Improving Sound Transit's Project Planning and Design to Reduce Costs

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Office of the Washington State Auditor
Pat McCarthy

Key audit findings

- Additional upfront planning could reduce change orders and save Sound Transit millions of dollars
- An agencywide lessons learned program could lead to fewer mistakes

Background

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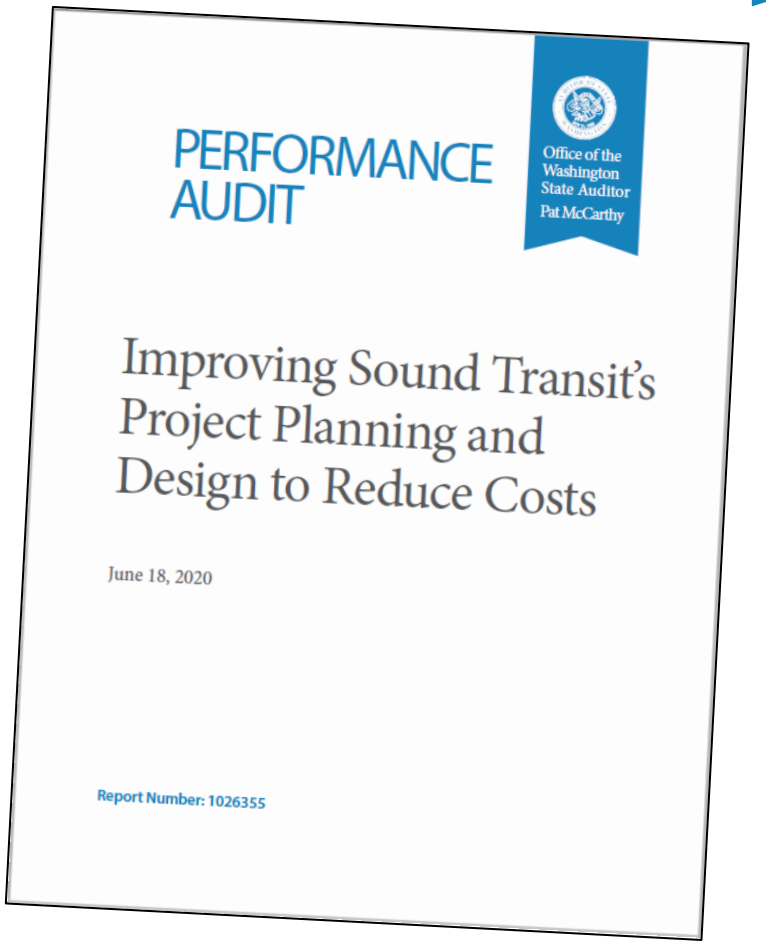
- Provides transit services in the Puget Sound region.
- Governed by an 18-member Board of Directors.
- Received funding through three voter-approved initiatives Sound Move, ST2 and ST3.
  - ST3, by far the largest measure, provides $54 billion for construction, operations and maintenance over the next 20 years.

Questions about costs, oversight of Sound Transit projects prompted audit

- High-profile projects have experienced cost increases and equipment failures
- Lawmakers have questioned the board's accountability to the public
- Voters passed Initiative 976
  - With the $30 cap, the Office of Financial Management estimated Sound Transit could lose $328 million annually

Audit question

How can Sound Transit improve its oversight and management of its projects?



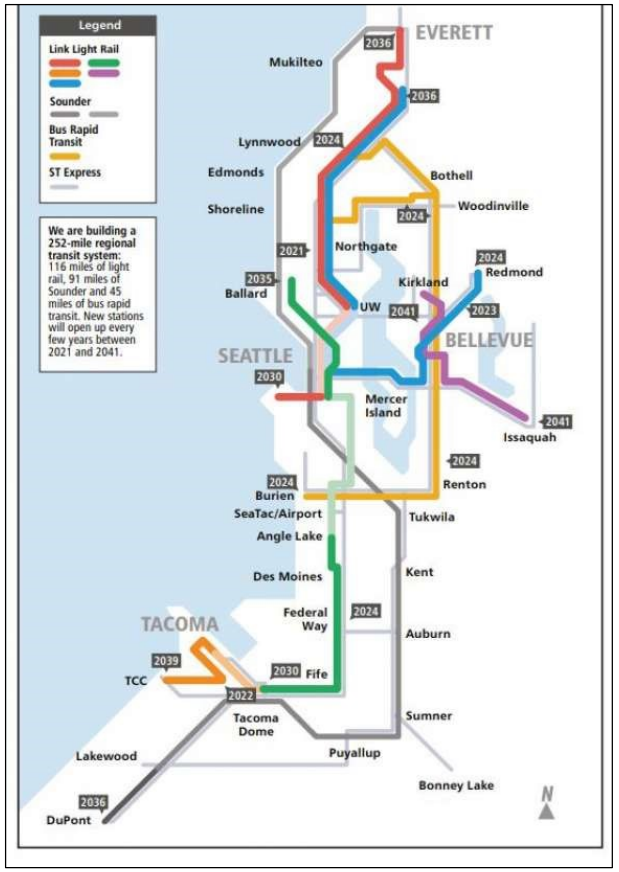
Reviewed project management and oversight processes

Reviewed five projects:

- **D to M Street**
- **Tacoma Trestle**
- **University Link**
- **Northgate Link**
- **OMF East**

Selected 12 open contracts:

- Total value: $2.3 billion
- 300 change orders
- Change orders totaled: $172 million



Change orders are common, but can be costly and should be minimized

- Change orders cannot take advantage of competitive bidding
  - Change orders were priced **8 percent more** than cost estimates
  - Competitively bid contracts were **15 percent less** than cost estimates
- Some change orders can be avoided

Issues in designs and contracts have cost Sound Transit millions

These mistakes and missing information included:

- Design deficiencies, such as:
  - Electrical systems missing power supplies
  - Structures not meeting building codes
- Adverse underground conditions not sufficiently described in contract documents, like:
  - Groundwater
  - Contaminated soil

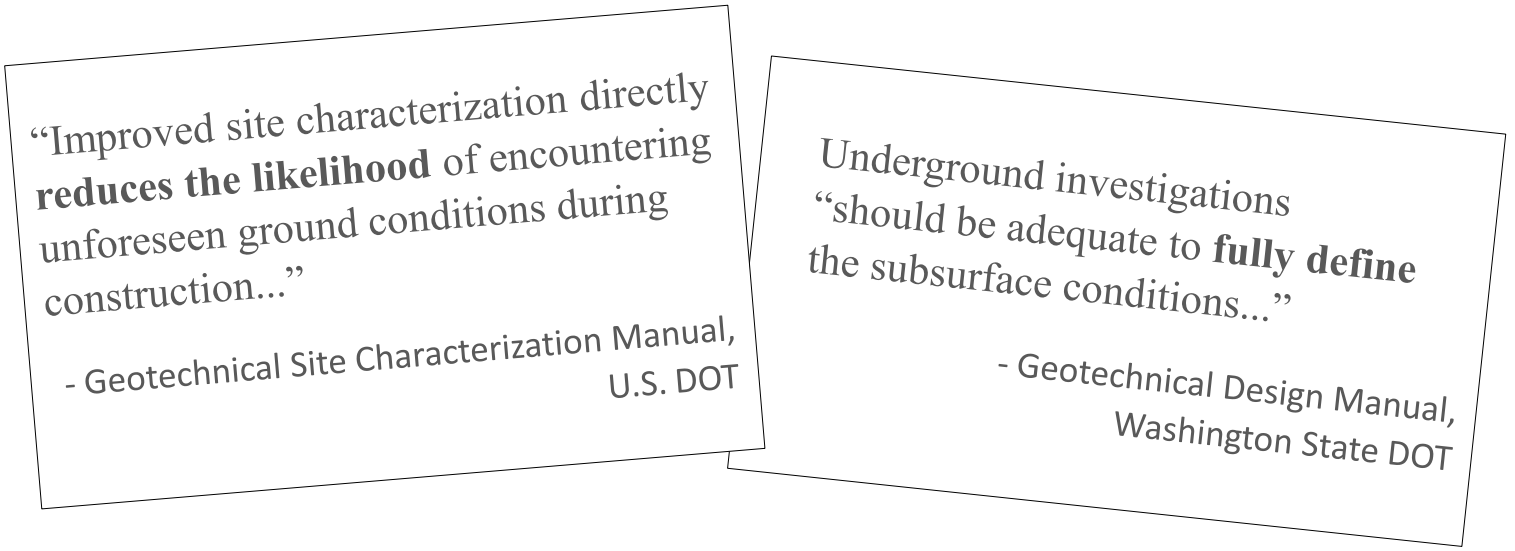
Sound Transit spent

$100 million

on 160 change orders to address these mistakes

More early planning efforts could reduce rework and other change orders

Leading practices and other transit agencies suggest underground investigation work pays off



Regional Transportation District of Denver and Los Angeles Metro reported it was more **cost effective** to investigate underground conditions before construction

Design deficiencies could have been avoided

Sound Transit spent

$23 million

fixing design deficiencies

- Design deficiencies can cause **cascading extra costs** if not caught before construction
- Reduce design deficiencies by **double-checking** key areas and adopting **standard review checklists**

More exploration could have found unexpected underground conditions

Sound Transit spent

$79 million

because of unexpected underground conditions

Uncovering these issues earlier saves money through competitive bidding and planning

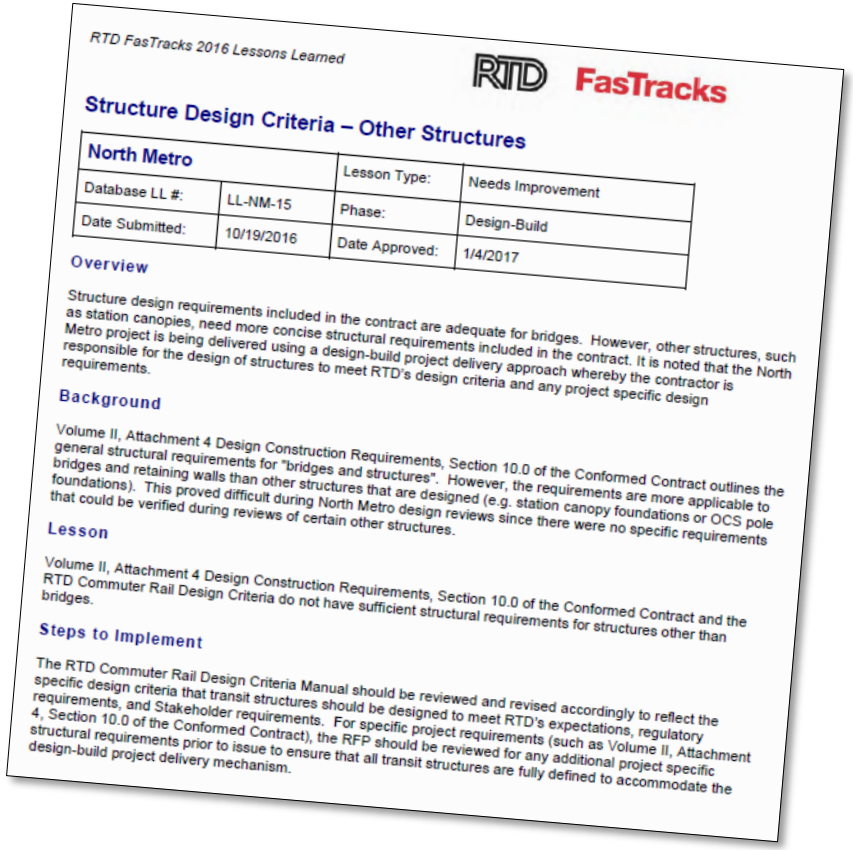
- Removing contaminated soil at the D to M Street project cost **$12 per ton** on the *original bid*, but more than **$28 per ton** on *change orders*

Best practices advise establishing robust lessons learned programs

The Project Management Institute recommends:

- Add lessons learned to searchable database
- Incorporate lessons learned into project planning activities

Other transportation agencies have implemented lessons learned programs



RTD FasTracks 2016 Lessons Learned

RTD FasTracks

Structure Design Criteria – Other Structures

North Metro		Lesson Type:	Needs Improvement
Database LL #:	LL-NM-15	Phase:	Design-Build
Date Submitted:	10/19/2016	Date Approved:	1/4/2017

Overview

Structure design requirements included in the contract are adequate for bridges. However, other structures, such as station canopies, need more concise structural requirements included in the contract. It is noted that the North Metro project is being delivered using a design-build project delivery approach whereby the contractor is responsible for the design of structures to meet RTD's design criteria and any project specific design requirements.

Background

Volume II, Attachment 4 Design Construction Requirements, Section 10.0 of the Conformed Contract outlines the general structural requirements for "bridges and structures". However, the requirements are more applicable to bridges and retaining walls than other structures that are designed (e.g. station canopy foundations or OCS pole foundations). This proved difficult during North Metro design reviews since there were no specific requirements that could be verified during reviews of certain other structures.

Lesson

Volume II, Attachment 4 Design Construction Requirements, Section 10.0 of the Conformed Contract and the RTD Commuter Rail Design Criteria do not have sufficient structural requirements for structures other than bridges.

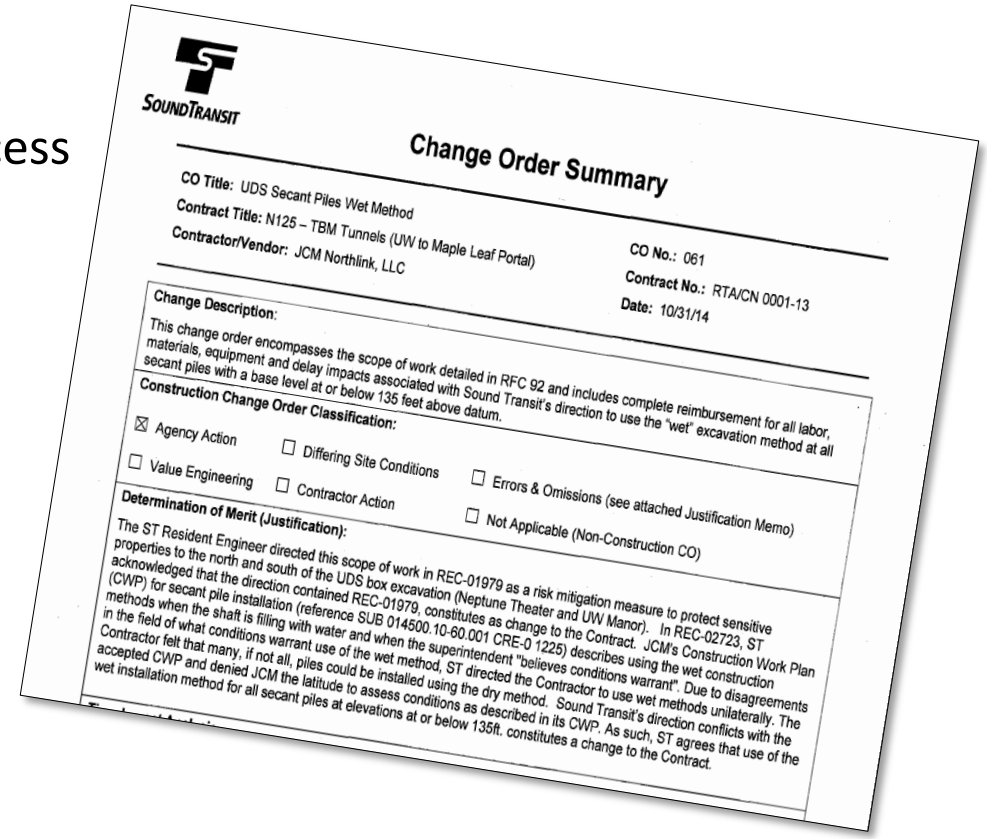
Steps to Implement

The RTD Commuter Rail Design Criteria Manual should be reviewed and revised accordingly to reflect the specific design criteria that transit structures should be designed to meet RTD's expectations, regulatory requirements, and Stakeholder requirements. For specific project requirements (such as Volume II, Attachment 4, Section 10.0 of the Conformed Contract), the RFP should be reviewed for any additional project specific structural requirements prior to issue to ensure that all transit structures are fully defined to accommodate the design-build project delivery mechanism.

An agencywide program to learn from past projects would reduce mistakes

Sound Transit has collected lessons from past projects

- However, it lacks a formal process to ensure lessons are applied
- Sound Transit can use existing information to help restart the program



SOUNDTRANSIT

Change Order Summary

CO Title: UDS Secant Piles Wet Method

Contract Title: N125 – TBM Tunnels (UW to Maple Leaf Portal)

Contractor/Vendor: JCM Northlink, LLC

CO No.: 061

Contract No.: RTA/CN 0001-13

Date: 10/31/14

Change Description:

This change order encompasses the scope of work detailed in RFC 92 and includes complete reimbursement for all labor, materials, equipment and delay impacts associated with Sound Transit's direction to use the "wet" excavation method at all secant piles with a base level at or below 135 feet above datum.

Construction Change Order Classification:

☒ Agency Action ☐ Differing Site Conditions ☐ Errors & Omissions (see attached Justification Memo)

☐ Value Engineering ☐ Contractor Action ☐ Not Applicable (Non-Construction CO)

Determination of Merit (Justification):

The ST Resident Engineer directed this scope of work in REC-01979 as a risk mitigation measure to protect sensitive properties to the north and south of the UDS box excavation (Neptune Theater and UW Manor). In REC-02723, ST acknowledged that the direction contained REC-01979, constitutes as change to the Contract. JCM's Construction Work Plan (CWP) for secant pile installation (reference SUB 014500.10-60.001 CRE-0 1225) describes using the wet construction methods when the shaft is filling with water and when the superintendent "believes conditions warrant". Due to disagreements in the field of what conditions warrant use of the wet method, ST directed the Contractor to use wet methods unilaterally. The Contractor felt that many, if not all, piles could be installed using the dry method. Sound Transit's direction conflicts with the accepted CWP and denied JCM the latitude to assess conditions as described in its CWP. As such, ST agrees that use of the wet installation method for all secant piles at elevations at or below 135ft. constitutes a change to the Contract.

Recommendations

- Improve the design review process to reduce avoidable design deficiencies. Such controls could include:
  - ✓ Assigning at least two reviewers for each specialist area on design review teams to double-check design documents
  - ✓ Creating checklists for reviewers indicating areas most prone to deficiencies
- Use information from investigations and change orders to help determine the likelihood of adverse underground conditions

Recommendations

- Develop a formal, agencywide lessons learned program to track and incorporate lessons into future project planning. The program should include:
  - ✓ A mechanism to identify and capture lessons learned
  - ✓ An easily accessible database to store them
  - ✓ A process to ensure lessons learned are used to inform future project planning

Questions

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