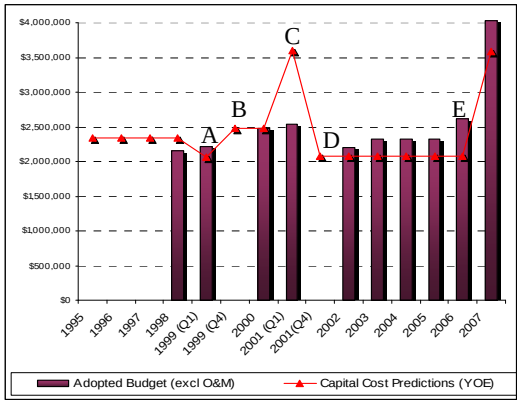
to coordinate and complement bus services throughout the region.

- Building transportation facilities and community connections that would support buses and trains and include several park-and-ride lots.

Funding for the plan included a combination of voter approved local taxes, bonds, federal funds, and user fees.

Other phases of the plan are intended to be implemented after the completion of Phase 1, focusing on elements of the *Vision* not already addressed in the first phase.

The Sound Transit Board, by passage of Resolution 75, sought voter approval to implement *Sound Move*. In November 1996, Proposition 1, the ballot measure implementing *Sound Move* - was passed.




A - Preliminary Locally Preferred Alternative (LPA)
B - Adopted LPA
C - Amended LPA
D - Initial Segment
E - Initial Segment plus University Link

*Source: Complied by TKW*

Upon voter approval of *Sound Move*, Sound Transit was created. Although the Sound Transit Board had already been formed, the rest of the organization included only a handful of personnel. Sound Transit was tasked with building a major transportation system throughout the Puget Sound region in a relatively short period of time (10-years) at the same time it was developing its organizational infrastructure.

Many of the elements outlined within *Sound Move* have been implemented. For example, Sound Transit worked extensively with community leaders, the public, and other stakeholders during the planning stage to obtain input regarding the preferred light rail route, station locations,

and the design of each station to reflect the values and unique attributes of local communities. In addition, transit stations were designed to support multi-modal transportation options including light rail, buses, Sounder commuter rail, bicyclists, pedestrians and persons with disabilities, as well as several park-and-ride lots that allow commuters to park their vehicles and take an alternate form of transportation to their ultimate destinations.

Sound Transit originally planned to design and begin building the north portion of the Central Link Light Rail line first. Numerous steps were taken during the planning stages including:

- working extensively with the community to narrow route choices,
- evaluating environmental impacts of the project,
- developing mitigation plans,
- completing preliminary engineering,
- starting the final design, and
- meeting requirements to qualify for a full funding grant agreement (FFGA).

The Board went through an extensive planning and review process to narrow the many route options and adopted the final Locally Preferred Alternative (LPA) in November 1999, which included the preferred route and station locations.

In August 2000, a contractor was selected to negotiate with Sound Transit to build a 4.5 mile tunnel between downtown Seattle and the University District. After months of negotiations, Sound Transit suspended the contract due to

the difference between the estimates of the contractor and Sound Transit.

In April 2001, Sound Transit's acting executive director informed the Board that the 21-mile line was no longer a viable option due to increased estimated costs to complete the project coupled with reduced available federal funding. The Board asked staff to analyze how a shorter "starter line" might be built and how that would affect ridership.

In the same month, the federal Office of Inspector General released an interim report critical of the Central Link Light Rail project and recommended, among other things, that Sound Transit identify all issues that could affect cost, schedule, and scope of the project. Sound Transit began answering questions raised in the report. $50 million in federal funds designated to Sound Transit, was held pending Sound Transit's response to the Inspector General Report.

The Board decided that due to environmental and cost issues that were difficult to resolve in the north portion of the project, it would be in the best interests of Sound Transit and the community to begin planning and building the south portion of light rail first.

Over the next several months, staff reviewed a number of design refinements and engineering activities in an effort to identify cost savings, reduce impacts, and improve service.

During the spring and summer of 2001, several lawsuits were filed against Sound Transit. One lawsuit was related to the lack of consideration of monorail technology. Another, filed by "Save Our Valley," was based on allegations that Sound Transit violated federal environmental, housing, and civil rights laws in the planning and design of the light rail line in the Rainier Valley. At Sound Transit's request, the judge delayed the trial of the lawsuit to await the outcome of a U.S. Supreme Court case. During the time that the trial was delayed, the judge prohibited Sound Transit from conducting property acquisition activities in the Valley. All claims were eventually dismissed or ruled in favor of Sound Transit.

After Sound Transit responded to all of the questions in the Inspector General Report, the federal Office of the Inspector General approved the plan and the $50 million federal grant was released.

In November 2003, Sound Transit broke ground and began constructing the Initial Segment of the Central Link Light Rail project. In the summer of 2006, a four-week concrete strike disrupted construction work on the Martin Luther King, Jr. Way, S. (MLK, Jr. Way, S.) in the Rainier Valley.

Work has progressed on the Airport Link as well as the North link. The Airport Link construction has begun, with an anticipated service start date set for late 2009. Planning has begun on the North link, with environmental impact statements and engineering studies being conducted.

Preliminary design has been completed on the University Link and FTA approval has been granted to commence final design.

Upon approval, Sound Transit began implementing Phase 1 of the plan. As of March 2007, the following activities are in the process of being or have been accomplished:

**Link Light Rail**

Link Light Rail consists of multiple segments:

| Project | Adopted Budget | Committed to Date | Incurred to Date |
|---|---|---|---|
| Initial Segment | $2,070.0 | $1,794.8 | $1,426.1 |
| University Link | $1,658.3 | $ 172.7 | $ 87.6 |
| Airport Link | $ 243.6 | $ 141.3 | $ 73.1 |
| **Total** | **$3,971.9** | **$2,108.8** | **$1,586.8** |

Source: Sound Transit

**Initial Segment**

A 13.9-mile light rail line between downtown Seattle and the City of Tukwila with 12 stations scheduled to begin service in July 2009.

**North Link**

North Link will connect four urban centers to the Initial Segment - Downtown Seattle, Capitol Hill, the University District, and Northgate. North Link is expected to be completed by 2018, and it encompasses two phases, Downtown to the University District (University Link or "U-Link") and the University District to Northgate. Construction for the link to the University of Washington (UW) is expected to begin in late 2008 or early 2009 with operations beginning in 2016. Construction from University to Northgate is not yet funded.

In July 2005, the Sound Transit Board modified the preferred route and station locations for the North Link Light Rail Project. The Board also identified


University Link as North Link's "preferred segment" for purposes of moving forward with a federal grant application. University Link is a 3.15-mile extension from downtown Seattle to the UW, with stations at Capitol Hill and on the UW campus near Husky Stadium. As a result of various studies revealing risks associated with soil conditions, cost, and schedule uncertainty, the North Link will not include a station at First Hill.

**Airport Link**

Light rail service to Sea-Tac Airport is scheduled to start in late 2009. The link is a 1.7-mile extension of the Initial Segment to Sea-Tac International Airport.

**Tacoma Link**

The 1.6-mile Tacoma Link was completed in August 2003 with five passenger stations in downtown Tacoma. It serves the UW's Tacoma campus, the Washington State History Museum, the Museum of Glass, the Convention Center, downtown offices, and the Broadway Theater District. At the Tacoma Dome Station, the line connects to a regional transportation hub that includes Sounder commuter train service.

In addition to construction of actual rail lines, other projects are underway to support light rail. As part of the Initial Segment, Sound Transit is retrofitting the DSTT and its' existing stations for joint use by both light rail trains and buses and a 25-acre operations and maintenance (O&M) facility is located south of Forest Street at Airport Way S.

The 15.6 mile line and 13 stations, including the initial and airport links, consist of at-grade and elevated guideways and tunnels. Starting north at the Westlake Station in the DSTT near Pine Street, the line runs through the downtown area, with stations located at or near University Street, Pioneer Square, and the International District/Chinatown.

Going south, the light rail line heads over to the station near the Mariners and Seahawk Stadiums at Royal Brougham Way and continues along the E-3 Busway next to 5th Avenue South. The line has a station at Lander Street, where it turns east near Forest Street, past the link O&M facility, under Interstate-5 and up into the one-mile long deep-mined Beacon Hill Tunnel where another station is located.

Once through the tunnel, the light rail continues to MLK, Jr. Way, S. where a station is located at S. McClellan Street (Mt. Baker Station). From there, the line turns south into the Rainier Valley, along MLK, Jr. Way S. with three stations located near S. Edmunds Street (Columbia City), S. Othello Street, and S. Henderson Street (Rainier Beach).

From MLK, Jr. Way. S. near Norfolk Street, the track heads west onto Boeing Access Road, where a station was originally planned but was eliminated to manage costs.

Continuing on Boeing Access Road, the line goes over Interstate-5 and heads south near E. Marginal Way, through the City of Tukwila, and turns west on S. 154th Street to a

Park-and-Ride station near Tukwila International Blvd. (Highway 99).

The Airport link continues southwest from the Tukwila International Blvd. Park-and-Ride station, over Highways 518 and 99 onto North Airport Expressway until it reaches a station at SeaTac Airport.

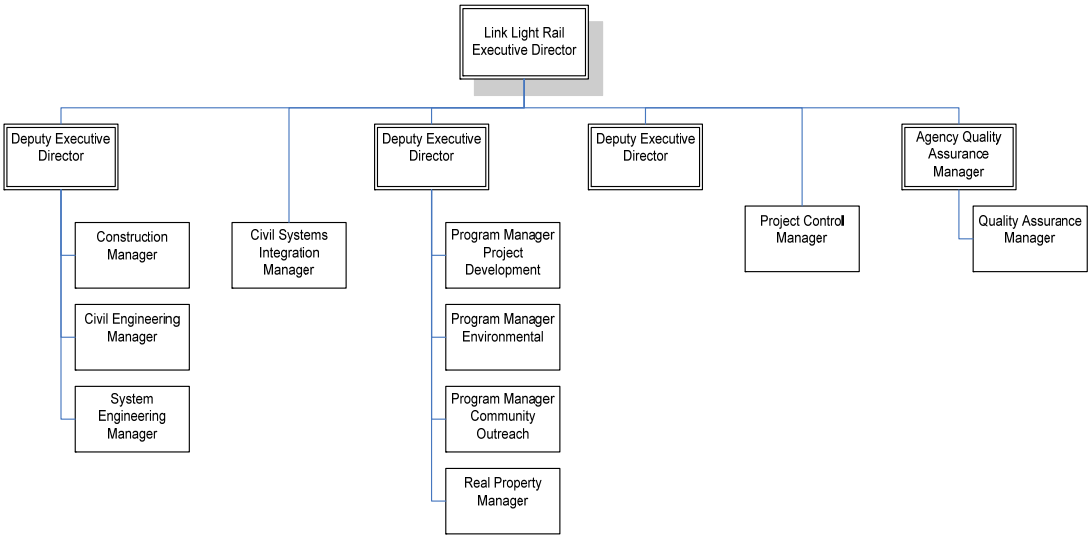
**FUNDING**

The estimated cost for Link Light Rail is $2.6 billion. The project is paid for through local voter-approved taxes, federal grants, bonding, and rider fares. Local taxes include a 0.3 percent motor vehicle excise tax, a 0.4 percent retail sales and use tax, and a 0.8 percent rental car tax.

**ORGANIZATION**

Sound Transit employs more than 345 full- and part-time employees, with more than 100 staff dedicated to the Link Light Rail Program.

**Sound Transit Link Light Rail 2007 Organization**



# Results

**Link Light Rail Project**
**Performance Audit**

# RESULTS

**Sound Transit was Unable to Complete the Link Light Rail Line at a Cost and Within Timeliness Communicated to Voters in 1996**

The Link Light Rail line is considered a vital component of the region's long-term transportation network. It is envisioned to provide a high-capacity, congestion-free transportation route serving some of the region's largest population and employment centers. Link Light Rail is one component within a master plan — *Sound Move* — that incorporates a mix of transportation improvements including Sounder commuter rail. The plan also includes new transit centers, park-and-ride lots, regional express buses, and high-occupancy vehicle (HOV) access projects.

The total system was intended to be built within 10 years (through 2006) at a cost of $3.9 billion (in 1995 dollars) with $1.8 billion dedicated to building the light rail system for both Central Link and Tacoma Link. The Link Light Rail project for both Central Link and Tacoma Link originally included a starter line of 25 miles, with 26 stations throughout the Link Light Rail line.

However, the original cost estimates substantially underestimated the cost of constructing the light-rail line. This under-estimation, combined with delays and cost overruns that were experienced in the course of initially planning, designing, and building the system, affected the organization's ability to deliver the system within the constraints communicated to voters.

In late 2000 and early 2001, Sound Transit determined that the initial cost estimate was too low and that other

unanticipated costs, primarily associated with the cost of mitigating the impacts of construction, rendered the cost of the planned system inconsistent with original estimates. This caused Sound Transit to recognize that a change in its management structure was necessary. As a result, a number of functions within Sound Transit were reorganized to improve management oversight and increase communication with outside stakeholders including project control, communications, government relations, and policy and planning.

By January 2001, based on information provided by Sound Transit staff, the Board made the decision to extend the time to complete the light rail system until 2009 and increased the budget to $2.6 billion (in 1995 dollars; $3.6 billion in year of expenditure dollars). In November 2001, the Board approved the Initial Segment of the Central Link Light Rail Project to be built, and in July 2005, the Board approved the construction of the Airport Link extension of the Central Link Light Rail project for a combined 15.6 miles, including 13 stations. In April 2006, the Board selected the University Link portion of the Central Link Light Rail Project for construction of an additional 3.15 miles, including two stations, shortening the line from 19.7 miles to a total of 18.75 miles, which includes 15 stations instead the 19 described in *Sound Move.*

**Sound Transit Response to Conclusion:**
Due to various factors, some of which were not within Sound Transit control and some that were, including those identified above, Sound Transit was unable to complete the Link Light Rail line as originally communicated to voters in 1996. As discussed in the

remainder of this report, Sound Transit has identified many of the challenges and has incorporated them as lessons learned into revised Sound Transit procedures.

One item within the conclusion above is factually incorrect. This conclusion states that "The Link Light Rail project for both Central Link and Tacoma Link originally included a starter line of 25 miles, with 26 stations throughout the Link Light Rail line." As clearly shown on page 21 of *Sound Move – The Ten-Year Regional Transit System Plan*, these numbers include the Roosevelt Station and Northgate Station. Both of those stations and the mileage of track associated with getting the light rail to them were provisional and subject to additional funding being identified. Thus, the correct information for Central Link and Tacoma Link is 21.3 miles and 24 stations.

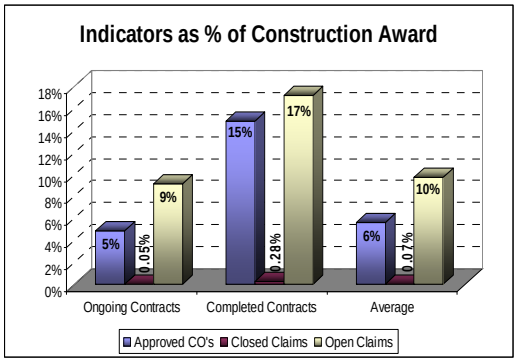
**Sound Transit Initially Lacked Procedures for Land Acquisition, Environmental Compliance, Permitting, and Construction Management Contributing Significantly to its Inability to Meet Project Costs and Timeliness Communicated to Voters in 1996**

At its inception in 1997, Sound Transit had no procedures relating to Right of Way (ROW) acquisition, environmental, or construction management. Subsequently, the agency had to develop its own approaches during the planning and implementation of *Sound Move*. Sound Transit initially began its development of a regional transit system with a lack of expertise and no established practices. The agency essentially started as an inefficient and ineffective organization.

Gaps in best practice tools and procedures created variability in early project delivery success. These risks resulted in project cost and schedule impacts.

Early project issues resulted in Sound Transit facing (and continuing to face) challenges in delivering capital construction contracts for the Link Light Rail Project. Open claims[6] on four contracts currently cumulatively total $103,121,062. Although this represents only 9.78 percent

[6] This audit did not evaluate any unsettled contract claims nor make any statements as to their content.




of the total awarded value of construction contracts for Link Light Rail, it should be noted that claims impact overhead costs through evaluation and negotiation by both Sound Transit and contracted consultants. For example, Sound Transit issued a change order in the value of $734,505 to a construction management consultant to provide services relating to the evaluation of $29,694,001 in claims on two contracts. However, open claims as a percentage of construction contract award values are currently trending less than those on completed contracts[7].

Contracts currently under construction for the Initial Segment are trending at $59,790,878 in approved change orders. This change rate of 5.67 percent (expressed as a percentage of the original contract award value) is currently within the lower end of industry norms.

However, delays to particular construction contracts have been significant. The Rainier Valley/MLK Jr. Way S., civil construction contract is reporting a 248-day overrun compared with the original contract completion date. In addition, Initial Segment contractors have reported delays due to events that include the following:

- Weather impacts
- Concrete strike
- Insufficient design details
- Sub-surface soil conditions
- Tunnel face collapse due to flowing sand
- Safety
- Site access

[7] Completed contracts include the Tacoma Link, E-3 Busway projects, and site preparation work for the Initial Segment.

**Sound Transit Response to Conclusion:**
Sound Transit's initial problems have been well documented. However, in a relatively short period of time (less than ten years), Sound Transit has evolved from a start-up agency to the owner/constructor/operator of one of the largest light rail capital construction projects in the United States, as well as several other commuter transit systems, including Sounder Commuter Rail and Regional Express bus service.

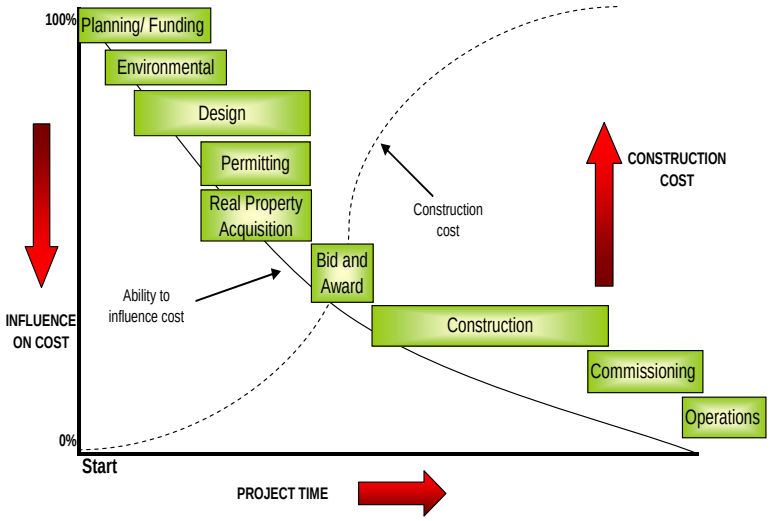
While it has experienced challenges, it has also managed the overall projects well in comparison to similar projects. For example, as noted above by the auditors, claims and change orders are currently within the low end of industry norms. We recently settled a $44 million claim for just over one third of the claimed amount. Sound Transit believes that many of the currently pending claims are similarly significantly inflated. Regardless, Sound Transit continues to identify lessons learned and streamline its procedures, and we are committed to delivering the best possible systems and services at the best value.

**In the Last Five Years, Sound Transit has Extensively Improved its Construction Planning and Management Processes**

In the past five years, Sound Transit has responded to its challenges through improvements in construction planning and management processes and implementation of "best practices." An improved structure has been implemented to manage projects, (although not *fully in place* as described by the Citizen Oversight Panel (COP), the 15-member volunteer committee appointed by the Sound Transit Board to oversee and monitor the implementation of *Sound Move*). These include standard guidelines on cost estimating, change and cost management, project management, risk assessment, and emerging lessons learned procedures. Because opportunities to influence the eventual total cost of a project or contract rapidly diminish during the pre-construction phase, project control processes are fundamental to the day-to-day management of construction cost and schedule.

Sound Transit is actively using a number of project management tools that can affect delivery in a positive

manner. These include FTA recommended project management tools such as Project Management Plans, Cost and Schedule Risk Analysis, Value Engineering, Peer Reviews, and Constructability Reviews. Compliance with recognized standards tends to produce reduction in project variability and project delivery risk. Sound Transit has formalized these improvements within Project Controls and Construction Management Procedures.




These changes have improved Sound Transit's construction planning and management processes. However, knowledge management, and in particular the application of lessons learned to ongoing and future projects, remains key. Lessons learned from the Tacoma Link Project have been identified and applied to the Initial Segment. Real estate lessons learned revealed that challenges remain, particularly with early involvement of the Real Estate Division organizational structure and process evaluation. The initiation of these forums reveals a proactive approach by Sound Transit and its recognition of the need to strive towards continuous improvement.

Sound Transit has recognized that it should continually adapt to route specific challenges through adoption of lessons learned, sharing of knowledge and expertise, and the application of high-performance project management for completion of the University Link and beyond. Opportunities to mitigate cost increases and delays occur particularly within the activities of ROW acquisition, environmental remediation, and management of contaminated ground conditions.

Sound Transit has initiated value engineering studies for civil and systems contracts. Value management helps focus efforts on attaining optimized solutions for the desired functional requirements that not only eliminate waste and unnecessary cost, but delivers essential performance, e.g., to get the *best value for the money spent*. Value engineering has resulted in the identification of potential cost savings of approximately $6.5 million during preliminary design. Sound Transit's use of value engineering techniques reflects its commitment to reduce and control costs.

Sound Transit has also applied value management and cost and schedule risk assessment tools to assist in the management of budget and schedule. The COP clarified this process in their report on the Draft Sound Transit-2 Plan[8] (ST2), the implementation plan to be presented to voters in November 2007 to expand the system, as *Strong*

[8] Report dated April 5, 2007.

*management and mature agency skills are not created overnight. It took five years from start-up to the time Sound Transit had its policies, its systems and its management practices fully in place. The Puget Sound region should be careful to preserve and nurture this knowledge base and not to assume that every new program needs a new agency to manage it.*

While the implementation of "best practices" contributes towards improvements in project performance, quality, and effectiveness, the benefit is influenced by oversight and participation of subject matter experts. Sound Transit has recently engaged a number of experienced and qualified industry experts. Examples of such experts include:

- Certified Value Specialists (CVS) leading value engineering workshops.
- Experienced and qualified experts in the field of cost and schedule risk analysis and facilitation.
- Management from peer transit agencies participating in constructability reviews, value engineering, and cost/schedule risk workshops.

In addition, Sound Transit is required, in accordance with the terms of the FTA grant agreements, to comply with the federal agency's oversight requirements. This includes working with the FTA Project Management Contractor (PMOC). For example, the PMOC was involved in the North Link Risk Assessment exercise, working collectively with Sound Transit and external technical experts.

The use of the aforementioned "best practices" in conjunction with input from technical and subject matter experts and FTA oversight demonstrate that Sound

Transit's construction planning and management systems are maturing. This should be understood in the context of the complex and high-risk contracts that Sound Transit is delivering, where challenges and risks will always be present. Focus, innovation, and due diligence will always be required to avoid surprises on such projects.

**Sound Transit Response to Conclusion:**
Sound Transit appreciates the auditors' recognition of our efforts to improve over the last five years. Even with the significant progress already made, Sound Transit remains committed to continuous improvement.

The following discusses the issues Sound Transit encountered regarding cost, schedule, and scope changes relating to the Central Link Light Rail Project and provides recommendations that will contribute towards Sound Transit's present culture of continuous improvement.

**Sound Transit has not Commissioned Annual, Independent, Comprehensive Performance Audits Limiting the Ability to Identify and Address Budget, Schedule, and Scope Issues**

The Citizen Oversight Panel (COP) — the 15-member volunteer committee appointed by the Board — was created to *oversee and monitor the implementation of Sound Move*[9]. In addition, the COP is mandated to oversee the completion of annual, specific assessments through *independent performance audits*.

As an independent group charged with this purpose, the COP's input is central to ongoing year-to-year management decisions. Evaluating project alternatives, capital and operating budgets, financial plans, management of the regional fund, equity in sub-area budgets and reporting,

[9] Sound Move, Year 8, Citizen Oversight Panel Report

adhering to schedules and budgets, and reviewing annual performance audits is paramount for accountability. Performance audits are crucial to helping the COP assess the health of the organization. In addition, performance audits enhance transparency of operations and practices, increase accountability, and provide recommendations for improvement. The intended impact is increased efficiency and effectiveness of the audited entity.

Independent, comprehensive performance audits have not been conducted annually[10]. *Sound Move* states, within its Public Accountability requirement that *the RTA will:*

*a). Conduct an annual comprehensive performance audit through independent audit services;*
*b). Appoint and maintain for the ten-year construction period a citizens' oversight committee, charged with an annual review of the RTA's performance audit and financial plan, for the reporting and recommendations to the RTA Board."*

In addition, Resolution 75 states: *To ensure that the ten-year development and implementation program occurs within the framework and intent of the financial policies approved by Resolution 72, the RTA will conduct an annual comprehensive performance audit through independent audit services and appoint and maintain a citizens' oversight committee for the ten-year construction period. The oversight committee is charged with an annual review of the RTA's performance audit and financial plan and for reporting and recommendations to the Board.*"

Sound Transit's legal counsel has previously advised the Sound Transit Board and the COP that the COP is only required to review Sound Transit's annual independent financial audits to assess compliance with the financial

[10] See Appendix A-3 for a listing of completed audits.

policies adopted as part of *Sound Move.* However, language stated within *Sound Move*, Resolution 75, and the financial policies approved by Resolution 72, specifically requiring an *annual comprehensive performance audit*, appears to go beyond a financial audit. The Government Accountability Office (GAO) defines a performance audit as follows:

> *Performance audits provide an independent assessment of the performance and management of government programs against objective criteria or an assessment of best practices and other information. Performance audits provide information to improve program operations, facilitate decision making by parties with responsibility to oversee or initiate corrective action, and contribute to public accountability. The term performance audit is used generically to include work classified by some audit organizations as program evaluations, program effectiveness and results audits, economy and efficiency audits, operational audits, and value-for-money audits.*

This definition is widely publicized and accepted. By specifically using the stated terminology *annual comprehensive performance audits* implies to the average reader that an assessment of operational efficiency and effectiveness as it relates to public accountability will be conducted. These types of audits have not taken place on an annual basis.

Since comprehensive performance audits were not carried out on an annual basis, strategic action plans addressing the cause of the budget, schedule, and scope problems were not implemented in a timely manner. For example, a performance audit that was limited to Sound Transit's cost estimating systems and project controls was not carried out

until 2001. The audit found that *when the estimating guidelines were completed, they were issued (February 1999) but never formally implemented during the development of the earlier project estimates. As a result, it appears there were some deficiencies in the development of the earlier estimates. Based upon a review of the available documentation as well as interviews with various Project personnel, some of these deficiencies were discovered or noticed during [Deloitte & Touche's] D&T's assessments.* Sound Transit noted on their website that the same auditor "*concluded that Sound Transit used adequate methods and data in developing its current Link light rail cost estimate."* This is an example of a reactive rather than proactive process. Sound Transit would have benefited from a proactive audit plan.

Sound Transit's lack of annual performance audits since 2001 has made it a challenge for the COP to address the cause of problems. In April 2005, the COP's *Sound Move Year 8 Report* noted ten "lessons learned." However, the causes of these issues were not identified. A comprehensive performance audit would have provided a mechanism to identify those causes. This has made it difficult for the COP to measure whether Sound Transit has addressed why problems occurred and how Sound Transit's culture of continuous improvement mitigates the risk of the addressed problems happening again.

Recommendations identified in annual performance audits should also be followed-up upon in subsequent years to assure status of implementation, benefit, and validity.

**Recommendation #1a:** **We recommend Sound Transit initiate annual comprehensive performance audits, incorporating a process of review and reporting on the status of actions and progress on previous report recommendations.**

**Recommendation #1b:** **We recommend the Citizen Oversight Panel ensure annual comprehensive performance audits are conducted and reported to the public and the Board when they have not been performed.**

**Sound Transit Response to Recommendations 1a and 1b:**
Sound Transit appreciates the benefits that can be identified through independent review of Sound Transit's operations. Over the last ten years, Sound Transit has been one of the most frequently audited governmental entities within the State of Washington. Appendix A-3, for example, identifies forty-nine (49) different audits that were previously completed, many of which were targeted performance audits. In fact, between 2003 and January 2007, Sound Transit had an independent Performance Audit Committee, which was tasked with planning, directing, and monitoring performance-based audits focused on agency deliverables and outcomes. Upon passage of I-900, which gave the State Auditor's Office performance audit authority, Sound Transit sunsetted this committee.

Additionally, as the auditors have noted in this report, Sound Transit has internally identified numerous lessons learned from the construction of the Initial Segment. Many of these lessons learned are already in place, and Sound Transit is in the process of incorporating others.

Independent review and auditing plays an important role in the refinement of procedures. However, because the auditor's conclusions conflict with settled Washington law regarding the applicable legal rules of statutory interpretation, Sound Transit disagrees with the auditor's interpretation that Resolutions 72 and 75 require comprehensive, annual performance audits of all of Sound Transit's operations. In fact, Sound Transit's Board previously requested a legal analysis of this very issue.

That legal analysis, which was made available to the auditors during the audit process, demonstrates that Sound Transit's governing documents plainly require only that Sound Transit perform a comprehensive, annual *financial* audit. We understand that this issue has also been reviewed by the State Attorney General in past years, and that the AG's conclusion is not inconsistent with our own legal interpretation. In accordance with this interpretation, we have conducted such an audit each year and have made the annual

financial audit available to the COP each year to ensure compliance with the adopted financial polices (e.g., subarea equity) as legally required by Resolutions 72 and 75.

Comprehensive, annual performance audits of all of Sound Transit's operations are also unfeasible. By way of comparison, this audit was only of Link construction, and it has taken more than seven months to complete and, although not actually tracked, has likely required well over a thousand hours of Sound Transit personnel time, in addition to the cost of the auditors. A comprehensive performance audit as suggested by the auditors, however, would encompass all of Sound Transit's operations, including the construction, maintenance, and operations of Sounder Commuter Rail and Regional Express bus service, as well as all of Link operations and all of the various departments and operations that support Sound Transit generally. The magnitude of such an audit would easily increase by a factor of five or ten, resulting in a cycle of perpetual audits requiring the addition of full-time audit support personnel and disruption to normal activities. Perpetual audits would also create no lag time between audits to allow for evaluation and incorporation of recommendations and lessons learned. Follow-on audits would be conducted prior to there having been time to incorporate recommendations from the prior audit. For all of these reasons, comprehensive, annual performance audits of all of Sound Transit's operations are not only not legally required, they are also logistically unfeasible.

As noted, Sound Transit appreciates the value of both self-evaluation and external evaluation. We intend to continue to self-evaluate and implement lessons learned as they are identified. As we have done in the past (see, for example, the eight previous performance audits identified in Appendix A-3), we will also continue to request our own limited performance audits that are focused on areas that have been specifically targeted for evaluation. Finally, as required by our governing documents, we will continue to perform a comprehensive, annual *financial* audit every year.

**Auditors' Concluding Remarks:** Performance audits help insure that Sound Transit efficiently and effectively spends Washington State taxpayers' dollars. We believe the intent conveyed to the voters, regardless of Sound Transit's internal legal opinion, was for performance audits to take place. The language stated within *Sound Move*, Resolutions 72 and 75, specifically state that *annual comprehensive performance audits* are to be performed. We believe that the common definition of performance audits coupled with the placement of the requirement within the public accountability statement of *Sound Move*, indicate the intent to provide the public with an assessment of the performance and management of Sound Transit. Interpreting this requirement as only having to conduct *comprehensive*, *annual financial audits* misleads the general public and does not meet the intended outcome of the goal.

**Sound Transit has not Fully Implemented a Formal Knowledge Management Procedure and Database Increasing Risk in the Future of Higher Costs, Decreased Efficiency, and Missed Timelines.**

Sound Transit has formally documented lessons learned for the Tacoma Link Project and is currently drafting a *Lessons Learned Engineering Procedure and Flowchart*. Informal lessons learned have been compiled for the Real Estate Division. However, documented lessons learned do not exist for the Initial Segment. Although Sound Transit's response to a 2005 performance audit report stated that a lessons learned process was implemented in early 2006, formal procedures are still not in place and only exist in draft form.

Knowledge Management is an effective means to eliminate project variability. Knowledge Management involves application of lessons learned within a culture of continuous improvement. Sound Transit's draft Lessons Learned Engineering Procedure policy statement explains that *the lessons learned program provides a process for implementing improvements in the accuracy and efficiency of how we do our work. It is a repository for knowledge and experience gained from project activities, used to benefit current and future projects by revising the procedures and work products to eliminate non-value added activities….It also identifies areas where cost and schedule performance can be improved…."*

Failure to absorb experience and understand root causes of what worked and what did not will have cost and schedule impacts for future projects. The Real Estate Division has

made positive first steps to identify and act upon their documented lessons learned.

Sound Transit has not yet implemented a formal Knowledge Management procedure and database. The aim is to "institutionalize" knowledge, not rely solely on retention of experiences by individuals. Given the complexity, uniqueness, and high risk nature of Sound Transit projects, the loss of the current knowledge base could have an immense impact including increased costs, decreased efficiency, and missed timelines. Although formal documentation and the sharing of information help minimize potential negative impacts, lessons learned on open construction contracts should be held confidential to the owner until contract closure. To do otherwise would create exposure to potential claims.

**Recommendation #2:** **We recommend Sound Transit require formal documenting and sharing of lessons learned within the agency and implement appropriate procedures.**

**Sound Transit Response to Recommendation 2:**
Sound Transit agrees that identification and sharing of lessons learned is critical to the success of any agency, including Sound Transit. Successful identification and application of lessons learned on the Initial Segment can greatly increase the efficiency and success of Sound Transit's construction of University Link and any subsequent segments of the light rail system. We intend to incorporate all of these lessons learned into future construction operations.

The Initial Segment is also still under construction. Notwithstanding this, Sound Transit is in the process of completing the following:

- We have formed a Contract Documents Review Committee (CDRC) to work closely with the Construction Manager, the five Resident Engineers, design managers, and project managers to gather information on lessons learned by capturing the actual experience of these key team members responsible for the

implementation of the Initial Segment from final design through construction and start-up activities.

- Regular brown bag training sessions and other meetings were held with construction management personnel for cross-training of information on successes and challenges.
- As part of the U-Link Final Design work, the Contract General Provisions, Special Provisions, and Technical Specifications of the Initial Segment are being reviewed and revised in light of all the lessons learned from the Initial Segment.
- Link Engineering now has an approved engineering procedure for lessons learned that will be utilized to formally implement the process.

**Sound Transit's Real Estate Division Should Continue to Proactively Address All Lessons Learned as Identified in 2006 to Increase its Effectiveness and Mitigate Potential Cost and Schedule Impacts in the Future**

The Central Link Light Rail Project (Phase I) covers 19 miles (Initial Segment, Airport Link, and University Link) across multiple cities and counties in the Puget Sound area. The scope of these projects includes the acquisition of properties to enable construction of Link Light Rail within the ROW. The type of properties that have been acquired range from small domestic buildings to larger commercial properties. In addition to full property acquisition, partial possessions and temporary easement payments to owners are required. Therefore, the involvement of the Real Estate Division is a critical component in the life cycle of transportation construction projects.

The FTA recognized in their *Construction Project Management Guidelines* that *this is a critical phase of the project; if it is not performed well it can result in major cost and schedule impacts later in design, construction, or operations.*

Sound Transit experienced many challenges associated with real estate and land acquisition including the lack of early involvement of the Division, poor organizational structure, and inadequate process evaluation. In an effort to increase the efficiency and effectiveness of the Real Estate Division, an internal review of the department Division was conducted in July of 2006. The effect of the issues identified by the Real Estate Division's lessons learned addresses Sound Transit's history and it's lack of efficiency and effectiveness in the management of property acquisition and evaluation of the environmental impacts of those acquisitions.

This audit team requested Sound Transit to demonstrate application of these lessons learned to ensure past issues would not be repeated and have an impact on future projects.

A lessons learned document was presented to the audit team along with a strategy (developed in the spring of 2007) to address these issues to ensure more accountability to the stakeholders. Sound Transit's Real Estate Division's Lessons Learned document identifies specific recommendations to improve organizational structure, increase understanding of real estate processes and durations, and address the importance of process data collection and evaluation.

Because of pending litigation, the actual financial impact of past inefficiencies was not determined as a component of this audit. However, the risk of cost and schedule impacts

to Sound Transit will increase without a proactive approach to assuring lessons learned are incorporated in all future real estate activities.

**Recommendation #3:** **We recommend Sound Transit continue to proactively address all lessons learned associated with its Real Estate Division to ensure that there is no repetition of previous issues that can result in negative budget and schedule ramifications.**

**Sound Transit Response to Recommendation 3:**
Sound Transit has already identified and incorporated many lessons learned into its present operations. We are also committed to continuing to identify and incorporate lessons learned into all future operations.

It is also important to note that the overall real estate acquisition program was quite successful. Generally speaking, the measure of success is whether or not all properties needed for the project are acquired so as not to delay the construction contractor. In the case of the Initial Segment, 736 parcels were acquired and 221 relocations completed over what was essentially a 35-month period. This is a high level of performance under an aggressive schedule.

Going forward, Sound Transit remains committed to continuing to identify and implement lessons learned. To date we have already done the following:

- The 'lessons learned' summary and property acquisition timeline has been made available to agency staff.
- Real Estate has been reassigned to the Link Department to enhance integration of real estate functions with project functions.
- Real Estate staff and consultants have received additional training for their work on University Link.
- Construction contractors have been instructed to provide parcel-by-parcel costs for hazardous materials remediation to assist in future claims resolution.

**Perceived Conflict of Interest Occurred on $734,000 Change Order to a Consultant Contract to Manage $95 Million Construction Contract**

The perception of a conflict of interest in a governmental agency diminishes creditability, erodes public trust, and compromises integrity. A conflict of interest creates the belief that the owner's interests may not be best

represented, particularly concerning matters which are in dispute between parties.

Sound Transit has recognized this and in its 2004 procurement manual states: *organizational conflicts occur when, because of other activities, relationships or contracts, a consultant or contractor is unable, or potentially unable, to render impartial assistance or advice to Sound Transit; a contractor's objectivity in performing the contract work is or might be impaired; or a contractor has unfair competitive advantage. Examples include: a firm is unable to provide unbiased construction management advice due to a financial interest in the contractor selected to perform the work.* Sound Transit's Contractor Management Agreement requires a consultant to immediately disclose any conflict of interest with the agency and take action to eliminate conflict or withdraw from the Agreement.

Although Sound Transit has specifically established protocols for the potential of a conflict of interest, a construction management consultant was awarded an agreement to manage a construction contractor with whom the consultant subsequently entered into a significant joint venture project. No conflict of interest existed at the time of the execution of the agreement between Sound Transit and the construction management consultant, because the construction contract had not yet gone out to bid.

The consultant did not submit a declaration of a conflict of interest to Sound Transit at any time, in particular, prior to execution of several change orders, which included as part of their scope, claims evaluation.[11]. Although Sound Transit indicated that *Change Order Nos. 1 and 3 did not suggest any conflict of interest for either* (consultant) *or* (contractor), *Sound Transit determined that the* (consultant) *CM team would have the best understanding of the claim and decided not to hire a new consultant,* the issue of conflict of interest was not addressed at the time services for claims evaluation and negotiation were sought.

The audit found that there was solely a perception of conflict and no evidence or specific examples of diminished value were found. However, to assure that complete transparency is achieved in all contracting practices, Sound Transit should enhance its existing procedures to eliminate the risk of conflict - real or perceived.

**Recommendation #4:** **We recommend Sound Transit ensure that it obtains all declarations of non-conflict from any consultants being considered to provide dispute evaluation, assessment and negotiation services, or other services which are of a sensitive nature.**

**Sound Transit Response to Recommendation 4:**
Sound Transit agrees that it is important to avoid conflicts of interest in the awarding of contracts to consultants. We have specific policies in place to ensure that no such conflicts exist. This conclusion relates to one specific instance in which there was no

[11] Change Order No. 3 - a $734,505 change order for consultant services on the O&M Facility and the E-3 Bus Wing (Total award value $9,468,9061)

actual conflict of interest, as noted by the auditors. However, Sound Transit agrees that we need to remain diligent about obtaining and reviewing all declarations of non-conflict from consultants and will do so going forward.

**Sound Transit has no Formal Procedures for Evaluation of Consultant Performance Potentially Resulting in Risk of Delays in Construction and Added Costs**

Sound Transit's *Contract Administration Manual* does not include any procedures or requirements for evaluation of consultant performance. The manual requires updating to incorporate performance reviews and reflect periodic assessments.

Approximately $197,000,000 in consultant agreements has been issued for Link Light Rail from 1998 through 2011. In two examples (award values of $14,171,430 and $11,136,362), agreements initially awarded for five years with options to extend up to seven years, and four year agreements with options to extend up to six years were noted. Sound Transit does not regularly evaluate or monitor performance of consultants during the duration of a contract or prior to an extension. The requirement for reviews during the closeout process of a contract may have little or no impact on performance during the life of that contract. Effectiveness of the process is diminished and reduces Sound Transit's ability to manage.

Performance issues in administration of contracts have the potential to lead to delays in construction and added costs. For example, while not specifically differentiating between Sound Transit or consultant performance issues, a contractor's monthly status report cites delinquent

submittal response times, slow RFI response times, and general administrative delays for which they are tracking and analyzing.

To ensure consultants are efficient, effective, and accountable to the client, Sound Transit should evaluate and measure consultant and supplier performance. These practices will ensure service delivery continues to meet agreement and project expectations and that Sound Transit receives maximum value for services purchased. Periodic assessment is required during the life of a contract to ensure consistency and should include review criteria such as:

- Safety
- Quality
- Cost
- Schedule
- Management Systems

Appendix A-2 contains additional detail.

**Recommendation #5:** **We recommend Sound Transit implement quarterly consultant/supplier performance evaluations into the management of consultant contracts and follow-up to ensure expectations of contracts are being met.**

**Sound Transit Response to Recommendation 5:**
Sound Transit agrees that periodic performance evaluation of consultants is important to ensure that our contractual expectations are being met.

Although Sound Transit's Contract Administration Manual does not have specific procedures for evaluating and scoring consultants, in addition to the informal evaluation that occurs on a daily basis through constant interaction, all of the following already occur:

- Our contracts with consultants require monthly progress submittals by which Sound Transit monitors budget, scope, and schedule performance and progress of the work.

- Monthly reports are prepared by Sound Transit and submitted to the project stakeholders, including the FTA, that detail status of the work, indicate progress to date of both design and construction contracts, and identify issues requiring resolution.
- Our Quality Assurance program requires stringent incremental reviews during each milestone of design development (30 percent, 60 percent, 90 percent, and 100 percent) to validate progress to date and assess the quality of the consultants' submittals. Formal reports are prepared and transmitted to the consultants with our comments. Contractually, consultants are required to formally respond to our comments to demonstrate how they have implemented our comments into the next milestone for the design.

With regards to Architectural and Engineering contracts and other design contracts, Sound Transit agrees that a formalized evaluation process will be helpful to ensure that design teams are efficient, effective, and accountable. However, rather than quarterly evaluations, Sound Transit will conduct formal reviews at the conclusion of each design milestone. The scope of this formal review will assess the quality and completeness of the deliverables (including engineer's estimates), the timeliness of the team's performance, and budget management.

With regards to Construction Management consultants, in addition to the evaluation tools listed above, Sound Transit also receives and reviews weekly construction reports from the Construction Management consultants. This is in addition to almost daily contact with the construction management teams. So while there may not be a formal, quarterly review process, there is in reality a daily evaluation process that is constantly occurring. However, Sound Transit agrees that a periodic, formalized evaluation process may be helpful, and will initiate such a process for our Construction Management contracts.

**Sound Transit has not Formalized Tracking of RFI Response Times in the Link Construction Manual Resulting in Risk of Project Delays and Claims**

The effectiveness of construction management and contract administration is demonstrated through the reporting of key performance indicators (KPI). KPI's can be used to monitor administrative and management performance during project execution. Performance measures also provide owners with data that can be utilized in the project planning and decision making process, identifying areas for corrective action, and improvements while measuring

progress against targets. Performance measurement is a valuable tool to help owners achieve goals and maintain standards.

Measurable criterion includes Submittal, Request for Information (RFI), and Field Clarifications. The Association for Advancement of Cost Engineering (AACE) Total Cost Management (TCM) framework recognizes *you can't manage what you can't measure* and *whatever you measure tends to improve.* Structured and effective management of key processes can mitigate exposure to project delays and claims.

Sound Transit's *Link Project Control Policies and Procedures Manual* states that the *turnaround time for a RFI (from receipt by the Resident Engineer to transmittal of the RFI answer to the Contractor) shall be seven calendar days or less.* The guidelines of seven days are put in place to lessen possible disruptions to the contractor and also reduce the potential for claims at a later stage in the project. Although RFI status is documented in Weekly Progress Meeting Minutes and delinquent RFIs are identified in the Resident Engineer's Weekly Report, Sound Transit does not have any formalized KPI's for RFIs identified in the *Link Construction Manual* to report performance against this target.

In addition, the *Manual* requires a corrective action plan must be developed to bring performance within target but does not include response times.

Sound Transit has received contractor claims. For example, the civil construction contract for the Central Link O&M Facility, (which has open claims of $14,213,998 for miscellaneous items including alleged delays and extended overhead), states the following in the Contractor's monthly status report: *The delays associated with mal-administration of the Contract are being analyzed and tracked.* The Resident Engineer's report states that *the submission, receipt, processing, and return of submittals and RFI's continues to be an area of concern for all parties involved.*

Sound Transit has recently seen improvements while tracking closure of its Non-Conformance Reports. Response times have begun to decrease from 2006 to 2007. The Agency has stated that *based upon lessons learned from the initial segment regarding submittals and RFI response times, Sound Transit is reviewing and will refine measures to track and trend contract critical metrics with the goal to improve the management of consultant contracts.* However, response times metrics have yet to be defined and incorporated into construction management procedures.

**Recommendation #6:** **We recommend Sound Transit incorporate metrics into construction management procedures for tracking of response times for RFI's.**

**Sound Transit Response to Recommendation 6:**
Sound Transit agrees that tracking of RFI response times can be one of many helpful tools in construction management. Going forward, we will continue to track this and many other performance measures to ensure construction activities proceed as efficiently as possible.

To that end, Sound Transit already has effective construction management and contract administration measures in place. Although tracking and monitoring the average response times of RFIs from the contractors and submittals is one management tool, we believe an even more effective management tool is tracking and managing the specific RFIs and submittals that are critical to the cost and schedule of the contract. Sound Transit has a process in place to flag and manage these critical items through weekly meetings between the Resident Engineers and the contractors. The agency also tracks the submittal of all RFIs and submittals, including those less time sensitive.

As noted, Sound Transit is reviewing and will refine measures to track and trend contract critical metrics. This work is being refined through our Sound Transit Agency Review (STAR) Performance Management program as a way for the agency to continually refine key performance indicators. Sound Transit also reports to the FTA quarterly on the performance of RFIs, Non-Conformance Reports, Change Orders, Cost Forecasting and Contingency Status.

Finally, it is important to note that though the contractor's monthly report quotation implies mal-administration of the contract by Sound Transit, this was written in light of the contractor's intent to file claims for additional compensation on the project. Sound Transit disagrees with the contractor's quote. Significantly, Sound Transit has not identified or acknowledged, and no independent finder of fact has found, any such mal-administration of any contract.

**Sound Transit Should Continue to Follow a Risk Management Plan to Assure Cost Probabilities are Not Exceeded**

Sound Transit has steadily improved its application of cost and schedule risk assessment best practices. Its decision to excavate a test shaft at Beacon Hill to gather more geotechnical data and allow contractors and designers to observe nature and behavior of the ground indicates a modified approach. Given the high risk nature of tunneling in this area, these efforts should be commended. Additionally, the risk assessment for the University Link is comprehensive and detailed. For this scope, Sound Transit has a risk management plan to update and monitor items

identified on the risk register and have retained subject matter experts to support this process.

The objective of risk management is to provide a proactive management tool to focus on key areas of risk, develop strategies to manage risk, and improve performance in terms of cost, time, and quality. Sound Transit has improved the process and quality of its risk assessments through involvement of technical experts, risk subject matter experts, and staff from peer transit agencies. Its application and approach to risk assessment has increased in depth. Risk matrices have been prepared for the Initial Segment to Beacon Hill risk workshop, assessment, and report, and more recently, for the University Link risk workshop, assessment, and report. Lessons learned from the Beacon Hill experience to develop a contract packaging plan for the University Link have been incorporated.

Although extensive improvements have been implemented regarding risk management, issues will always arise. The 100 percent final cost probability for Beacon Hill was exceeded by the contractor's low bid. The University Link budget (without First Hill Station) was given an 86 percent probability of meeting final anticipated costs by the 2005 risk assessment. These occurrences highlight the need to assure that risk management plans are continuously updated, managed, and followed throughout the life of a project.

**Recommendation #7:** **We recommend Sound Transit ensure that the risk management planning for the University Link is followed and the risk assessment is updated and managed as appropriate.**

**Sound Transit Response to Recommendation 7:**

Sound Transit agrees that risk management planning plays an important role in project and cost management and we appreciate the auditors' recognition our efforts to provide a comprehensive and detailed risk assessment for the University Link Project. Going forward, we are committed to utilizing this management tool, as appropriate, and continue to focus on areas of risk as we develop strategies to mitigate the risks. Link's risk assessment program has evolved into the most robust and comprehensive risk assessment program of its kind. Link currently employs a rigorous risk assessment methodology, and consistently involves risk technical experts and relevant professional peer reviewers in the risk assessment process and workshops. While no guarantee, effective risk management does reduce the risk that cost and schedule estimates will be exceeded. As was the case on the Beacon Hill contract, however, sometimes a convergence of various factors beyond the control of the Agency can combine to affect bids in an adverse manner.

**Sound Transit does not Stipulate the Frequency and Format of "Second-Opinion" Cost Estimates, Decreasing the Ability to Compare and Validate Cost Predictions**

Sound Transit has had "second-opinion" cost estimates performed for high risk and complex construction packages such as Beacon Hill ($280 million) and the University Link ($1.5 billion). This approach supports best practices and efforts to mitigate cost overruns. However, attempts to reconcile selected "second-opinion" cost estimates against the final Engineer's Estimates proved inconclusive. The Beacon Hill "second-opinion" cost estimate was prepared only for "high risk" portions of scope at 90 percent design completion and the Engineer's Estimate, based upon 100 percent design. Costs at the summary level were not easily comparable between these documents. Sound Transit was not able to provide documentation to demonstrate its process. Where variances between estimates occurred, no

evidence of reconciliation or subsequent refinement that had taken place was identified.

| Project type | Number of cases (N) | Average cost escalation (%) |
|---|---|---|
| Rail | 58 | 44.7 |
| Fixed-link | 33 | 33.8 |
| Road | 167 | 20.4 |
| All projects | 258 | 27.6 |

*Source: Underestimating Costs in Public Works Projects Error or Lie? Bent Flyvbjerg, Mette Skamris Holm, and Søren Buhl*

Independent reviews or "second-opinion" cost estimates are an important tool to validate capital cost predictions for high risk and complex projects. This is a proactive approach to address the potential for systematic underestimation, one factor that has been reported to contribute to cost-overruns of publicly-funded capital projects. Sound Transit has endorsed this approach. In its response to the Performance Audit Committee's (PAC) 2007 Capital Project Audit Report, Sound Transit stated that *Capital Projects currently use an on-call estimating firm to obtain independent cost reviews on projects with high risks or complex scopes. Link routinely augments its own cost estimating efforts through the solicitation of independent cost estimates during the design phase.*

This approach supports best practice and mitigation of cost overruns. Sound Transit has developed a scope of work for an independent review of the University Link cost estimate. Objectives include steps to *assess the adequacy of project budgets, including contingencies established at the current design stage* and *protect Sound Transit against unreasonably high or low cost estimates and unreasonably optimistic or pessimistic project schedules at the design stage.*

Although Sound Transit has recognized the value of "second-opinion" cost estimates, its procedures do not

currently stipulate their frequency and format, hindering cost reconciliations between documents or reporting of variances against capital cost predictions.

**Recommendation #8:** **We recommend Sound Transit continue to utilize "second-opinion" cost estimates for high risk and complex projects and refine the process to allow for clear comparison and validation against capital cost predictions.**

**Sound Transit Response to Recommendation 8:**
Sound Transit concurs with this recommendation. We will also develop criteria for requiring second-opinion cost estimates and revise the existing cost estimating procedures.

## CHANGE ORDER MANAGEMENT

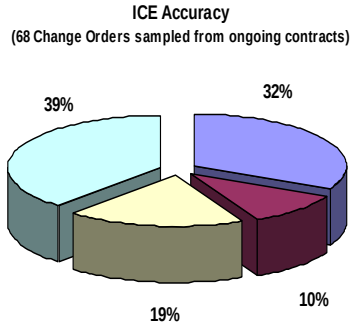
**Sound Transit has not Consistently Applied Estimating Guidelines Resulting in Variations in Quality and Content of Independent Cost Estimates for Change Orders.**

Application of Sound Transit's estimating guidelines have not been consistently applied in all cases. The use of a variety of estimating techniques has resulted in some variation in quality and content of Independent Cost Estimates (ICE).

The final cost of a project is its initial bid and all subsequent change orders. Robust change order controls ensure that the owner pays only fair and reasonable prices for changes and that unsubstantiated change orders are rejected. This can include maintaining exacting requirements for detailed change order documentation and enforcement of strict approval techniques. Sound Transit has formalized cost estimating guidelines contained within the *Link Project Controls and Procedures* document which

should be applied when preparing the Independent Cost Estimate. Sound Transit requires that *Cost estimates are prepared in a consistent manner that adheres to adopted practices and industry standards.*

A change order may not necessitate an ICE if it is processed on a Time and Material (T&M) basis. These change orders are approved through the work directive process and each provides a summary of actual hours worked and the cost of material with a standard markup applied.




Our review of the accuracy of independent cost estimates found:

- 39 percent fell in the range of -10 percent to +20 percent accurate (accuracy is measured against the approved Change Order value).
- 19 percent were lower than -10 percent of the approved change order value.
- 10 percent of approved change orders were greater than 20 percent above the change order value.
- ICE's were not available for 32 percent of the sample.

The *Contract Administration Manual* defines the ICE as *Cost/Price Analysis – The* (Resident Engineer) *RE shall prepare a Rough Order of Magnitude (ROM) for (Change Orders) COs not expected to cost greater than $100,000, an Independent Cost Estimate (ICE) for COs expected to cost greater than $100,000 and a Time Impact Analysis prior to receiving the Contractor's cost proposal and schedule proposal, if needed.*

Sound Transit's procedures however, do not provide guidance to produce a structured ICE for change orders, other than requiring a Rough Order of Magnitude for those expected to cost less than $100,000 and a cost estimate for anything over that value. This results in a variety of estimating formats with a possible variability of assessment of value.

Without a well-defined and detailed independent cost estimate, an accurate cost comparison cannot be made and therefore is difficult to establish whether value is being obtained. It is important to demonstrate diligence when processing change orders in order to mitigate exposure to claims.

**Recommendation #9:** **We recommend Sound Transit improve requirements for change order Independent Cost Estimates and provide an estimating framework.**

**Sound Transit Response to Recommendation 9:**
Sound Transit agrees that accurate and complete independent cost estimates (ICEs) are an important tool in managing the change order process. The estimating guideline for producing ICE in the Link Project Controls Policies and Procedures are supplemented by contract and the ST procurement manuals which provide additional guidelines, instruction, and checklists for producing ICEs. The guidelines allow for minor flexibility to accommodate varying work conditions and different contracting methods, *i.e.* scopes involving heavily subcontracted work, specialties, and/or Time & Material (T&M) work. To the extent that ICEs have been performed inconsistently with the policies identified above, Sound Transit will evaluate the existing procedures for revisions and take the necessary steps to ensure that ICEs are completed in a more uniform manner.

**Sound Transit's Documentation and Presentation of Change Order Data/Information Not Following Best Practices Limits the Ability to Demonstrate Fully the Receipt of Fair Market Value**

The actual structure of Sound Transit change orders are in accordance with the agency's best practice procedures. However, the ability to extract specific costs and relevant information was not always straightforward. Some Sound Transit change orders do not allow for a comprehensive review due to their format and document structure. Some cost summaries for very large change orders do not include a basic cost breakdown. As a result, it was difficult to easily obtain detailed data on some identified change orders.

In 2002, Sound Transit combined and consolidated procedures and produced the first copy of the *Link Project Control Policies and Procedures* document. Topics within this document include Cost Estimating Guidelines, Procurement Control, Progress Reporting, Cost Forecasting and Change Management. This document provides guidelines and practices in order to:

- *Maintain clear, accessible, and accurate up-to-date information on cost, schedule, and scope of all Link projects.*
- *Develop and use apt measures of cost, schedule, and scope performance that enable management to evaluate such performance, and to make and support decisions that affect the direction of the Link Program.*
- *Apply agency principles and industry standards of project management, tracking, and reporting.*
- *Manage the change process effectively, instituting thorough configuration management and document control to assure that project participants are working with a common information basis.*

It is important to Sound Transit to retain change order information for future estimating and to allow effective

budget control. If unit prices have been used to estimate, then the agreed upon unit prices should be readily available as cost data for any given project. It will enable consistent pricing of change orders.

It is equally important for Sound Transit to demonstrate fully that value for money and fair market pricing is being gained for all expenditures. Our review of selected change orders found it impossible to easily extract relevant costs from the documentation or cost agreements. These documents were confusing and, in some instances, not comprehensible.

**Recommendation #10:** **We recommend Sound Transit ensure that the Best Practice guidelines are followed to ensure that information can easily be obtained.**

**Sound Transit Response to Recommendation 10:**
Sound Transit agrees that clear documentation in change orders can facilitate ease of review to ensure the receipt of fair market value. We will evaluate the existing procedure for revision and take steps to ensure that change order documentation is easier to review.

To date, however, there has been no indication that lack of clear documentation has resulted in Sound Transit not receiving fair market value on any of its change orders.

**In Two Identified Instances, Known Scope was Omitted From Sound Transit Contract Documents Minimizing Competitive Pricing**

Some Sound Transit change orders were found to have scope excluded from the original contract documents - only to be added in at a later date as a change order on the project. The two instances identified include:

**Beacon Hill Tunnel Project (C710).**

The demolition of a building and removal of hazardous material was described as being ”inadvertently” left out of contract documents. This $165,229 change order did not receive the benefit of competitive pricing and most likely cost Sound Transit more through the post-contract change order process.

**Contract *C735; Change Order 018.***

The base contract scope of work included Cleanup Action Plan (CAP) activities, but deferred its quantification until post award. An estimate of the cost to clean this material from the construction site at the time of award was $2.5 million, although no commitment was included in the contract. Pay Item B-2 *Provisional Sum - Unknown & Contaminated Substance,* which, per Measurement and Payment provisions, included CAP work but did not include funds for the activities.

All known scope items should be included at the time of contract bidding to secure the most competitive price for the work. The lump sum low bid methodology is most effective when scope is fully defined.

Sound Transit is not receiving the benefit of a competitive price if it adds known work activities after contract award. Construction costs are not being minimized. Additional markups can typically be expected on scope added after the project has been awarded.

Gaps in contract work packages occurred when Sound Transit combined design sections which were produced by multiple prime design consultants. The agency has stated that as a result of this lessons learned, it has contracted with only a single prime design consultant for civil contracts and one for systems contracts for the University Link Project.

**Recommendation #11:** **We recommend Sound Transit improve scope verification procedures and processes prior to finalizing Information for Bid documents.**

**Sound Transit Response to Recommendation 11:**

Sound Transit agrees that to the extent possible, all known scope should be included in the scope of work that is advertised for bid. With the exception of the two instances identified above, we believe we have successfully done this. We also believe that despite the work not having been included in the original bid, the actual increased cost, if any, was likely minimal.

Sound Transit is employing the lessons learned from the Initial Segment experience to prevent this from happening in the implementation of future projects, including University Link. With early decisions relating to final contract packaging for University Link and the decision to use a single consultant for the final design of University Link, the potential for repeating this has, to a great extent, been eliminated.

**Sound Transit has Provided Inadequate Provisional Sums for Known Risk Items Resulting in Larger than Expected Costs**

Provisional sums — a contract amount included and designated as a specific contingency for the execution of work — are used in several Sound Transit contracts. There have also been some large extensions to existing provisional sums in contracts. The value of the provisional sum is typically drawn down as the work is carried out and costs are managed on a time and material (T&M) basis using this cost allowance.

Provisional sums in Sound Transit's contracts were found to be inadequately funded. Factors relating to why this occurred were reviewed. In addition, the identification of whether adequate procedures were being conducted in the early stages of a project to estimate a realistic cost was assessed.

On the O&M Facility project *C810*, the base contract scope included a provisional sum allowance of $400,000; however, this was extended on three occasions by Change Orders 023, 024, and 054. An additional $2,750,000 was approved. Change Order 054 was issued as an interim payment to settle the Contractor's request for $3,738,981.

These change orders were provided to supply funds to accommodate the urgent need to carry out removal of contaminated soils. However, no schedule impacts were noted at that time. This project has open claims awaiting negotiation, one of which concerns contamination in the value of $2,403,060.

Best practice requires quantitative risk analysis to identify magnitude of risk. Improved quantification will help contractors at pre-bid, improve assessment of required resources, and schedule risk.

**Recommendation #12:** **We recommend Sound Transit improve quantification of risk items included in contracts as Provisional Sums to reduce potential impacts for delays and cost increases.**

**Sound Transit Response to Recommendation 12:**

Sound Transit generally agrees that the risk of potential cost and time impacts can be minimized through improved quantification of risk items in advance of bidding. By their very nature, however, provisional sums are used when an accurate quantification of risk items cannot be made at the time of bid. Thus, while the risk (for example, that contaminated soils might be encountered) may be known, the exact quantum of that risk cannot, in all instances, be known in advance of construction activities.

For the specific example of the Operations & Maintenance Facility Contract, C810, many factors affected the accuracy of the estimated soil contamination, including:

- The project site included sixteen (16) occupied buildings and a large area of paved streets and parking lots, which prevented a significant number of soil samples from being taken prior to the completion of the C810 final design documents.
- Final design was completed before many of the buildings were vacated for demolition, and many of the buildings were still occupied less than one year prior to the C810 bid advertising.
- During construction, additional contaminated soils were discovered beneath recently demolished buildings.
- In addition to petroleum contamination, a high level of leachable lead was identified and required remediation. The high level of leachable lead was very unusual for this area and was not previously anticipated.

All of these factors affected the accuracy of the original provisional sum. While Sound Transit agrees that additional preliminary investigation and testing may be helpful in the future, the use of provisional sums will always be subject to some amount of risk that the sum will be exceeded once actual risks and quantities can be quantified through construction activities. Sound Transit is committed to ensuring that the costs and benefits of increased levels of preliminary investigation will be weighed to determine the appropriate level of preliminary testing for all future projects, including University Link.

The claim that is mentioned above has been settled as part of a global settlement of all claims on the Operations & Maintenance Base and related E-3 Busway extension. Although the amount of the settlement related to the removal of contaminated soil is not specifically addressed in the settlement, Sound Transit's internal valuation was less than $2 million.

**Sound Transit's Classification of Change Order Sources is not to FTA Guidelines and May Limit the Ability to Effectively Assess Changes to Contract Scope**

The classification of change orders allows owners to monitor the performance of the changes to the contract scope and assess the causes of the change. The FTA's *Changes during Construction/Contractor Compensation* provides a list of the types of change and whether the contractor should be compensated or not. For example:

- Agency Action
- Differing Site Conditions
- Errors or Omissions
- VE
- Contractor Action

Tracking this kind of information provides a record of the types of change experienced on a project. This information is useful in managing current and future projects. However, Sound Transit does not currently classify change order sources in accordance with FTA suggested guidelines.

Additionally, using performance data in this manner is recommended by the Federal Government, Office of Management and Budget, stating that *we have learned from the experience of agencies and contractors that recording contractor current performance information periodically during contract performance and discussing the results with contractors is a powerful motivator for contractors to maintain high quality performance or improve inadequate performance before the next reporting cycle. Current performance assessment is a basic best practice for good contract administration, and is one of the most important tools available for ensuring good contractor performance.*

The absence of FTA change order source classification means that lessons learned and performance measurement data is not available. Sound Transit should enhance its system of identifying change order sources. Improved tracking of sources of specific changes will generate data Sound Transit management can use to determine whether occurrences are within acceptable limits, whether there are possible areas for improvement in project delivery, whether corrective actions may be needed, and at contract completion, whether there are any lessons learned to be documented. Data should be available for detailed review to increase the effectiveness of executive management oversight.

**Recommendation #13:** **We recommend Sound Transit implement a process to classify change order sources to acquire performance measurement data and a basis for understanding changes on all projects.**

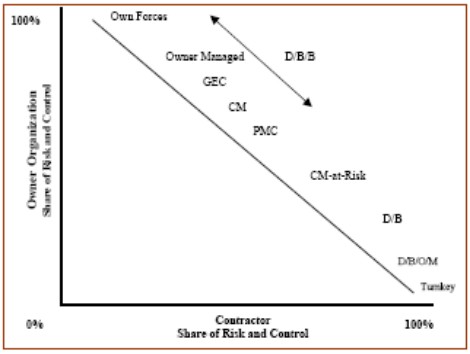
**Sound Transit Response to Recommendation 13:**

Sound Transit agrees that tracking the number and types of change orders experienced on a project can be an important tool in assessing many things, including the quality of Sound Transit's original contract documents and contractor performance. In fact, beginning in the second quarter of 2006, Sound Transit began tracking change orders by type. Instead of the FTA recommended change order category types, Sound Transit elected to track change orders through the following categories: (a) Scope Change including dollars; (b) Schedule Change; (c) Scope and Schedule Change; (d) Term Change; and (e) No Cost Other. Sound Transit will investigate the feasibility and benefits of revising the "type" of change order categories tracked to be consistent with FTA recommendations.

**Current Washington State Law Limits Sound Transit's Current Procurement Strategies, Which May Limit Best Value, Increase Project Risk and Soft Costs, and Result in Longer Delays**

Sound Transit's civil construction contracts for the Initial Segment are based upon a Design-Bid-Build (Low Bid) delivery method. *The University Link Project Management Plan* (Section 3.2.5 *Contracting Techniques*) states that construction contracts will be delivered through low-bid contracts. This section also states that *other methods of delivery may be explored during final design and prior to completion of the 60-percent final design milestone.* Sound Transit has confirmed that civil contracts for the University Link will be constructed using the Design-Bid-Build approach. As described in the *North Link Risk Assessment Technical Report*, the proposed packaging and sequencing of construction was based upon consideration of contracting opportunities, industry capacity, bidding risks, construction bonding constraints, and construction interfaces. This incorporates lessons learned from the Beacon Hill contract where lack of competition and market conditions at the time of bid are believed by Sound Transit to be significant contributing factors to a bid higher than the probable cost range predicted by the risk assessment.

*Sharing of Control and Risk Between Owner and Contractor for Alternative Delivery Strategies*




*Source: FTA Construction Project Management Handbook*

Although current Washington state law limits Sound Transit's procurement methods, a key component to successful project management planning is the development of an appropriate contracting strategy. Such a strategy involves identifying the method of procurement and project delivery that will be utilized on the project. Sound Transit, if current Washington law is amended to permit it, should select an approach that will deliver the core project objectives and provide the best value.

Traditional procurement strategies often do not facilitate "fast tracking" and may lack the benefits of contractor input at the design stage. Alternative strategies can allow faster construction without increasing cost and can also leverage contractor knowledge in terms of constructability, long lead items, schedule improvements, and maintenance considerations. A research paper issued by Arizona State University titled *Effectiveness of the Specification, Low-Bid Construction Delivery System* finds that *the results of the study show that the low-bid award in design, bid, and build process is the primary cause of construction nonperformance….* The goal is to select an approach that will deliver the core project objectives and provide the best value to stakeholders.

Typically, an organization's contracting strategy focuses on maximizing value while reducing areas of risk. For example, a poorly detailed or undeveloped scope inevitably leads to increased cost to the owner through the use of change orders during construction. It becomes very important to choose a strategy that will reduce the risk to the owner of increased costs. Sound Transit should also use risk analysis techniques to quantify project risks to aide the selection of contracting strategies to mitigate those risks.

Low bid procurement can increase project risk[12], higher soft costs, and longer delays. In addition, large contract packages mean smaller number of contractors able to bond and build complex and challenging projects. Opportunities for competitive pricing via the low-bid approach are diminished. Sound Transit experienced the problem associated with large scope packages in 1999/2000 during the budgeting and procurement of the downtown Seattle to University District tunnel segment. In addition, the Initial Segment's Beacon Hill civil and tunneling contract received only two bids and was awarded at a value of $279,964,375. The Engineer's Estimate was $238,647,794.

Sound Transit has developed a construction-packaging plan for the University Link, which will utilize 'low bid' for four main packages (excluding project-wide contracts such as vehicles, trackwork, systems, utilities, and demolition/site prep/abatement). It should be noted that while this strategy may attract a greater number of interested and capable contractors, agency soft costs may increase as contract and construction management becomes more complex and the need to provide careful inter-package coordination grows. Risk of scope gaps between packages increase and the need arises to identify and manage inter-dependencies.

[12] Awarding contracts based on low-bid does not necessarily result in low overall project costs. On three different contracts, Portland's Tri-Met saw large cost overruns on low-bid projects (Irwin 2003). On a $29 million contract, the agency received a $13 million claim late in construction. On a $104 million contract, costs increased $75 million; and on an $8 million contract, the agency was forced to delete certain work and let a separate contract for $2.5 million to complete the work.
Source: Analysis of Capital Cost Elements and their Effect on Operating Costs (FTA)

**Recommendation #14a:** **We recommend that the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.**

**Recommendation #14b:** **We recommend that Sound Transit, if permitted by changes instituted by the Legislature, consider the use of alternative project delivery methods.**

**Sound Transit Response to Recommendations 14a and 14b:**
Sound Transit agrees that, in certain circumstances, project delivery methods other than the design-bid-build method can be helpful in reducing potential project risks relating to the total cost and time for project completion. Sound Transit also recognizes that the utilization of alternative contracting methods has generated significant debate within the public contracting and construction community. Pursuant to Sound Transit's enabling statute, RCW 81.112.070, Sound Transit already has the authority to use various project delivery methods, including negotiated procurements. Sound Transit will continue its practice of carefully considering the various project delivery methods to which it may legally avail itself, and it will procure future construction contracts accordingly.

In addition to selecting the best project delivery method, Sound Transit also believes that an equally important factor is the proper packaging of the work to be completed. The goal is to package the work in a manner that encourages the highest degree of participation from bidders while controlling Sound Transit's coordination and oversight role. In other words, the work needs to be packaged so that the packages are not so large as to dissuade all but the largest bidders, but not so small as to require coordination of a large number of contracts. Sound Transit's current packaging strategy for University Link attempts to strike a balance between the two extremes.

**Sound Transit Does not Use Milestone Payment Incentives Resulting in the Potential Risk of Higher Administrative Costs and Limiting Contractor Performance Opportunities**

One challenge faced by Sound Transit in the construction of the light rail system is the risk of significant disruption to local businesses and traffic flow where guideways pass through existing public right of ways.

Contracts can include provisions for payment upon completion of pre-defined contract milestones with incentives for completion on or ahead or schedule and disincentives for failure to meet the target. Milestone incentives are best applied to contracts where schedule

performance has a high impact on traffic flow. Milestone payment schedules are used overseas to reduce the cost of administrative burden and provide incentives to contractors to work efficiently.

Typically, and based in part on its experience with similar projects, the payment terms in Sound Transit's civil construction contracts are based upon percentage progress for lump sum items and actual quantities performed for unit price items. Payment terms typically do not include incentives or disincentives for accomplishment of defined contract milestones.

**Recommendation #15:** **We recommend Sound Transit, as appropriate, use a milestone payment strategy on future contracts particularly those that significantly impact public access and traffic flow.**

**Sound Transit Response to Recommendation 15**:
Sound Transit agrees that, in certain circumstances, milestone payment strategies may be an appropriate contracting strategy. In the past, including on a portion of the Initial Segment, Sound Transit used milestone payment strategies. Based on that experience, as well as input received from the contractor involved on that project, milestone payment strategies were not used on subsequent portions of the project. However, Sound Transit will assess its current contract payment strategies, and as appropriate, may utilize milestone payment strategies on future projects to be constructed. We will also evaluate the types of criteria to be used in determining when a milestone payment strategy would be appropriate and develop procedures adopting this criteria.

## ENVIRONMENTAL MANAGEMENT

### Sound Transit's Environmental Assessment Strategy did not Fully Estimate the Number and Extent of Hazardous and Contaminated Sites and Materials Resulting in Unnecessary/Underestimated Costs

Existing hazardous materials and subsurface contamination along the project segment ROW was not fully identified or quantified in some instances in advance of contract award and construction activities. Hazardous materials within structures scheduled for demolition and subsurface contamination on parcels along the project segment ROW were not always adequately investigated and quantified in advance of contract award. In many cases, due diligence surveys and investigations underestimated the location, extent, and volume of hazardous materials and contaminated soil. In addition, unit prices agreed to were higher than typical industry-wide costs.

Pre-construction (demolition) due diligence assessments should be of sufficiently detailed scope to allow quantification of hazardous materials/contamination, establish the degree of uncertainty associated with quantity/volume estimates, and agree to a reasonable unit price. Well-supported quantity estimates allow unit costs to be established for abatement and removal to replace the use of the provisional sum approach in contracting.

In many instances, the lack of detailed surveys containing reasonably accurate estimates of hazardous materials/contamination volumes resulted in inefficiencies including standby, demobilization of labor and equipment, and re-mobilization that increased project costs. In some instances, cleanup crews had to return to properties once

further testing indicated additional presence and quantities of hazardous materials/contamination.

Preparation of detailed surveys and cleanup plans were constrained by limited advance access to structures and properties and adequate schedule for testing and preparation of findings. Site access was a significant factor in that hazardous material surveys of structures could not be completed until the acquisition process was finalized and the structures vacated. In the case of known or suspected contaminated parcels, ongoing site activities and business hampered access for site investigation activities.

Sound Transit's Phase I/Phase II Environmental Assessment program did not identify many of the contaminated sites along the route alignment for *C735* (MLK, Jr. Way, S.). The due diligence environmental assessment approach utilized by Sound Transit failed to identify many of the contaminated sites encountered along the route during construction. Of the 42 contaminated parcels encountered during construction, 21 sites were known in advance to be contaminated.

A thorough investigation strategy should be to identify as many contaminated sites as possible along the planned route. Evaluation and selection of investigation methods that yield screening level data for all potentially impacted parcels and existing ROW along the entire construction corridor should be emphasized.

Failure to identify most of the contaminated sites resulted in unnecessary/underestimated cleanup costs during the planning phase. Cleanup costs were unnecessary/ underestimated by at least $3.5 million.

Clean-up Action Plans (CAP) for known contaminated parcels along MLK, Jr. Way S. under-estimated the volume of soil contamination and did not provide the contractor with meaningful information for remedial action planning. CAPs were based on assessment data that failed to define the full extent of soil contamination. The CAPs did not provide engineering details; therefore, the contractor was unable to effectively plan the remediation work resulting in duplicated efforts.

CAPs provided to the contractor should provide the estimated limits of contaminated soil and excavation boundaries, including recommended setbacks from structures and utilities. The expected thickness of clean material should be provided and volume estimates for both uncontaminated and contaminated soil should be included.

CAPs were developed from Phase II assessment data that were typically limited to three-four soil borings. As a result, the CAPs did not always provide accurate soil volume estimates. Because of pending resolution of disputes, further review of the impact of underestimating the volume of soil contamination was not pursued.

**Recommendation #16:** **We recommend Sound Transit:**

- **ensure that access to structures and properties for due diligence inspection and testing is negotiated early in the real estate acquisition process.**
- **ensure that the investigation and sampling plan is designed to obtain a comprehensive and representative sampling of materials to allow quantification of hazardous materials/ contamination requiring abatement.**
- **ensure that adequate time for testing, data compilation, and reporting of findings is factored into the project schedule.**
- **ensure available survey findings and volume estimates are incorporated into bid documents and made available to the successful bidder immediately following contract award.**
- **attempt to obtain screening level subsurface data from as many commercial properties along a planned route segment as possible.**
- **consider investigation techniques that require minimal access issues and site disruption.**
- **conduct subsurface investigations of public right of way adjacent to known or suspected contaminated sites during the design phase of projects in order to have a better understanding of potential presence, nature, and extent of contamination.**
- **conduct additional remedial investigations of known contaminated sites after properties are acquired and prior to the initiation of the request for bid (RFB) process. Incorporate the information gained into the Clean-up Action Plans and contract documents.**
- **assure Clean-up Action Plans provided to the contractor provide estimated limits and volumes of contaminated soil and excavation boundaries, including recommended setbacks from structures and utilities.**

**Sound Transit Response to Recommendation 16**:
As part of our experience on the Initial Segment, the schedule for property acquisitions and bid document preparation for future projects will endeavor to allow sufficient time to include the relevant and appropriate information necessary for an accurate bid to be prepared by our contractor(s), reflective of all known site conditions. At the same time, it

is important to recognize that with any complex investigation program, there is a calculated tradeoff between the amount of time and money that is reasonable to expend on studies, versus initiation of the project with adequate contingency in order to cover the cost of discovery of unknown contaminated hazardous substances. We estimated that an effort to identify all of the contaminated soil along the C735 corridor would have required an additional $850 thousand to $1.0 million, without a signification decrease in the overall cost of remediation.

Using the latest C735 contractor pay request data, we have also calculated that discovery of unknown hazardous materials resulted in the underestimation of cleanup costs by approximately 2.3 million dollars, in contrast to the higher figure (3.5 million dollars) quoted in the audit report.

But even if the 3.5 million dollar amount were correct, it is important to note that the initial underestimation of these clean-up costs does not mean that Sound Transit had to pay 3.5 million dollars more than otherwise would have been required. Had the full and complete extent of contamination been known in advance, Sound Transit would have still been required to pay to have the full extent of contaminated soil remediation cost, which would have resulted in a higher initial estimated cost. Thus, while it may have been slightly more expensive to proceed without the scope of contamination known to 100 percent certainty in advance, the combined additional cost of a 100 percent level of investigation and the higher estimated cost for a larger amount of known contamination would likely result in approximately the same total cost in the end.

Therefore, the auditors' suggestion that this resulted in a $3.5 million dollar potential "cost savings/unnecessary expenditure," as characterized above and in the Executive Summary chart is incorrect. It ignores the fact that Sound Transit would have been required to remediate the full extent of contamination encountered during construction, regardless of whether it was completely identified and quantified in advance of construction operations.

**Auditors' Concluding Remarks:** As stated previously, "the lack of detailed surveys containing reasonably accurate estimates of hazardous materials/contamination volumes resulted in inefficiencies including standby, demobilization of labor and equipment, and re-mobilization that increased project costs. In some instances, cleanup crews had to return to properties once further testing indicated additional presence and quantities of hazardous materials/contamination." We disagree with Sound Transit's assertion that these costs would have been incurred regardless — especially in light of outstanding claims by the contractor.

Sound Transit has acknowledged the need to allow for sufficient time for an accurate bid to be prepared by its

contractors. Improved due diligence results in cost savings. Well-supported quantity estimates allow unit costs to be established for abatement and removal to replace the use of the provisional sum approach in contracting.

**Unit Prices Agreed to were Higher than Typical Industry-wide Costs**

Sound Transit agreed to a change order associated with a CAP on Contract *C735*, (MLK Jr. Way S.). The change order established a provisional sum of $4,000,000 for the excavation, transportation, and disposal of contaminated soil. A Sound Transit consultant completed an initial estimate for the removal of approximately 32,400 cubic yards (CY) at a unit price of $125/CY, which formed the basis for the provisional sum. However, typical industry-wide costs for non-hazardous, hydrocarbon-contaminated soil are in the range of $50 to $90 per cubic yard with the possibility of lower rates on higher volumes.

As discussed in the previous section, an additional change order for $3,500,000 was unnecessarily initiated and established provisional unit costs that would be used until the contractor and Sound Transit agreed on unit costs. In addition to being unnecessary, the expense incurred was greater than required because of the use of higher unit prices. The *Provisional Schedule of Values* contained unit prices as:

> Hydrocarbon-impacted soil $60/ton, < 250 ton/site and $50/ton for > 250 ton/site.

This unit cost ($50/ton or $75/CY), applied to the volume of soil under CO 18 would have resulted in a cost reduction of $1,620,000 (32,400 CY at a cost savings of $50/CY).

In addition, the original estimate of the total volume of contaminated soil at 32,400 CY was understated by almost 15,000 CY's. The actual volume of soil excavated (as reported by the contractor) was 47,236 CY. Using unit costs established in the second change order, a savings of $2,361,800 (47,236 CY at a cost savings of $50/CY) would have resulted.

**Recommendation #17:** **We recommend Sound Transit:**

- **ensure that unit prices are consistent with industry standards.**
- **ensure that, for unit cost pay items, a rate for segregation and handling of uncontaminated soil is provided.**

**Sound Transit Response to Recommendation 17**:
Sound Transit will take steps to ensure that both recommendations are implemented on future projects.

The analysis presented above, however, is factually inaccurate and is inapplicable to the project at issue. The provisional sum was never intended to represent a unit price by which the contractor was to actually be paid. When the provisional sum was established, it was estimated that there were approximately 32,400 cubic yards of contaminated soil. In an attempt to be conservative in establishing the amount of the provisional sum, a $125/cubic yard was used as the basis for the provisional sum. Later, Change Order #18 was issued with a unit price of $75/cubic yard. But the contractor never agreed to this or any other unit pricing that was proposed by Sound Transit. Thus, Change Order #18 became a unilateral change order to which the contractor never agreed.

While the contractor may have received progress payments during the course of the project, final payment to the contractor for this work will be made, pursuant to the contract's payment provisions, on a provisional sum time and material basis. None of the unit prices identified above will be used for the final calculation of payment owed to the contractor for this work. The final reconciliation of amounts owed to the contractor for

this work are still being determined based on an audit of the contractor's time and material records.

Finally, because the unit prices discussed above are not the basis for final payment for the work identified, the $2,361,800 "cost savings/unnecessary expenditure" identified is inapplicable.

**Auditors' Concluding Remarks:** We disagree with Sound Transit's conclusion that no cost savings would have resulted in this instance. Information provided to us during the audit formed the basis for our conclusions and calculations.

---

**Cleanup Procedures for Unanticipated Soil Contamination Were Inefficient Resulting in Additional Costs**

Cleanup procedures for unanticipated soil contamination sites were inefficient and resulted in standby and mobilization of equipment and personnel for *C735* (MLK, Jr. Way, S.). Upon encountering unanticipated soil contamination, utility installation work ceased to allow testing. The construction crew was demobilized and a Hazmat-trained crew was mobilized to excavate the contaminated soil. Following removal of the contamination to the extent possible, the excavation was backfilled with clean material and the regular construction crew was re-mobilized to trench through the clean fill and install utilities. As work progressed, Sound Transit implemented contingency plans including Hazmat training for utility workers to reduce project inefficiencies.

Given the potential for repeated encounters with unanticipated contamination along a major commercial thoroughfare, procedures should be in place to provide a nearly seamless transition of work efforts between construction tasks and soil remediation activities.

Changing the work crew in each event when contaminated soil was encountered created schedule inefficiencies and excessive standby, demobilization, and remobilization costs. Work efforts were duplicated by backfilling excavations with clean import fill that was subsequently excavated and exported to facilitate utility installation. A preliminary estimate of the cost of equipment standby[13] is approximately $930,000.

Lack of key Hazmat-trained members on construction crews and a contingency preparedness and action plan for unanticipated contamination created inefficiencies that escalated the cost of cleanup.

**Recommendation #18:** **We recommend Sound Transit, given the potential for repeated encounters with unanticipated contamination along a major commercial thoroughfare:**

- **ensure that each construction team includes an appropriate number of Hazmat-trained individuals to allow work to continue when contamination is encountered.**
- **ensure that a contingency response plan which defines the roles, responsibilities, and standard procedures to be implemented is in place.**

**Sound Transit Response to Recommendation 18**:
Sound Transit and its contractors learned early on that it would be more efficient to require the inclusion of HAZWOPER-trained staff on each individual contractor subsurface utility installation crew, as opposed to continued reliance on a separate HAZWOPER- certified subcontractor.

A few points of clarification are necessary regarding some statements in the report above:

- Sound Transit's contract on the project referenced required the preparation of several contingency plans, including a Contaminated Material Handling Plan and

[13] Based on a review of a single sample parcel and extrapolated for the 15 original CAP sites, 27 unanticipated sites, and 20 contaminated right of way sites.

a Hazardous and Contaminated Health and Safety Plan. Both of these Plans, along with other submittals required in the contract, established roles, responsibilities, and standard operating procedures to be followed upon the discovery of unknown contaminated materials.

- The use of clean backfill in excavated areas that were later re-excavated for utility installation was designed to limit the potential exposure of workers in utility trenches to organic vapors associated with contaminated soil that was not excavated due to its presence in adjacent City right-of-way or in private property. Clean compacted fill served as a cheap, effective vapor barrier when placed in a volume sufficient to allow subsequent re-excavation of a portion, but not all, of the emplaced fill. This then could be re-used elsewhere on the project.

Sound Transit agrees that the goal should be to minimize any such costs, and this lesson learned will be incorporated into future construction operations.

**Sound Transit's Regulatory Clean-up Levels Were Improperly Determined Resulting in Unnecessary Costs**

Suspected soil contamination encountered within the existing ROW along MLK Jr. Way S. resulted in the removal and disposal of soils classified as contaminated, regardless of the fact that contaminants did not exceed regulatory cleanup levels. Upon encountering unanticipated soil contamination within the ROW, construction work ceased to allow testing. Although soil sample results from at least nine separate sites indicated that contaminant levels were below the most stringent cleanup standards, remediation activities proceeded based on petroleum odors in the soil. The most significant example was parcel RV-323 where all seven waste characterization samples did not contain detectable hydrocarbons yet 3,060 tons of soil was removed based on odors and field monitoring results.

When soil sample results indicate contaminant levels are below cleanup standards, construction activities should

continue. Air monitoring should be implemented to verify that worker exposure levels are below Occupational Safety and Health Administration (OSHA) limits. Excavation spoils should be tested as needed to verify acceptable disposal criteria.

Disposal of suspected contaminated soil, regardless of the fact that it did not exceed cleanup standards, created unnecessary costs. Between the nine parcels that did not exhibit confirmed soil contamination requiring cleanup, 7,334 tons of soil were disposed as contaminated at an estimated total cost of $513,380.

Lack of contingency plans, including key Hazmat-trained members on the construction crews resulted in a worst-case approach to dealing with soil that did not require cleanup.

**Recommendation #19:** **We recommend Sound Transit:**

- **develop a contingency plan to allow work to continue when suspected contamination is encountered in the right of way.**
- **ensure that health and safety monitoring is available to evaluate and ensure that construction workers are adequately protected during excavation of suspected contaminated soil.**

**Sound Transit Response to Recommendation 19**:
While Sound Transit conceptually agrees with these recommendations, we disagree with the text of the conclusion in its entirety, because it does not reflect Washington State cleanup regulations and the realities of "clean" soil disposal options in the Puget Sound area.

When encountering soils exhibiting strong odors and high organic vapors in excavations being made for utility installations, Sound Transit's contractor had limited options for disposal of the soils, and in most cases, had no choice but to treat the materials in a manner identical to that used for petroleum-contaminated soil (PCS). In the example

given (RV-323), only the soil necessary for installation of a joint utility trench was excavated. No effort was made to achieve complete removal of all high-vapor soils. The site to which the excavated "clean fill" was being hauled specifically excluded the acceptance of materials with strong odors or with a vapor content indicative of potential contamination. Furthermore, the presence of hydrocarbon odors, along with significant organic vapor readings on monitoring equipment, indicated that there was a strong potential that contaminants above the regulatory limits could be encountered at any time in the excavation.

This required the high-vapor soil be hauled to a separate site or facility that would accept such materials. No disposal sites that could accept "clean fill," as defined by King County, were willing to take this high-vapor material. This is due in part to the current lack of definition and guidance from the State Department of Ecology regarding any end-use criteria for the disposal or re-use of soil with low levels of contaminants. The subsequent uncertainty of long-term liability on the part of fill site operators has resulted in a very conservative approach on the part of site operators to their own acceptance criteria.

Although several soil treatment facilities exist in the Puget Sound area, they consist of the usual PCS treatment/disposal sites. The closest, and most cost-effective, location for disposal/treatment was the same subtitle D transfer station, which accepted PCS from other sites on the project. Therefore, the cost of handling the potentially contaminated, high-vapor soil, albeit determined to contain hydrocarbon concentrations below MTCA Method A, was the same as disposing of more heavily-contaminated PCS material.

In summary, Sound Transit contends that the cost of excavating and disposing of the high-vapor soils was a necessary component of the construction project, and Sound Transit's regulatory cleanup levels were properly determined and applied. No unnecessary costs were identified. The recommendations presented in item #19 were followed throughout the extent of the contract at issue.

**Limited Contractor Liability Resulted in Stormwater Pollution Fines to Sound Transit**

Based on discharge monitoring reports, Sound Transit was fined by the Washington State Department of Ecology on four occasions for stormwater pollution violations associated with construction activities. The two most significant Notices of Penalty resulted in fines totaling $145,000. The violations included the discharge of stormwater in excess of permitted effluent limitations and failure to properly develop and implement adequate

Stormwater Pollution Prevention Plans. Inadequate use and maintenance of Best Management Practices (BMPs) designed to prevent stormwater pollution were also cited among the violations.

The Stormwater Permit issued by the Washington State Department of Ecology for the project required site-specific Stormwater Pollution Prevention Plans and the implementation, monitoring, and maintenance of BMPs.

Violation of the stormwater permit for the project resulted in Notices of Violation, fines, issuance of an Immediate Action Order, and substantial staff time to implement corrective actions and comply with Department of Ecology orders.

Inadequate time was available for Sound Transit to fully analyze draft permit requirements and negotiate achievable compliance standards with the Department of Ecology. Permits were issued directly to Sound Transit, thus increasing the challenge of holding contractors accountable for permit compliance. Contractors lacked adequate commitment, training, and resources to fully implement BMPs and prevent stormwater violations.

**Recommendation #20:** **We recommend that Sound Transit:**

- **implement a plan to require contractors on future phases of construction to sign as co-permittee on Stormwater Permits.**
- **continue to educate contractors and raise awareness of stormwater compliance issues using independent technical consultants and the ongoing program of joint weekly compliance inspections.**

**Sound Transit Response to Recommendation 20**:
Sound Transit self-reports stormwater violations by contractors under our permit. As a result of the referenced penalties, primarily related to the same contractor, we have increased our oversight of the contractors through our Construction Management consultants, which includes environmental monitoring services, supplemented by joint weekly compliance inspections.

Sound Transit has already been in discussions with the Department of Ecology to have contractors named as co-permittees for future stormwater permits. While contractors have always been contractually required to meet all permit requirements, we believe co-permittee status will increase contractor ownership of the requirements, and it should enhance contractor compliance.

We are also pleased to be in final settlement negotiations with DOE regarding the penalties noted by the Auditors and look forward to a positive resolution for the public.

# Appendix

**Link Light Rail Project**
**Performance Audit**

## A-1 - LINK LIGHT RAIL CONSTRUCTION CONTRACTS MATRIX

# Sound Transit Link Light Rail Construction Contracts Matrix

| Contract # | % complete based on expenditures (as of 2/16/07) | Project Title | Board Approved Contract Budget | Engineer's Estimate | Construction Award | Approved CO's | Change Order % of Award | Orig. Contract Completion Date | Projected / Actual Construction Completion Date | Variance (days) |
|---|---|---|---|---|---|---|---|---|---|---|
| C510 | 87% | DSTT Retrofit and Expansion | $ 90,970,000 | $ 93,658,000 | $ 82,700,000 | $ 3,517,367 | 4.25% | 6/2/2007 | 6/4/2007 | 2.00 |
| C550 | 32% | Passenger Signage | $ 2,020,881 | Not Available | $ 1,837,165 | $ - | 0.00% | 12/31/2009 | 12/31/2009 | 0.00 |
| C710 | 58% | Beacon Hill Tunnel | $ 300,714,375 | $ 238,647,794 | $ 279,964,375 | $ 13,292,209 | 4.75% | 6/8/2008 | 6/8/2008 | 0.00 |
| C735 | 60% | Rainier Valley | $ 154,449,260 | $ 158,042,101 | $ 128,302,911 | $ 20,569,318 | 16.03% | 4/9/2007 | 12/13/2007 | 248.00 |
| C755 | 71% | S Boeing Access Road to S 154th (Tukwila Freeway) | $ 254,842,874 | $ 256,411,570 | $ 231,675,340 | $ (371,017) | -0.16% | 1/20/2008 | 2/11/2008 | 22.00 |
| C759 | | Southcenter Boulevard Improvements | TBD | Pending | TBD | | | | | |
| C802 | 52% | Train Signal System | $ 32,388,729 | $ 31,724,461 | $ 30,269,840 | $ 379,524 | 1.25% | 8/20/2008 | 12/13/2008 | 115.00 |
| C803 | 28% | Communications | $ 33,490,815 | $ 40,829,737 | $ 29,088,144 | $ 1,721,319 | 5.92% | 8/30/2008 | 12/16/2008 | 108.00 |
| C807 | 46% | Traction Power Electrical System | $ 38,963,386 | $ 41,489,100 | $ 36,414,379 | $ 90,382 | 0.25% | 6/17/2008 | 11/30/2008 | 166.00 |
| C809 | 10% | Fare Collection | $ 4,525,060 | NA | $ 4,111,167 | $ - | 0.00% | 12/31/2010 | 12/26/2008 | -735.00 |
| C810 | 99% | Central Link O&M Facility | $ 63,997,800 | $ 60,920,000 | $ 53,998,000 | $ 8,090,291 | 14.98% | 4/14/2006 | 4/14/2006 | 0.00 |
| C410 | 20% | Airport Link North | $ 38,950,000 | $ 35,148,187 | $ 37,950,000 | $ - | 0.00% | 2/11/2008 | 2/11/2008 | 0.00 |
| C420 | 14% | Airport Link Center | $ 44,783,996 | $ 46,139,639 | $ 40,712,723 | $ 254,180 | 0.62% | 8/26/2008 | 8/26/2008 | 0.00 |
| C430 | | Airport Link South - Station (IFB) | TBD | Pending | TBD | | | | | |
| C842 | 0% | Airport Link Train Signal System | $ 3,535,657 | $ 3,265,215 | $ 3,304,352 | $ - | 0.00% | 5/1/2008 | May 2009 | 365.00 |
| C843 | 0% | Airport Link Communications | $ 5,303,073 | $ 4,171,440 | $ 4,956,143 | $ - | 0.00% | 5/1/2008 | May 2009 | 365.00 |
| C847 | 0% | Airport Link Traction Power Electrical System | $ 6,634,000 | $ 4,851,144 | $ 6,200,000 | $ - | 0.00% | 5/1/2008 | May 2009 | 365.00 |
| C849 | 10% | Airport Link Fare Collection | $ 340,151 | NA | $ 310,277 | $ - | 0.00% | 11/26/2008 | 12/26/2008 | 30.00 |
| | | ***Sub-Total; Ongoing Contracts*** | ***$1,075,910,057*** | ***$1,015,298,388*** | ***$971,794,815*** | ***$47,543,572*** | | | | |
| C530 | 100% | Pine St. Advance Utility Work | $ 1,060,602 | $ 887,000 | $ 883,835 | $ (139,337) | -15.77% | 9/7/2004 | 10/18/2004 | 41.00 |
| C600 | 100% | Site Preparation Operations and Maintenance Facility | $ 4,582,794 | $ 12,861,600 | $ 4,336,803 | $ 244,812 | 5.64% | 4/16/2003 | 4/16/2003 | 0.00 |
| C700 | 100% | E-3 Busway | $ 47,588,738 | $ 49,960,000 | $ 40,691,061 | $ 5,635,591 | 13.85% | 10/31/2005 | 1/31/2007 | 457.00 |
| C705 | 100% | E3 Busway Improvements (Widening) | $ 2,514,618 | $ 1,998,946 | $ 2,065,289 | $ 449,329 | 21.76% | 9/15/2003 | 5/8/2003 | -130.00 |
| C710.04 | 100% | Beacon Hill Test Shaft | $ 2,030,000 | $ 2,086,669 | $ 1,761,882 | $ 90,988 | 5.16% | 8/12/2004 | 8/12/2004 | 0.00 |
| C715 | 100% | Site Preparation for Beacon Hill | $ 179,247 | $ 198,500 | $ 162,952 | $ (1,005) | -0.62% | 8/29/2004 | 8/29/2004 | 0.00 |
| C757 | 100% | Advance Utility Relocation | $ 6,642,547 | $ 5,552,900 | $ 5,776,128 | $ 355,469 | 6.15% | 11/1/2005 | 1/20/2006 | 80.00 |
| C910 | 100% | Tacoma LR | $ 25,217,921 | $ 25,023,962 | $ 22,925,382 | $ 5,300,196 | 23.12% | 5/4/2002 | 4/16/2003 | 347.00 |
| C920 | 100% | Tacoma O&M Facility | $ 4,381,257 | $ 3,809,794 | $ 3,982,961 | $ 311,263 | 7.81% | 6/30/2002 | 6/30/2002 | 0.00 |
| | | ***Sub-Total; Completed Contracts*** | ***$94,197,724*** | ***$102,379,371*** | ***$82,586,293*** | ***$12,247,306*** | | | | |
| | | ***TOTAL CONSTRUCTION CONTRACTS*** | ***$1,170,107,781*** | ***$1,117,677,759*** | ***$1,054,381,108*** | ***$59,790,878*** | | | | |

# A-2 - EXAMPLES OF SUPPLIER/CONSULTANT REVIEW CRITERIA

**Safety**

1. # of Recordables & Lost Day Cases
2. % Safety Design Errors & Omissions (E&O) (# of safety E&O/ # of drawing sheets)
3. Qualitative Safety Rating

**Quality**

1. % Errors & Omissions (# of E&O/ # of drawing sheets)
2. # of RFIs per $1000 of Design Work
3. % of RFIs closed on 1st Reply
4. Responsiveness to Design Review Feedback
5. Actual Field Verification (During Design)
6. Technical & General Information Accuracy
7. Constructability
8. Qualitative Quality Rating

**Cost**

1. % Impact of E&O ($ of rework/ AE contract value)
2. Value Engineering Program
3. Qualitative Cost Rating

**Schedule**

1. % of Deliverables Completed (# completed/ # committed)
2. Average RFI Turnaround Time (in days)
3. Average Submittal Turnaround Time (in days)
4. Qualitative Schedule Rating

**Management Systems**

1. Electronic delivery of IFCs
2. Electronic delivery of Documents (other than IFCs)
3. Compliance to CAD standards
4. Did Invoices meet contractual requirements?
5. Timely Completion of Record Drawings
6. # of Employees Lost that Impact the project
7. Qualitative Management Systems Rating

**A-3 - COMPLETED AUDITS**

**Completed Audits**

Performance Audits

- Deloitte Touche Performance Audit Report: Financial and Contract Change Order Processes - 1998 (issued January 1999)
- Deloitte Touche Performance Audit Report: Public Involvement and Real Estate Acquisition and Relocation - December 1999
- Deloitte Touche Performance Audit Report: Insurance Risk Management - March 2001
- Deloitte Touche Report: Peer Comparisons of Staffing and Overhead Practices - June 2001
- Deloitte Touche Performance Audit Report: Cost Estimating Systems and Project Controls - September 2001
- Booz Allen Hamilton ST Regional Express Final Audit Report - 2004
- Gannett Fleming Performance Audit Report: Capital Projects Management Systems - September 2005
- Booz Allen Hamilton ST Regional Express Follow-up on Performance Audit of Regional Express Operations - 2006

Financial Statements and Single Audit Reports

- WSAO - 1993 and 1994 Financial, Single and Compliance
- WSAO - 1995 Financial, Single and Compliance
- WSAO - 1996 Financial, Single and Compliance
- Deloitte Touche - 1997 Financial Statements & Single Audit
- WSAO - 1997 Financial and Compliance
- Deloitte Touche - 1998 Financial Statements & Single Audit
- WSAO Audit Report - 1998 Financial, Single and Compliance
- Deloitte Touche - 1999 Financial Statements & Single Audit
- WSAO Audit Report - 1999 Financial, Single and Compliance
- Deloitte Touche - 2000 Financial Statements & Single Audit
- WSAO Audit Report - 2000 Financial, Single and Compliance
- Deloitte Touche - 2001 Financial Statements & Single Audit
- KPMG - 2002
- KPMG - 2003
- KPMG - 2004
- KPMG - 2005
- KPMG - 2006

Agreed Upon Procedures - Schedule of Subarea Equity

- Deloitte Touche - 1998
- Deloitte Touche - 1999
- Deloitte Touche - 2000
- Deloitte Touche - 2001
- KPMG - 2002
- KPMG - 2003
- KPMG - 2004
- KPMG - 2005
- KPMG - 2006

State Accountability Reports

- WSAO Accountability Audit Report - 2001
- WSAO Accountability Audit Report - 2002
- WSAO Accountability Audit Report - 2003
- WSAO Accountability Audit Report - 2004
- WSAO Accountability Audit Report - 2005

Federal Funding Related Audits

- Cornerstone Oversite Audit Report - October 1999
- Cornerstone Oversite Audit Report - June 2001
- Cornerstone Oversite Audit Report - June 2002
- Cornerstone Oversite Audit Report - November 2002
- Cornerstone Oversite Audit Report - December 2003
- Department of the Transportation, Office of Inspector General - Audit Link Light Rail, Initial Segment - July 2003
- TA Audit Triennial Review - October 1998, June 2001, July 2004

# B-1 - LEGISLATIVE ACTIONS

The following recommendation provided in this report requires legislative action in support of implementation.

Legislative Action

**LOW BID RESTRICTIONS**

**Recommendation #14a:** **We recommend that the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.**

**Recommendation #14b:** **We recommend that Sound Transit, if permitted by changes instituted by the Legislature, consider the use of alternative project delivery methods.**

## B-2 – I-900 Cross-Reference to Recommendations

| I-900 Element | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Identification of cost savings. | | | | | | | | | X | | | X | | X | | X | X | X | | X |
| 2. *Identification of services that can be reduced or eliminated. | | | | | | | | | | | | | | | | | | | | |
| 3. *Identification of programs or services that can be transferred to the private sector. | | | | | | | | | | | | | | | | | | | | |
| 4. Analysis of gaps or overlaps in programs or services and recommendations to correct them. | | | X | | | | | X | | | X | | | | | X | X | | | |
| 5. Feasibility of pooling the entity's information technology systems. | | X | | | | | | | | | | | | | | | | | | |
| 6. Analysis of the roles and functions of the entity and recommendations to change or eliminate roles or functions | | | X | | | | | | | | | | | | | | | | | X |
| 7. Recommendations for statutory or regulatory changes that may be necessary for the entity to properly carry out its functions. | | | | | | | | | | | | | | X | | | | | | |
| 8. Analysis of the entity's performance data, performance measures and self-assessment systems. | X | X | | | X | X | X | X | X | X | X | X | X | | X | | X | | | |
| 9. Identification of best practices. | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

*Based on our review of project files, engineering files, Sound Transit's use of vendors in its construction management practices, and other procedures conducted during this audit, we found no opportunities for recommendations related to this element.

## B-2 – Conclusions, Recommendations and Potential Outcomes

Specific conclusions, recommendations, and potential outcomes - cost savings, improved efficiencies, improved use of existing resources, increased communication, improved performance, and reduced financial management risk - are summarized in the following matrix:

| Conclusions | Recommendations | Potential Outcomes |
|---|---|---|
| · Sound Transit was unable to complete the Link Light Rail Line at a cost and within timeliness communicated to voters in 1996.<br>· Sound Transit initially lacked procedures for land acquisition, environmental compliance, permitting, and construction management contributing significantly to its inability to meet project costs and timeliness communicated to voters in 1996.<br>· In the last five years, Sound Transit has extensively improved its construction planning and management processes. | See recommendations below. | See potential outcomes below |
| Sound Transit has not commissioned annual, independent, comprehensive performance audits limiting the ability to identify and address budget, schedule, and scope issues. | 1a. We recommend Sound Transit initiate annual comprehensive performance audits, incorporating a process of review and reporting on the status of actions and progress on previous report recommendations.<br>1b. We recommend the Citizen Oversight Panel ensure annual comprehensive performance audits are conducted and reported to the public and the Board when they have not been performed. | · Enhanced transparency of operations and practices<br>· Increased accountability<br>· Opportunities for improvement<br>· Timely implementation of strategic action plans addressing the cause of budget, schedule, and scope issues |
| Sound Transit has not fully implemented a formal knowledge management procedure and database increasing risk in the future of higher costs, decreased efficiency, and missed timelines. | 2. We recommend Sound Transit require formal documenting and sharing of lessons learned within the agency and implement appropriate procedures. | · Opportunities to eliminate project variability<br>· Reduced cost and schedule impacts on future projects |
| Sound Transit's Real Estate Division should continue to proactively address all lessons learned as identified in 2006 to increase its effectiveness and mitigate potential cost and schedule impacts in the future. | 3. We recommend Sound Transit continue to proactively address all lessons learned associated with its Real Estate Division to ensure that there is no repetition of previous issues that can result in negative budget and schedule ramifications. | · Increased efficiency and effectiveness<br>· Reduced risk of cost and schedule impacts |
| Perceived conflict of interest occurred on a $734,000 change order to a consultant contract to manage $95 million construction contract. | 4. We recommend Sound Transit ensure that it obtains all declarations of non-conflict from any consultants being considered to provide dispute evaluation, assessment and negotiation services, or other services which are of a sensitive nature. | · Assurance that complete transparency is achieved in all contracting practices<br>· Assurance that risk of conflict - real or perceived is eliminated |

| Conclusions | Recommendations | Potential Outcomes |
|---|---|---|
| Sound Transit has no formal procedures for evaluation of consultant performance potentially resulting in risk of delays in construction and added costs. | 5. We recommend Sound Transit implement quarterly consultant/supplier performance evaluations into the management of consultant contracts and follow-up to ensure expectations of contracts are being met. | · Increased effectiveness of project management<br>· Improved assurance that consultants are efficient, effective, and accountable<br>· Improved evaluation and measurement of consultant and supplier performance<br>· Increased assurance that service delivery meets agreement and project expectations<br>· Increased assurance that Sound Transit receives maximum value for services acquired |
| Sound Transit has not formalized tracking of RFI response times in the Link Construction Manual resulting in risk of project delays and claims. | 6. We recommend Sound Transit incorporate metrics into construction management procedures for tracking of response times for RFIs. | · Decreased exposure to project delays and claims<br>· Reduction of potential for claims<br>· Increased ability to monitor administrative and management performance during project execution<br>· Improved project planning (lessons learned)<br>· Enhanced identification of areas for corrective action and improvements<br>· Increased ability for progress measurement |
| Sound Transit should continue to follow a risk management plan to assure cost probabilities are not exceeded. | 7. We recommend Sound Transit ensure that the risk management planning for the University Link is followed and the risk assessment is updated and managed as appropriate. | · Enhanced ability to effectively manage risk<br>· Improved performance in terms of cost, time, and quality |
| Sound Transit does not stipulate the frequency and format of “second-opinion” cost estimates, decreasing the ability to compare and validate cost predictions. | 8. We recommend Sound Transit continue to utilize “second-opinion” cost estimates for high risk and complex projects and refine the process to allow for clear comparison and validation against capital cost predictions. | · Increased ability for cost reconciliations between documents<br>· Enhanced reporting of variances against capital cost predictions<br>· Increased confidence level for estimating accuracy<br>· Improved quality of estimating approach and deliverables |

| Conclusions | Recommendations | Potential Outcomes |
|---|---|---|
| Sound Transit has not consistently applied estimating guidelines resulting in variations in quality and content of independent cost estimates for change orders. | 9. We recommend Sound Transit improve requirements for change order Independent Cost Estimates and provide an estimating framework. | · Assurance that the owner pays only fair and reasonable prices for changes<br>· Assurance that unsubstantiated change orders are rejected<br>· Improved ability to perform accurate cost comparisons |
| Sound Transit's documentation and presentation of change order data/information not following best practices limits the ability to demonstrate fully the receipt of fair market value. | 10. We recommend Sound Transit ensure that the Best Practice guidelines are followed to ensure that information can easily be obtained. | · Effective budget control<br>· Effective change order review<br>· Increased accessibility to accurate historical data |
| In two identified instances, known scope omitted from Sound Transit contract documents minimizing competitive pricing. | 11. We recommend Sound Transit improve scope verification procedures and processes prior to finalizing Information for Bid documents. | · Ability to secure the most competitive price for work performed |
| Sound Transit has provided inadequate provisional sums for known risk items resulting in larger than expected costs. | 12. We recommend Sound Transit improve quantification of risk items included in contracts as Provisional Sums to reduce potential impacts for delays and cost increases. | · Improved ability to quantify magnitude of risk<br>· Improved assessment of required resources<br>· Decreased schedule risk |
| Sound Transit's classification of change order sources is not to FTA guidelines and may limit the ability to effectively assess changes to contract scope. | 13. We recommend Sound Transit implement a process to classify change order sources to acquire performance measurement data and a basis for understanding changes on all projects. | · Ability to determine whether occurrences are within acceptable limits<br>· Identification of possible project delivery improvement<br>· Determination of need for corrective action<br>· Increased effectiveness of executive management oversight |
| Current Washington State law limits Sound Transit's current procurement strategies, which may limit best value, increase project risk and soft costs, and result in longer delays. | 14.a. We recommend that the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.<br><br>14.b. We recommend that Sound Transit, if permitted by changes instituted by the Legislature, consider the use of alternative project delivery methods. | · Decreased project risk<br>· Increased opportunities for "best value" |
| Sound Transit does not use milestone payment incentives resulting in the potential risk of higher administrative costs and limiting contractor performance opportunities. | 15. We recommend Sound Transit, as appropriate, use a milestone payment strategy on future contracts, particularly those that significantly impact public access and traffic flow. | · Reduction in cost of administrative burden<br>· Increased incentives to contractors to work efficiently |

| Conclusions | Recommendations | Potential Outcomes |
|---|---|---|
| Sound Transit's environmental assessment strategy did not fully estimate the number and extent of hazardous and contaminated sites and materials resulting in unnecessary/underestimated costs. | 16: We recommend Sound Transit:<br>· ensure that access to structures and properties for due diligence inspection and testing is negotiated early in the real estate acquisition process.<br>· ensure that the investigation and sampling plan is designed to obtain a comprehensive and representative sampling of materials to allow quantification of hazardous materials/ contamination requiring abatement.<br>· ensure that adequate time for testing, data compilation, and reporting of findings is factored into the project schedule.<br>· ensure available survey findings and volume estimates are incorporated into bid documents and made available to the successful bidder immediately following contract award.<br>· attempt to obtain screening level subsurface data from as many commercial properties along a planned route segment as possible.<br>· consider investigation techniques that require minimal access issues and site disruption.<br>· conduct subsurface investigations of public right of way adjacent to known or suspected contaminated sites during the design phase of projects in order to have a better understanding of potential presence, nature, and extent of contamination.<br>· conduct additional remedial investigations of known contaminated sites after properties are acquired and prior to the initiation of the RFB process. Incorporate the information gained into the Clean-up Action Plans and contract documents.<br>· Assure Clean-up Action Plans provided to the contractor provide estimated limits and volumes of contaminated soil and excavation boundaries, including recommended setbacks from structures and utilities. | · Improved accuracy of cost estimates for cleanup<br>· Improved identification of contaminated sites prior to construction<br>· Increased ability to estimate cleanup cost, plan, and manage cleanup actions efficiently<br>· Cleanup costs unnecessary/underestimated by at least $3.5 million<br>· Enhanced accuracy in soil volume estimates<br>· Increased ability to plan and effectively manage cleanup actions<br>· Contaminated soil volume underestimated by >100% |

| Conclusions | Recommendations | Potential Outcomes |
|---|---|---|
| Unit prices agreed to were higher than typical industry-wide costs. | 17. We recommend Sound Transit:<br>· ensure that unit prices are consistent with industry standards.<br>· ensure that, for unit cost pay items, a rate for segregation and handling of uncontaminated soil is provided. | · $2.36 million (included as part of $3.5 million identified in #16) from total volume of contaminated soil |
| Cleanup procedures for unanticipated soil contamination were inefficient resulting in additional costs. | 18. We recommend Sound Transit, given the potential for repeated encounters with unanticipated contamination along a major commercial thoroughfare:<br>· ensure that each construction team includes an appropriate number of Hazmat-trained individuals to allow work to continue when contamination is encountered.<br>· ensure that a contingency response plan which defines the roles, responsibilities, and standard procedures to be implemented is in place. | · Improved efficiency of cleanup work<br>· Reduction of costs associated with standby and remobilization<br>· $930,000 in unnecessary costs |
| Sound Transit's regulatory clean-up levels were improperly determined resulting in unnecessary costs. | 19. We recommend Sound Transit:<br>· develop a contingency plan to allow work to continue when suspected contamination is encountered in the right of way.<br>· ensure that health and safety monitoring is available to evaluate and ensure that construction workers are adequately protected during excavation of suspected contaminated soil. | · Improved procedures to assure unnecessary cost do not occur<br>· Reduction of soil disposal costs<br>· $513,380 in additional (unnecessary) expenditures |
| Limited contractor liability resulted in stormwater pollution fines to Sound Transit. | 20. We recommend that Sound Transit:<br>· implement a plan to require contractors on future phases of construction to sign as co-permittee on Stormwater Permits.<br>· continue efforts to educate contractors and raise awareness of stormwater compliance issues using independent technical consultants and the ongoing program of joint weekly compliance inspections. | · Increased accountability of contractors to reduce violations<br>· Improved use and maintenance of best management practices to prevent storm water pollution<br>· Fines of $145,000 |
| **Unnecessary/Underestimated Expenditures: $4,943,000<br>Fines: $145,000** | | |

## C-1 – Sound Transit Response Letter

SOUNDTRANSIT



September 28, 2007

The Honorable Brian Sonntag
State Auditor
PO Box 40021
Olympia, WA 98504-0021

Dear Mr. Sonntag:

Thank you for the opportunity to provide these responses to the performance audit that was conducted of Sound Transit's Link Light Rail construction operations. Our responses to each conclusion and/or recommendation are embedded within the text of the document so that the responses flow directly from the conclusion or recommendation to which they respond.

We have worked very closely with the auditors, Talbot Korvola & Warwick, and we appreciate the input that we have received from them in the form of their conclusions and recommendations. As noted in their report, Sound Transit has already begun to implement many of the items identified and is committed to continuous identification and implementation of lessons learned. Where applicable, our responses also identify steps that Sound Transit will take to implement the specific recommendations provided by the auditors.

Again, we appreciate the significant efforts of your office, as well as the independent auditors, and we look forward to working with you within the spirit of Initiative 900 to greatly increase the efficiency and effectiveness of our construction operations.

Sincerely,

Joni Earl
Chief Executive Officer

Central Puget Sound Regional Transit Authority • Union Station
401 S. Jackson St., Seattle, WA 98104-2826 • Reception: (206) 398-5000 • FAX: (206) 398-5499 • www.soundtransit.org