

**Performance Audit of**  
**Sound Transit**  
**Value Engineering Practices**  
**RP 0061-11**

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**Seattle, WA 98104**

March 22, 2012

Mr. David Hammond  
Director of Internal Audit  
Sound Transit – Union Station/G030  
401 S. Jackson Street  
Seattle, WA 98104-2826

Subject: Performance Audit of Value Engineering Practices, RP 0061-11

Dear Mr. Hammond:

Moss Adams LLP is pleased to present the results of our performance audit of the Value Engineering Practices for Sound Transit for the period October 2009 to September 2011.

We conducted our audit in accordance with the standards applicable to performance audits contained in Government Auditing Standards issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe the evidence obtained provides reasonable basis for our findings and conclusions, based on our audit objectives. The performance audit objectives, scope, methodology, conclusions and a summary of the views of responsible Sound Transit officials are included in the report body.

Sound Transit Management remains responsible for the proper implementation and operation of an adequate internal control system. Due to inherent limitations in any internal control structure, errors or irregularities may occur and not be detected. Also, projections of any evaluation of the internal control structure to future periods are subject to the risk that the internal control structure may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

This report is intended solely for the use of Sound Transit and its Board of Directors. Moss Adams LLP does not accept any responsibility to any other party to whom this report may be shown or into whose hands it may come.

We would like to express our appreciation to you and all members of Sound Transit for their cooperation throughout this performance audit. Please contact me at (206) 302-6214 if you have any questions regarding this report.

Sincerely,



Allan Meyers, Director  
for Moss Adams LLP

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## **EXECUTIVE SUMMARY**

Sound Transit (Agency) has been conducting VE studies since the beginning of the Agency's design program in 1998. Recent changes, such as consolidation of the responsibility for Value Engineering and obtaining training for personnel assigned the responsibility for Value Engineering, have moved Sound Transit VE practices closer to industry best practices; however, opportunities exist to implement leading practices to capture the full benefit of Value Engineering. VE studies conducted by Sound Transit in the last two years did not involve operations and maintenance personnel, or consistently follow the guidelines of SAVE International® and industry best practices; therefore, it is likely the program did not achieve optimal results. The performance of the Sound Transit Value Engineering (VE) practices was generally consistent with the programs of other transit agencies, but as a group all of the agencies are in need of improvements in personnel, training, VE program funding and the number of studies to become leading programs. The fact that Sound Transit requested this study was a strong indicator of the desire to strengthen their VE Program beyond that of their peers.

### **Recommendations for Improvement**

Our project scope involved VE activity performed during the two years prior to October 2011; we understand that concurrently and since that time the VE Program has continued to improve its practices. In general, the report's recommendations provide a road map to becoming a leading VE program. The recommendations involve improvements to provide more visibility to the program, reporting at a higher level with an adequate budget to ensure a continuing, viable program; that VE is properly considered for all construction projects that exceed \$5 million in cost and that VE program staff, and engineering leadership, has the proper training to implement VE.

The following improvements would capture additional capital, operation and maintenance cost savings as well as opportunities for functional improvement of the designs. A summary of the recommended improvements to the program is provided below in a recommended sequence of implementation. A detailed description of the observations and recommendations is provided in the body of the report.

#### **Near-Term (Immediate)**

1. Identify all current projects that should receive VE studies including number and scope; develop and implement a long-term VE program that includes staffing plans and budgets. Begin tabulating and publicizing VE program success internally and externally.
2. Strengthen the requirements of the workshop task orders under the existing on-call VE contracts to increase the length and modify the agenda of the VE studies to comply with SAVE International® guidelines and industry best practices.
3. Scoping, analyses and documentation from VE studies should comply with SAVE International® guidelines and best practices.

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Mid-Term (before year-end 2012)

4. Establish a separate budget for the VE program and individual VE studies.
5. Assign a full-time staff to the VE program and transfer VE responsibility and management of the budgets to the VE program staff. Define the VE program as a formal organizational unit that reports to an Executive Director Level to assure long-term VE program viability.
6. Implement the first stages of a training program in Value Engineering.
7. Additional program controls should be implemented regarding stakeholders, training and regulatory reporting requirements.

Long-Term (by year-end 2013)

8. Procurement strategy should separately identify VE services from other engineering services.
9. Separate VE contract terms and conditions should be prepared for VE services.

**Comparison with Other Agencies**

Sound Transit's VE program was compared with the programs of other transportation agencies in 16 areas of program performance. Sound Transit's VE program was generally comparable to VE programs at two of the three transit agencies, while their program fell short of the practices at another. The VE programs at all three of the other transit agencies do not fully achieve industry best practices.

Comparison of Sound Transit's VE program to the American Association of State Highway and Transportation Officials (AASHTO) VE Program studies suggested Sound Transit's recently revised VE program was functioning better than that of many state departments of transportation.

In comparison to two other transportation agencies, the Washington State Department of Transportation (WSDOT) and the Ontario Ministry of Transportation, Sound Transit's VE program performed fewer VE studies and realized less benefit, in terms of capital savings and non-monetary value proposals. See Appendix A for a comparison of all the benchmarked entities and the 16 areas of program performance.

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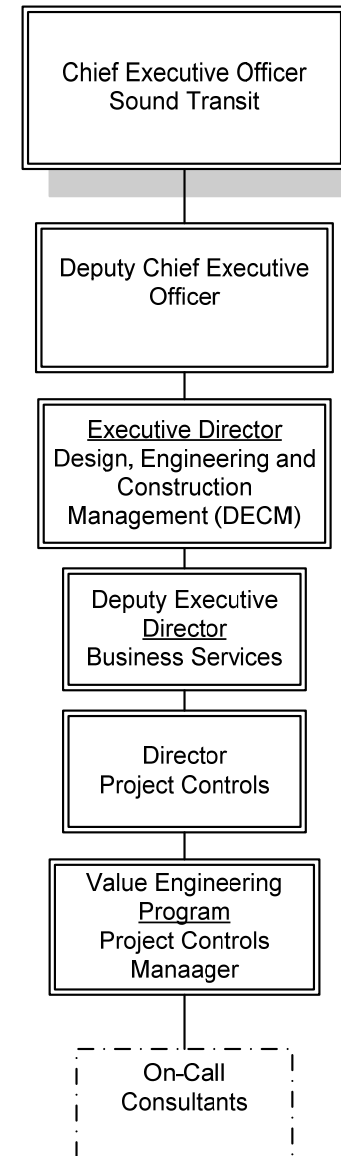
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**BACKGROUND INFORMATION**

The Value Engineering program at Sound Transit was staffed by two part-time engineers who report to the Director, Project Controls, Cost Control & Reporting, and are part of the Design Engineering and Construction Management (DECM) division. These individuals currently oversee two on-call contract consultants. The current program was initiated in mid-2011. Prior to 2011, Value Engineering studies were coordinated by project design managers. The current hierarchy of the VE program is as shown to the right.

Two Value Engineering studies were performed on Sound Transit and joint WSDOT/Sound Transit projects in 2010 and 2011 prior to the establishment of the current VE management team. One of these studies was managed by WSDOT. The other was conducted by the engineering firm that had provided the project design.

Two Value Engineering studies have been conducted since the establishment of the new program management structure. These studies were outside the scope of this audit and were not reviewed. Both of those studies were conducted under the current contract. To date no information was available about accepted savings and functional and value improvement from the two most recent studies.



## **OBJECTIVE, SCOPE AND METHODOLOGY**

### **Objective**

The objective of the performance audit was to evaluate Sound Transit's program and identify opportunities to improve its effectiveness, including analysis of alternatives and comparison to industry standards or best practices, and to provide recommendations to position the Agency to use VE within the context of the Agency's significant capital construction program while ensuring compliance with federal and state regulations.

### **Scope**

The scope of Agreement RP 0061-11 was to conduct a performance audit of Sound Transit's Value Engineering program on its light rail, commuter rail and Regional Express bus capital programs, over the last two years. This period was selected because of changes in the VE approach that were initiated approximately two years prior to the audit. Additional changes in the management of the VE efforts were initiated about mid-year in 2011; however the effects of those changes had not been fully realized at the time of the audit and were outside the scope of the performance audit.

The following areas were evaluated with respect to Value Engineering:

- Compliance with Federal Transportation Administration (FTA) requirements
- VE Program Legal
- VE Consultants
- Contracting
- Procurement
- Design Consultants
- Sound Transit performance compared to other agencies
- Risk Management
- Construction Contractors
- Compliance with state regulations

## **Methodology**

### Interviews

Eighteen interview sessions with 26 Sound Transit Staff members were conducted over the course of the performance audit. Some of these were interviews with individuals and some were with groups of staff members from a given unit within the Agency. The individuals interviewed were from:

- Design Project Management
- Construction Project Management
- Finance
- Engineering
- Procurement
- Planning
- Project Controls (the current location of the VE program)
- Safety and Quality Assurance
- University Link Project Team
- Deputy Executive Director – Business Services
- South Segment Management
- Operations
- Public Relations

Six interviews were conducted with staff members from the State of Washington to assess Washington State requirements for Value Engineering that might apply to Sound Transit. These included staff members from the following organizations:

- Washington State Legislative Joint Transportation Committee
- Washington State Office of Financial Management
- Washington State Senate Transportation Committee
- Washington State House Transportation Committee



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Six interviews were conducted with representatives from other transportation organizations in the U.S. and Canada to provide information to enable comparison of the Sound Transit Value Engineering program with the Value Engineering programs of other similar programs. The agencies with which staff interviews were conducted were:

- Tri-County Metropolitan Transportation District of Oregon (Tri-Met; transit agency for metropolitan Portland, OR)
- Toronto Transit Commission (TTC; transit agency for metropolitan Toronto, Ontario, Canada)
- Denver Regional Transit District (RTD; transit agency for metropolitan Denver, CO)
- Washington State Department of Transportation (WSDOT)
- Ontario Ministry of Transportation (MTO; Canada)
- American Association of State Highway and Transportation Officials (AASHTO)

Data Gathering

The audit team received data from Sound Transit regarding internal procedures, staffing, staff contact information and previous Value Engineering studies. This included information about procurement, contracting, project management, involvement of other departments in the VE process, training, budgeting, public relations and VE study performance over the last three years. Assembly of the requested information was coordinated by a Project Controls Manager at Sound Transit.

Additional information about Federal Transit Administration Value Engineering requirements and Washington State requirements for Value Engineering were assembled by members of the audit team. See Appendix B for documents reviewed.

Analysis of Information

The written information along with the information gained from the interviews was analyzed to:

- Assess the current procedures within Sound Transit related to the VE program.
- Compare the Sound Transit VE practices with the practices of similar agencies.
- Assess the conformance of the Sound Transit program with the recommendations of SAVE International®, the international Value Engineering professional and certifying organization.
- Identify areas where improvement is needed and formulate recommendations to improve the program.

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The panel of subject matter experts involved in the analyses consisted of:

| <b>Name</b>                | <b>Role</b>        | <b>Organization</b>       |
|----------------------------|--------------------|---------------------------|
| Don Stafford, PE, CVS-Life | VE Lead            | Robinson, Stafford & Rude |
| Anna Bremmer, CVS          | VE Program Analyst | Bremmer Consulting        |
| Esther (Sam) Stafford, CVS | VE Program Analyst | Help at the Helm          |
| Harvey Childs, NICARB      | Special Consultant | Individual Consultant     |

Review of VE Program Internal Controls

We met with the Project Controls Manager and documented the current VE process and existing internal controls. See Appendix C for VE process maps and controls information.

Review of Regulatory Reporting Requirements

We met with transportation specialists from the State of Washington, the Washington Department of Transportation (WSDOT), gathered information from the Federal Transportation Administration (FTA) and reviewed Sound Transit reports on VE to determine Sound Transit was compliant with WSDOT and FTA VE reporting requirements.

## **CRITERIA**

Existing practices were evaluated against the following:

- SAVE International®, the international Value Engineering professional and certifying organization website ([www.value-eng.org](http://www.value-eng.org)), which contains Value Engineering performance criteria, representative scope of work and procurement templates:
  - 1) Value Methodology Standard and Body of Knowledge - [http://www.value-eng.org/pdf\\_docs/monographs/vmstd.pdf](http://www.value-eng.org/pdf_docs/monographs/vmstd.pdf)
  - 2) ProForma Agreement for Value Engineering Services – [http://www.valueeng.org/pdf\\_docs/monographs/Proforma\\_Agreement\\_for\\_VE.pdf](http://www.valueeng.org/pdf_docs/monographs/Proforma_Agreement_for_VE.pdf)
  - 3) ProForma Request for Proposal for Value Consulting Services – [http://www.value-eng.org/pdf\\_docs/monographs/Proforma\\_T\\_of\\_R\\_for\\_VE.pdf](http://www.value-eng.org/pdf_docs/monographs/Proforma_T_of_R_for_VE.pdf)
- Guidelines for Contracting for Architectural, Engineering, Land Surveying & Landscape Architect Services in Washington State – Government Agency requirements of RCW39.80, Architects and Engineers Legislative Council, 2005 – procurement
- Construction Project Management Handbook, Federal Transit Administration, Revised April 2007 – FTA Guidelines
- 2009 and 2010 Annual Reports on Value Engineering at State Departments of Transportation, AASHTO – VE program performance of 50 US DOTs
- NCHRP – Synthesis 352 – Value Engineering Applications in Transportation – A synthesis of Highway Practice, Transportation Research Board of the National Academies, Washington, DC, 2005 – contained best practice references
- Construction Project Management Handbook, Federal Transit Administration, Revised April 2007 – contained FTA VE guidelines
- Subject Matter Expert experience conducting more than 300 Value Engineering studies for more than 100 agencies – industry best practices

## **PERFORMANCE AUDIT RESULTS**

The condition of various VE program attributes, analyses and recommendations are as follows:

### **Observation 1 – VE Program Should be More Comprehensively Planned, Managed, Monitored and Publicized**

#### **Description of Practice during Audit Scope**

Sound Transit does not have a comprehensive plan addressing key components of an industry-leading Value Engineering program, including guidelines regarding the frequency, size, staffing requirements or budget for VE studies for the Capital Improvement Program. Sound Transit recently implemented a more programmatic approach to managing its Value Engineering effort, but this program is not yet fully established.

The VE program's results were not tabulated for internal use or publicized to capture public relations benefits. Additionally, implementation of the VE recommendations was not monitored to ensure that the design changes were retained through design completion and that the benefits were captured.

Also, Value Engineering program managers do not appear to collaborate with employees responsible for determining the scope of design team contracts, which may result in a lack of adequate designer resources to support to support VE studies.

#### **Assessment of Practice during Audit Scope**

A comprehensive VE plan is a critical factor for long-term program success. Guidelines over which projects are to receive VE studies, including the number and proposed scope, should be tentatively planned well in advance.

Because the VE recommendations proposed, accepted and rejected were not tracked, there was a loss of valuable information that could inform future designers and VE teams of innovative ideas and their acceptability to Sound Transit. Research has demonstrated that reintroduction of the results of VE studies yielded in an improvement in the cost-effectiveness of the original designs over time.<sup>1</sup>

A process to inform the public of the benefits gained from the VE program at Sound Transit was not in place. Publicizing this type of information allows Sound Transit an opportunity to inform their constituents of the efforts to improve the value and utility within the Sound Transit capital program.

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<sup>1</sup> Research conducted on the Washington Superintendent of Instruction VE program in the 1980s.

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Designer efforts needed to support the VE process were not included in the initial designer scope of work. This could lead to reluctance from the designers to support the VE effort, and less than optimal results, or requests for change orders to the designer contracts, increasing the potential for delays in the design process.

**Recommendations**

- 1.1 Develop a comprehensive VE program plan. Prepare guidelines for determining the number of workshops and appropriate workshop durations for each project to properly match the VE scope of work to each project.
- 1.2 Set a minimum size threshold and mandate Value Engineering studies for all capital projects above that threshold, unless waived by senior management for valid reasons. Scheduling should not be a valid reason in all but the most unusual cases. The suggested initial threshold for mandatory VE studies is \$5 million in construction cost. As the VE program matures, Sound Transit may find benefit in establishing differing thresholds for different types of projects as well as lowering some of the thresholds to as low as \$2 million.
- 1.3 In conjunction with the guidelines described above, prepare draft VE plans for each major project identified in the Capital Improvement Plan, so that project management plans, schedules and budgets for the projects include the Value Engineering element of managing the project from its inception.
- 1.4 Prepare a VE Policy and procedures document that explains how VE is used by Sound Transit and includes exhibits of documents, timelines to be followed and standards to be met. This document can be provided to design teams, VE teams and Management as a guide to the process.
- 1.5 Establish VE recommendation registers that list, i) all VE recommendations from all VE studies, ii) all accepted VE recommendations, and iii) all rejected VE recommendations along with the reasons for rejection. Make these lists available to the designers on all future design projects, and make these lists available to all VE team leaders on all future VE studies. (Note: These lists should not be provided to the VE team members themselves prior to the creative phase of the VE workshop.)
- 1.6 Track accepted capital and annual savings for all VE recommendations as well as all non-monetary benefits resulting from those recommendations.
- 1.7 Incorporate a component in the project budget tracking system to track the impact on the project cost of accepted VE recommendations as well as other changes to the design through project bidding to ensure that the benefits of the VE recommendations are not lost through later design changes.
- 1.8 Report regularly on the success of the Sound Transit Value Engineering program using the Sound Transit website, through papers and articles in appropriate publications, and through other media as appropriate.
- 1.9 Ensure that design project managers include the scope of work needed from the designers to support the Value Engineering effort in the design contract. This should include:

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- i. Preparation and distribution of project documents to the Value Engineering team members in advance of the Value Engineering workshop
- ii. Preparation of a design presentation for the Value Engineering team to be given on the first day of the Value Engineering workshop
- iii. Responding to questions from the Value Engineering team during the workshop
- iv. Attending a mid-workshop meeting to review the “shortlist” of Value Engineering ideas
- v. Attending the Value Engineering presentation on the final day of the workshop
- vi. Evaluation of each of the Value Engineering recommendations and preparation of a written response to each at the same level of detail as the recommendations; this includes a review of and response to the estimated cost impacts
- vii. Attendance at the decision meeting for the Value Engineering recommendations following the workshop
- viii. Redesign, if necessary, to incorporate accepted recommendations into the design. (Note: The designer should not be required to make the design changes without compensation, unless the changes would normally be expected to be accommodated within the design process.)

**Observation 2 – VE Workshops Should Conform to SAVE International® Guidelines and Industry Best Practices**

Description of Practices during Audit Scope

Information was available regarding four Value Engineering studies conducted in the last three years. Two were conducted under an on-call consultant contract, one was conducted by a design-build contractor, and the fourth was conducted by a VE consultant under contract to WSDOT on a joint WSDOT/Sound Transit project. Workshop durations ranged from two days to five days. Operations and maintenance representation were not included in either the VE workshops or the post-workshop decision-making process.

Assessment of Practices during Audit Scope

Two of the four VE workshops did not follow SAVE International® guidelines, in that a function analysis of the project under review was not conducted. It is important to note that function analysis is the cornerstone of the SAVE International® job plan that defines the process as VE and distinguishes it from all other project analysis tools. One of the other two workshops (the WSDOT study) incorporated a good function analysis. The fourth incorporated a function analysis of the project, but the Function Analysis System Technique (FAST) logic was not consistent with the SAVE International® standards for FAST diagrams.

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Three of the four Value Engineering studies generated a reasonable number of creative ideas, indicating that the creative idea generation portion of the process was conducted effectively. All Value Engineering studies generated a reasonable number of Value Engineering proposals. Documentation of the Value Engineering proposals was excellent on the WSDOT study.

All of the Sound Transit VE studies focused on capital cost reductions and did not include operations personnel in developing the Value Engineering proposals. All three of the Sound Transit-sponsored VE studies we reviewed under-scoped the size and complexity of the projects.

Documentation of the results for the three Sound Transit-sponsored Value Engineering studies was missing important information such as Value Engineering workshop agendas, workshop durations, constraints and life-cycle costing assumptions.

Recommendations

***Pre-Workshop***

- 2.1 Define the Sound Transit expectations for conducting a VE study workshop and provide them to VE team leaders in advance of conducting each workshop.
- 2.2 Ensure sufficient time is available to the VE team leader and team members to accomplish all pre-workshop activities.
- 2.3 Require pre-workshop preparation of matrix or graphical models of capital cost, O&M cost, life-cycle cost, energy, space, time, or other project characteristics as needed to provide the VE team with appropriate insights into the distribution of these critical elements through the project components.
- 2.4 Distribute presentation outlines to the Sound Transit project manager and the design project manager to provide guidance about the information they need to present during the information phase on the first day of the VE workshop. Coordinate with them as needed to ensure their presentations do not consume excessive time delivering information that is not of use to the VE team.
- 2.5 Have the VE team cost estimator conduct a validation of the project construction cost estimate in advance of the VE workshop to identify any areas of concern in the estimate.
- 2.6 Provide the VE team with information about unit prices for annual cost elements to be used in the life-cycle cost analysis (e.g., power, fuel, chemicals, etc.).
- 2.7 Agree with the VE team leader in advance about the economic assumptions to be used in the life cycle cost analysis of the VE recommendations (e.g., discount rates, analysis period, replacement cycles, etc.).

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- 2.8 Ensure that the meeting room for the VE study is sufficiently large (minimum 500 square feet) and has all needed support services available (good lighting, sufficient table space, photocopier, fax, phone and wireless Internet access).
- 2.9 Ensure involvement by at least two VE team members (one Sound Transit design/project management staff member who is not part of the design team for the project and one staff member from operations and maintenance) appropriate to the type of project for the duration of at least half of the workshop.

***Workshop***

- 2.10 Ensure that one trained member of the VE program professional staff participates in at least the first VE study conducted by each new consultant VE team leader to ensure that the workshop is conducted in accordance with SAVE International® guidelines and Value Engineering industry best practices.
- 2.11 Provide the VE team with a list of clear and well-defined true constraints on the VE team in order to help them stay focused.
- 2.12 Ensure that a function analysis of this specific project is conducted with the VE team during the workshop. This may be a tabular function analysis or any of a variety of types of FAST diagrams. It must be specific to this project rather than borrowing functions identified in previous VE studies.
- 2.13 Ensure that the creative process is truly creative and is not limited to proven ideas. In a truly creative process, typical VE teams will usually generate upwards of 100 ideas for consideration.
- 2.14 Ensure involvement by the Sound Transit team members on the VE team in the idea evaluation process.
- 2.15 Schedule and attend a mid-workshop review of the “shortlist” of VE ideas along with representatives of operations and maintenance as well as the design team and identify any ideas with “fatal flaws” and any ideas not on the shortlist that should be added.
- 2.16 Assure attendance at the VE team presentation by representatives of all of the internal stakeholder groups relevant to the project. Emphasize that the purpose of the VE team presentation is understanding, not decisions.
- 2.17 Require that the Value Engineering team leader, assistant or another team leader review each recommendation for completeness and correctness before the end of the workshop.

***Post-Workshop***

- 2.18 Require the design team to respond to each VE recommendation and design suggestion with the same level of detail as is contained in the VE recommendation. Require detailed documentation if the design team disagrees with the VE team-estimated cost impacts of the recommendation. Require detailed justification for recommendations to reject any VE recommendation.



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- 2.19 Ensure that all key stakeholders respond to the VE recommendations and are represented at the post-workshop decision meeting, including the VE team leader.
- 2.20 Ensure that the results of each VE study are entered in the various tracking systems that are part of the VE program.

**Observation 3 – Manage and Modify Sound Transit VE Workshop Approach and Execution**

Description of Practice during Audit Scope

VE studies are currently scoped on an individual project basis. Current on-call contracts established the “standard” Value Engineering workshop duration at three days, which is not enough time considering the size of Sound Transit projects.

The one task order provided to the audit team included a single five-day Value Engineering workshop and a post-Value Engineering risk assessment workshop. The scope of work for the Value Engineering activities was overly detailed in certain areas and under-detailed in others. It included specific methods for accomplishing steps in the VE process that should have been left to the discretion of the VE team leader. The workshop included activities that were part of the risk assessment (e.g., review and refinement of a risk register).

The specific steps listed for the workshop did not reference, nor did they follow, SAVE International<sup>®</sup> guidelines. The workshop guidelines appeared to require delivery of three copies of a VE study preliminary report on the last day of the VE workshop. Personnel from the VE team were not subsequently involved in the Sound Transit VE decision-making process. Their involvement would have provided additional perspective regarding the recommendations being considered.

Assessment of Practice during Audit Scope

Current practice does not have guidelines in place for determining the number and duration of Value Engineering workshops to be conducted on a project basis. Not having those guidelines could present a risk of either under-scoping or over-scoping of VE studies. Use of the “standard” VE workshop duration of three days in the on-call contract puts Sound Transit at risk for regularly under-scoping Value Engineering study efforts, which can impair the potential benefit from the VE studies. Not having a standard scope of work that is consistent with SAVE International<sup>®</sup> guidelines exposes Sound Transit to the risk that VE workshops will not be properly conducted, and as a result, the desired level of project improvement from the Value Engineering study process will not be obtained. Specification of how the steps in the VE process are to be conducted is too detailed in some areas and limiting in others to ensure proper VE performance. Failure to include representation from the VE team in the decision-making process runs the risk that the decision-makers inappropriately reject good VE recommendations that may not be fully understood.

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Sound Transit's Value Engineering Change Proposal (VECP) process is not formally documented. VECPs are change proposals identified and developed by construction contractors and ST construction teams to improve project cost and utility. Although several VECPs were received and processed by Sound Transit during the audit period, the process appears to have room for improvement by developing and implementing a formal VECP process.

**Recommendations**

- 3.1 Identify whether or not a VE study should be conducted for each project prior to each of Phase Gates (2, 3, 4 and 5).
- 3.2 The VE program management staff should monitor the performance of the VE process steps in the VE workshops.
- 3.3 Change the "standard" duration for VE workshops in the on-call contracts to five days (40 hours).
- 3.4 Prepare a revised scope of work template that is consistent with SAVE International® guidelines. (A sample scope of work template is available on the SAVE International® website.) Do not specify particular methods for achieving each of the steps in the six-step VE workshop process unless there are particular case-by-case reasons. Allow the Certified Value Specialist (CVS) VE team leader to select the methods most applicable to each individual VE workshop.
- 3.5 Do not require delivery of the preliminary VE report on the last day of the VE workshop. This takes resources away from conducting the VE workshop and reduces its effectiveness. Instead, set a delivery date within a short period of time following the last day of the VE workshop (three business days is suggested in the SAVE International® template).
- 3.6 Allow time and money for the VE team leader to attend the Sound Transit decision meeting regarding acceptance or rejection of the VE team recommendations to ensure that the Sound Transit decision-makers have the benefit of the VE team leader's perspective.
- 3.7 When integrating VE studies with other analytical tools such as risk assessments, consider the time impact on the VE study workshop process of adding additional tasks from other processes into the VE workshop activities so that the effectiveness of the VE study is not diminished.
- 3.8 Include a VE assistant to support the VE team leader on all VE studies to free the team leader and team members to focus on tasks that increase the effectiveness of the VE study rather than the administrative tasks.
- 3.9 For large VE teams (more than about a dozen members), include an assistant VE team leader to increase the control and productivity of the larger team.

The following recommendations are directed toward the Value Engineering Change Proposal process:

- 3.10 The processing of VECP proposals must be prompt and consistently on-time.
- 3.11 Sound Transit must clearly document what types of VECP proposals will or will not be considered.

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- 3.12 VECP language in the construction contracts must be clear and consistent with Sound Transit procedures.
- 3.13 Provide the details of the process to all construction contractors as a part of the bidding process information.

**Observation 4 – The VE Program Should Have a Separate and Adequate Budget**

Description of Practice during Audit Scope

Budgets were not prepared for the Value Engineering program, either for program costs or for individual VE studies. Funds for VE studies came from the allowances for design and contingencies in the project budgets.

Assessment of Practices during Audit Scope

The absence of an identified budget for the VE program means that time and expenses for operation of the fledgling VE program must come from general engineering budgets or project budgets. This means that both time and money needs for the VE program must compete with the general engineering needs of the Agency, creating a strain on the commitment of the optimal resources to the VE program.

The lack of identified budgets for individual VE studies results in competition for funds with other elements of the design process for a project. Because Design Project Managers have little training in the benefits to be gained from a properly scoped VE study, there is little incentive for them to support the optimal level of VE effort on their projects. Because the standard scope of work in the on-call VE services contracts is set at a three-day VE workshop, incentives to minimize rather than optimize the investment in Value Engineering are established.

Recommendations

- 4.1 Incorporate a line item in the agency budget for the Value Engineering program that includes funds for VE program staffing and associated expenses, training for VE program staff and design project manager, and consultant services for VE studies. Make the head of the VE program responsible for meeting that budget. Include a contingency allowance in the budget for VE studies that may be identified at a later date.
- 4.2 Set a VE study budget for each project in the Sound Transit Capital Improvement Plan.
- 4.3 Check the VE budget for each project to confirm that it falls between 0.5 percent and 2 percent of the project construction cost.
- 4.4 Allocate a budget amount for a reasonable number of VE studies of design standards along with standard specification each year beginning in calendar year 2013.
- 4.5 Allocate a budget amount for a reasonable number of VE studies of organization procedures beginning in calendar year 2013.

### **Observation 5 – VE Program Staffing Should Be Increased to Manage Expected Study Volume**

#### Description of Practices during Audit Scope

Though Sound Transit has been conducting VE studies since the Agency's inception, the programmatic approach to Value Engineering is new to Sound Transit. VE program staffing currently consists of two part-time individuals, one of whom has received his Associate Value Specialist (AVS)™ Certification from SAVE International®. Both individuals are new to Value Engineering and the Value Engineering program team which was established in mid-2011.

#### Assessment of Practices during Audit Scope

This is a newly staffed program at Sound Transit. One member of the Value Engineering program staff has received basic initial training in the Value Engineering process and has been certified at the SAVE International® initial certification level. This was a good beginning for the program, but was insufficient to enable the program to conform to industry best practices. As the VE program moves toward the more optimal characteristics recommended in this report, staffing demands to support the VE program are expected to increase. The level of staffing required for successful VE program management will be driven by the number of VE studies conducted per year and by the number of internal staff used as VE team members. Use of more internal staff will require additional time from the VE program staff for internal coordination and scheduling.

The current program appears to be more a “champion” based or voluntary process than imbedded as its own department within Sound Transit. This could lead to a declining emphasis on VE over time as people move in the organization.

#### Recommendations

- 5.1 The VE program should have staff that are committed full-time rather than part-time.
- 5.2 Create a plan for staffing the VE program to meet the demands of the upcoming Capital Improvement Program.
- 5.3 Define the VE program as a formal organizational unit that reports to an executive director level to assure long-term VE program viability.
- 5.4 The annual evaluations of all managers above the Value Engineering program manager should include the performance of the Value Engineering program as one of the criteria.

## **Observation 6 – VE Program Personnel and Construction Leadership Should Have VE Training**

### Description of Practices during Audit Scope

No evidence was found of a formal, organized training program in Value Engineering-related topics at Sound Transit. Formal training in Value Engineering topics has not been provided for Design Project Managers, operations staff, maintenance staff or management. Sound Transit recently arranged entry-level training (SAVE International®-certified Module I) for one of the two individuals who are responsible for the Value Engineering effort.

### Assessment of Practices during Audit Scope

The absence of a formal training program has contributed to less frequent use of VE than would be considered desirable according to best practices. Lack of participation in the VE training process by important stakeholders could lead to VE studies that do not conform to SAVE International® guidelines as well as a rejection of valid, or poor implementation of, VE recommendations.

### Recommendations

- 6.1 The manager of the Sound Transit VE program should obtain training in Value Engineering and should seek and obtain certification by SAVE International® as a Certified Value Specialist (CVS)™. Training should include basic training in Value Engineering (SAVE International®-approved Module I training – 40 hours), advanced training in Value Engineering (SAVE International®-approved Module II training – 24 hours), and additional training to equip him or her with sufficient knowledge about Value Engineering to knowledgeably manage the Sound Transit Value Engineering program.
- 6.2 Value Engineering project managers within the VE program team should obtain training in Value Engineering and should seek and obtain certification by SAVE International® as at least an Associate Value Specialist (AVS)™. If they are to be regularly leading VE studies as a part of the Sound Transit VE program, they should advance to a higher level of certification as soon as is reasonable.
- 6.3 Sound Transit design project managers should obtain basic training in the use of Value Engineering from a project manager's perspective, through courses available from SAVE International® or from other sources.
- 6.4 The individual to whom the VE program manager will report should receive the same training as the design project managers to become familiar with the Value Engineering process and the critical factors in Value Engineering success, so as to monitor the overall performance of the VE program.
- 6.5 Sound Transit may wish to contact SAVE International® for development of customized training to specifically address Sound Transit's needs.

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- 6.6 Have at least one member of the VE program staff attend the annual SAVE International<sup>®</sup> conference each year to obtain additional knowledge and training in Value Engineering.
- 6.7 Have at least one member of the VE program staff attend the biennial AASHTO Value Engineering conference to obtain additional knowledge and training in Value Engineering.

**Observation 7 – Additional Controls are Needed to Monitor VE Program Practices**

Description of Practices during Audit Scope

We identified four formal controls that existed within the VE Program, which was implemented in mid-2011 (the controls are further described in Appendix C):

- Control VE1 – Approval of the Three-Year Rolling VE Plan by the Change Control Board
- Control VE2 – Approval of the VE Study Task Order by the Project Control Manager
- Control VE3 – Approval of the Final VE Report by the Value Engineering Review Board
- Control VE4 – Approval of the final drawings, that incorporate the accepted VE recommendations, by the Project Control Manager and the Project Director

Assessment of Practices during Audit Scope

Because the VE Program was revised in 2011, risk management and internal controls to monitor program performance do not appear to be fully formed. The existing controls were evaluated relative to the best practice control objectives identified in our preliminary report to you. The four current controls were designed properly to achieve the control objectives as noted in the table below; however, because the controls were recently implemented, sufficient VE activity has not occurred to test the controls and determine if they were consistently working.

Every observation in this report related to a control design or operating weakness. The existing controls were sufficient to monitor some of the observations we identified in this report, but other controls are needed to completely account for all of the observations. The below table shows which observations can be monitored by the existing controls, and which observations will require additional controls to monitor:

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| No. | Best Practice Control Objective                                     | Existing Controls | Observation |
|-----|---|-------------------|-------------|
| 1   | A process is in place to properly evaluate the VE project universe. | VE1               | 1           |
| 2   | Procurement of VE services meets Sound Transit requirements.        | VE2               | 8, 9        |
| 3   | VE program has appropriate stakeholder support.                     | Control Needed    | 1, 4, 5     |
| 4   | VE program personnel meet skill and experience requirements.        | Control Needed    | 6           |
| 5   | VE studies conform to best practices.                               | VE3               | 2, 3        |
| 6   | VE study recommendations are properly evaluated.                    | VE3, VE4          | 3           |
| 7   | VE program meets regulatory reporting requirements.                 | Control Needed    | NA          |

An explanation of where additional controls are needed:

**Control Objective 3** – VE program has appropriate stakeholder support; our observations identified:

- a) There was no process for reporting program accomplishments either internally or externally.
- b) Separate budgets for VE have not been implemented on either a program or project basis.
- c) Oversight of program staffing to ensure conformance with best practice standards did not occur.

**Control Objective 4** – VE program personnel meet skill and experience requirements:

- a) Controls and processes to implement formal VE training for VE personnel and team leaders have not been implemented.

**Control Objective 7** – VE program meets regulatory requirements.

- a) An informal control existed regarding FTA and WSDOT<sup>2</sup> reporting requirements, which should be implemented formally.

Recommendations

The following internal control enhancements are recommended to better monitor compliance with the best practices control objectives:

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<sup>2</sup> Sound Transit does not have any reporting requirements to WSDOT unless involving a joint Federal project. FTA requires an annual update of VE activity.

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- 7.1 The Director of Project Controls should approve annual reports to stakeholders (the Board, Sound Transit personnel and public constituents) regarding the achievements of the VE program.
- 7.2 The Director of Project Controls should approve the VE staffing levels, training program and semi-annually affirm that the VE program is compliant with the training program. The Project Controls Manager should annually affirm that Sound Transit is compliant with VE reporting requirements for WSDOT and FTA.

**Observation 8 – Procurement Strategy Should Separate VE Consultants from Other Types of Providers**

Description of Practice during Audit Scope

A review of Sound Transit’s documents for the most recent procurement of VE consultant services disclosed the approach used to solicit proposals for several types of services, such as constructability reviews in addition to Value Engineering. Two contracts were awarded.

Two consultants were selected and issued on-call contracts for three-year durations with a two-year extension option. To date, only one of the two consultants has conducted VE studies for Sound Transit.

Assessment of Practice during Audit Scope

The procurement appeared to have been consistent with both the Sound Transit internal guidelines for procurement of professional services and the State of Washington Guidelines for procurement of engineering services. However, procurement of Value Engineering services in combination with multiple other services results in an evaluation process for consultant selection that must, of necessity, be based on a consolidated assessment of the proposer’s credentials in a variety of categories. The risk is that a firm may be selected to provide a VE service though it does not have the level of VE credentials most desired by Sound Transit. Because the credentials in the other areas of service included in the proposal are high, this may overshadow the weaker VE credentials. While procurement of multiple types of services in a single procurement exercise may reduce the cost and reduce the workload on the procurement staff, it will not necessarily produce the optimum quality of VE services to meet Sound Transit’s needs.

Recommendations

- 8.1 Procure VE services using a separate procurement event.
- 8.2 Revise the selection criteria to generally conform to the guidelines suggested in “Pro Forma Request for Proposal for Value Consulting Services” issued by SAVE International®, latest revision. (Available from the SAVE International® website at [http://www.value-eng.org/pdf\\_docs/monographs/Proforma\\_T\\_of\\_R\\_for\\_VE.pdf](http://www.value-eng.org/pdf_docs/monographs/Proforma_T_of_R_for_VE.pdf).)



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- 8.3 Once the number of studies to be conducted per year has been predicted, revisit the number and durations of VE contracts to be solicited. It is recommended that VE contracts not be solicited in the same year (i.e., procure half of the desired capacity each year over a two-year period, or one-third of the capacity over a three-year period) to provide better continuity of the VE program in the event procurements are delayed for any reason. Set the contract durations consistent with the selected approach to procurement.
- 8.4 Considerations in the decision about the number of consultants to procure, in addition to the impact of the number of solicitations on procurement and other staff, should be:
- i. Diversity of VE team leader experience (i.e., having a larger resource base of VE team leaders allows better matching of the VE team leader experience with the specific project under VE review)
  - ii. VE study capacity (number of VE studies per year per VE team leader as compared to the total number of consultant-led VE studies planned per year)
  - iii. Ability to take a team leader out of the rotation as a result of poor performance

**Observation 9 – Develop Contract Terms and Conditions More Appropriate for VE Consultants**

Description of Practice during Audit Scope

Sound Transit had two existing on-call contracts that included Value Engineering services along with constructability reviews, risk assessment and other services. Each contract was for a three-year term, with one two-year extension option available to Sound Transit. A very limited number of task orders were issued to one contractor and at the time of this performance audit, no task orders were issued to the other.

The contracts appeared to have been prepared by modifying previous contracts or contract templates for design services and/or construction contracts and still contained provisions related to those types of services. It is expected that, absent recommendations from this audit, the form of these existing contracts would be used for future VE service contracts.

Assessment of Practices during Audit Scope

The existing contracts contain a number of provisions that do not appear to be applicable to Value Engineering services, and, in some cases, place burdens on the consultants with minimal or no benefits to Sound Transit. Some consultants may take issue with certain provisions which will extend contract negotiation, consuming both calendar time and staff time to resolve, with no consequential benefit to Sound Transit.

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Recommendations

Modify the VE services on-call contracts to make the language more appropriate to Value Engineering services. Suggested modifications to the contract language are as follows:

- 9.1 Section 4D does not commit Sound Transit to providing the VE consultant with all of the information needed to properly perform the VE study. Revise to clarify that the VE consultant may depend on Sound Transit to provide all of the information needed in order to properly perform the VE study.
- 9.2 Revise Section 6B to be specific to the potential errors and omissions associated with providing the Value Engineering service. Much of the language in the current section, while appropriate for design services, does not reflect the actual services provided by the VE consultant. The VE consultant does not provide designs in the classical sense. They provide recommendations, which, if accepted, are designed by Sound Transit's design consultant for the project, who then is liable for the final design.
- 9.3 Delete Section 9 of the contract. It is specific to design services and is contrary to the creativity essential to the successful performance of the VE service. If taken at face value by the VE consultant, it will limit his or her creativity and likely result in missed opportunities for Sound Transit.
- 9.4 Section 11B, as written, does not bind Sound Transit to provide all of the information needed by the consultant to conduct the VE review. Because the VE consultant is dependent on Sound Transit to provide all of the information that has been prepared by Sound Transit and by others, this section should be rewritten to reflect that Sound Transit will provide all of the information about the project that is necessary for the consultant to conduct the VE study, and that the VE consultant is entitled to rely on that information.
- 9.5 Sections 12 and 13 appear to be configured for long-term design contracts, with scopes that can change significantly and which require documentation of tasks to confirm the legitimacy of the payment request. We recommend simplification by use of a lump sum form of payment, with two invoices to be triggered by completion of the VE workshop and the final report rather than by a date. The lump sum amounts would be negotiated at the time of issuance of the task order as currently contemplated.
- 9.6 Section 14C requires that all provisions of the prime contract be included in all subcontracts. Not uncommonly, some of the desired subconsultant Value Engineering team members are individual sole practitioners, or work for small specialty firms. Specific areas of concern tend to be insurance requirements and the defense requirement in the hold harmless agreement. If it is not Sound Transit's intention that subconsultants be bound to all provisions of the prime contract, then we suggest adding a section to the contract that specifically lists in one place the sections of the prime contract that are to be included in all subcontracts.

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- 9.7 Section 14C also requires that each subcontract be submitted to Sound Transit before proceeding with work on each task order. We suggest revising to reflect a requirement to pre-approve a subcontract template when a contract is awarded to the VE consultants, and to require submittal of the specific subcontracts prior to receiving final payment for the task order.
- 9.8 Section 20 appears to have been drafted for a design contract. It has a number of provisions that are either not applicable or inappropriate for a Value Engineering contract. The Value Engineering consultant makes no design decisions and will never act as Sound Transit's agent. All changes to the design that flow from the Value Engineering process, once they have been accepted by Sound Transit, are designed by a designer under a separate design contract to Sound Transit. That consultant will sign and seal any design documents.
- 9.9 Per Section 29, the Partnering requirements for the contract, while appropriate for a design contract, appear excessive for a Value Engineering contract. This will place an additional administrative burden on Sound Transit and the VE consultant with little, if any, benefit.
- 9.10 In Exhibit A – Work Plan – Task 2 Value Engineering, the reference to the VE professional organization should be SAVE International<sup>®</sup>. The name was changed from the Society of American Value Engineers to SAVE International<sup>®</sup> about 15 years ago.
- 9.11 Exhibit A – Work Plan – Task 2 Value Engineering – Provision (e) specifies normal VE duration of three days. This is far too short for projects of the size and complexity that Sound Transit is executing. This duration should be increased to five days. For the size and complexity of the projects that Sound Transit is constructing, a three-day VE duration is far from optimal. The workshop duration should be set at a standard of five days in the contract, with provisions for adjustment on a case-by-case basis for each task order.
- 9.12 Exhibit A – Work Plan – Task 2 Constructability Reviews – Provision (c) specifies constructability review duration of three days. If Sound Transit elects to include constructability reviews as a part of the work elements to be accomplished under the Value Engineering services contract, this duration should be re-evaluated. This may be too short for projects of the size and complexity that Sound Transit is executing.

It should be noted that we are not providing legal advice in this performance audit, and we are not qualified to do so. What is presented here is based on our comparison of your practices to benchmarks. We recommend you engage a qualified attorney in addressing any of the recommendations in this report section. None of these recommendations should be considered legal advice. Rather, these are recommendations to make the contract conform more accurately to the nature of the Value Engineering service.

## **REPORTING VIEWS OF RESPONSIBLE OFFICIALS**

Sound Transit appreciates the auditor's thorough and detailed report, and agrees with most of the audit recommendations. In fact, many have already been implemented during the agency's most recent value engineering efforts on North Link and University Link projects. Management has planned actions to implement all recommendations prior to December, 2012, with the exception of the two recommendations to which management disagrees. The following summarizes agency management response to each recommendation:

- 1. Identify all current projects that should receive VE studies including number and scope; develop and implement a long-term VE program that includes staffing plans and budgets. Begin tabulating and publicizing VE program success internally and externally.**

Sound Transit partially agrees with this recommendation. The agency has already identified ST2 projects that will require VE within the next three years and plans annual updates on a rolling three year basis. Staffing and budget changes are being evaluated and will be resolved during the 2013 budget development process. VE results are currently tabulated, and a database of all VE items and their status is under development. Sound Transit will pursue effective means to publicize VE successes.

- 2. Strengthen the requirements of the workshop task orders under the existing on-call VE contracts to increase the length and modify the agenda of the VE studies to comply with SAVE International<sup>®</sup> guidelines and industry best practices.**

Sound Transit agrees with this recommendation. Sound Transit's most recent VE sessions utilized primarily five day workshops based on the determined need and developed agendas that comply with the 6-step SAVE International guidelines (North Link and East Link projects). ST has been working with its VE consultants to ensure workshops strive to follow best practices. ST will continue to refine its process and requirements based on the nature, size and complexity of individual projects.

- 3. Scoping, analyses and documentation from VE studies should comply with SAVE International<sup>®</sup> guidelines and best practices.**

Sound Transit partially agrees with this recommendation. Current studies on North Link and East Link were developed with 6-step SAVE International guidelines in mind, and were developed collaboratively with experienced SAVE practitioners from the VE consultants. ST will continue to use SAVE recommended guidelines. However, ST may amend SAVE guidelines with industry best practices and guidelines from other professional organizations, as appropriate.

**4. Establish a separate budget for the VE program and individual VE studies.**

Sound Transit agrees with this recommendation. Currently, VE is budgeted within the Final Design Phase of each individual capital project. The agency will segregate future VE study budgets by creating a separate Work Breakdown Structure for VE within the Final Design Phase.

**5. Assign a full-time staff to the VE program and transfer VE responsibility and management of the budgets to the VE program staff. Define the VE program as a formal organizational unit that reports to an Executive Director Level to assure long-term VE program viability.**

Sound Transit does not agree with this organizational structure recommendation, but we agree that the VE program needs expanded visibility within the Design, Engineering & Construction Management Department and other departments in the Agency such as Operations. VE is currently managed within the Project Control Division and we believe it should continue as an integral part of project level risk management effort. The VE program should not be transferred from Project Controls where it is currently being managed. Our approach is to combine risk analysis with value engineering into an integrated assessment process to assist in evaluating alternatives, recommending delivery methods and establishing a credible range for cost and schedule impacts and opportunities. We believe this approach will provide greater overall value than establishing VE as an isolated process. In addition, the VE studies utilize cost estimating, scheduling and risk assessment to fully analyze the viability of VE proposals and impacts on project scope, cost, schedule, including functionality. The Project Control Division is very visible within the Agency and the Federal Transit Administration. It is considered an “independent” unit by the FTA and the CEO.

**6. Implement the first stages of a training program in Value Engineering.**

Sound Transit agrees with this recommendation. Three project controls staff, including the Director, and a Senior Manager, are scheduled to receive SAVE authorized training in March, 2012. Following this training of key staff, additional SAVE authorized training is planned for corridor design managers, both civil and systems.

**7. Additional program controls should be implemented regarding stakeholders, training and regulatory reporting requirements.**

Sound Transit agrees with this recommendation. The agency will review existing controls and expand as appropriate.

**8. Procurement strategy should separately identify VE services from other engineering services.**

Sound Transit does not agree with this recommendation. The current approach solicits both VE and Risk Assessment Services which provides for an integrated approach by these two disciplines. This approach fairly maintains the independence of these activities from the Final Design Team.

**9. Separate VE contract terms and conditions should be prepared for VE services.**

Sound Transit generally agrees with the auditor's recommendation that Sound Transit's VE contracts could be written with contract terms that are more specific to the types of services provided by a VE consultant. To the extent appropriate, the agency will develop refined contract language for future value engineering services contracts.

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**APPENDIX A – COMPARISON WITH OTHER AGENCIES**

Interviews were conducted with six other agencies regarding key aspects of their current Value Engineering programs. See also the summary at page 3. Their comparative responses follow:

| <b>Attribute</b>                       | <b>Sound Transit</b>                                 | <b>Agency A</b>               | <b>Agency B</b> | <b>Agency C</b>               | <b>Agency D</b>          | <b>Agency E</b>   | <b>AASHTO**</b>  |
|--|--|-------------------------------|-----------------|-------------------------------|--------------------------|---|--|
| <i>Normal VE Workshop durations</i>    | Contract says three days;<br>Actual to two five days | Usually five days             | Five days       | Five days                     | Mostly four to five days | Five days or more on capital projects; one to three days on processes | Not available  |
| <i>Compliance with SAVE Guidelines</i> | Some SAVE compliant                                  | SAVE compliance not confirmed | SAVE compliant  | SAVE compliance not confirmed | Mostly SAVE compliant    | SAVE compliant  | Not available  |
| <i>VE done on all projects</i>         | No   | No                            | Yes             | No                            | No                       | No  | No   |
| <i>Average VE Studies/Yr</i>           | 2  | 1                             | 2               | 1                             | 13                       | 13  | 8 per agency;<br>Largest annual high for a single agency was 90,<br>Low was zero |
| <i>CVS required</i>                    | Yes  | Yes                           | Yes             | Yes                           | Yes, if consultant-led   | Yes   | Not Available  |
| <i>VE Register</i>                     | No   | No                            | Yes             | No                            | No                       | Yes   | Generally No   |
| <i>VE Program Budgeting</i>            | Not performed  | Not performed                 | Yes             | Not performed                 | Yes                      | Yes   | Not available  |

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| Attribute   | Sound Transit                     | Agency A   | Agency B   | Agency C   | Agency D                      | Agency E   | AASHTO**                     |
|---|-----------------------------------|--|--|--|-------------------------------|--|------------------------------|
| <i>Staffing</i>   | Two part-time                     | No program staff, VE coordinator assigned on a project basis | VE manager and VE coordinators                       | No program staff, VE coordinator assigned on a project basis | Two                           | One full-time program manager, five part-time regional coordinators                  | Varies significantly         |
| <i>VE program staff certification</i>                     | One entry level (AVS™)            | None identified  | None identified                                      | None identified  | None identified               | Two masters level (CVS™)<br>Six entry level (AVS™)                                   | None to masters level (CVS™) |
| <i>Training</i>   | Entry-level                       | None   | Informal, including brown bag talks for agency staff | None   | Intermediate level            | All VE program staff trained at entry- to high-level informal training of management | None to high-level           |
| <i>Study Performance</i>                                  | Not tracked                       | Not tracked  | Tracked  | Not tracked  | Tracked                       | Tracked  | Tracked                      |
| <i>Procurement</i>  | Solicited as a bundle of services | VE solicited for individual projects                         | Three on-call separate VE contracts                  | VE solicited for individual projects                         | On-call separate VE contracts | On-call separate VE contracts  | Varies                       |
| <i>Integrated Risk Management Studies with VE Studies</i> | Not fully formed                  | Not present  | Moderate   | Not present  | Moderate                      | Excellent  | Varies                       |
| <i>Contracts</i>  | Not VE specific                   | VE specific  | VE specific  | VE specific  | VE specific                   | VE specific  | Not available                |



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| <b>Attribute</b>                     | <b>Sound Transit</b> | <b>Agency A</b>              | <b>Agency B</b>                            | <b>Agency C</b>  | <b>Agency D</b>                | <b>Agency E</b>  | <b>AASHTO**</b>  |
|--------------------------------------|----------------------|------------------------------|--|--|--------------------------------|------------------|--|
| <i>Construction Contracts</i>        | VECP not tracked     | 5 VECPS proposed, 4 accepted | VECPs in program, construction not started | Typically 10-30 VECPS per contract, 10-20 percent accepted | 29 VECPS approved in 2009-2010 | VECP not tracked | Average- 6 approved/agency /yr Range is 0-91 approved/agency /year |
| <i>State and Federal Regulations</i> | Compliant            | Compliant                    | Not Applicable                             | Compliant  | Compliant                      | Not Applicable   | Probably Compliant   |

\*\* AASHTO collects data from the DOT VE programs at all 50 U.S. states, the District of Columbia, and 3 federal lands transportation programs. Information shown is a compendium of that data.

## **APPENDIX B – LIST OF POLICIES AND DOCUMENTS REVIEWED**

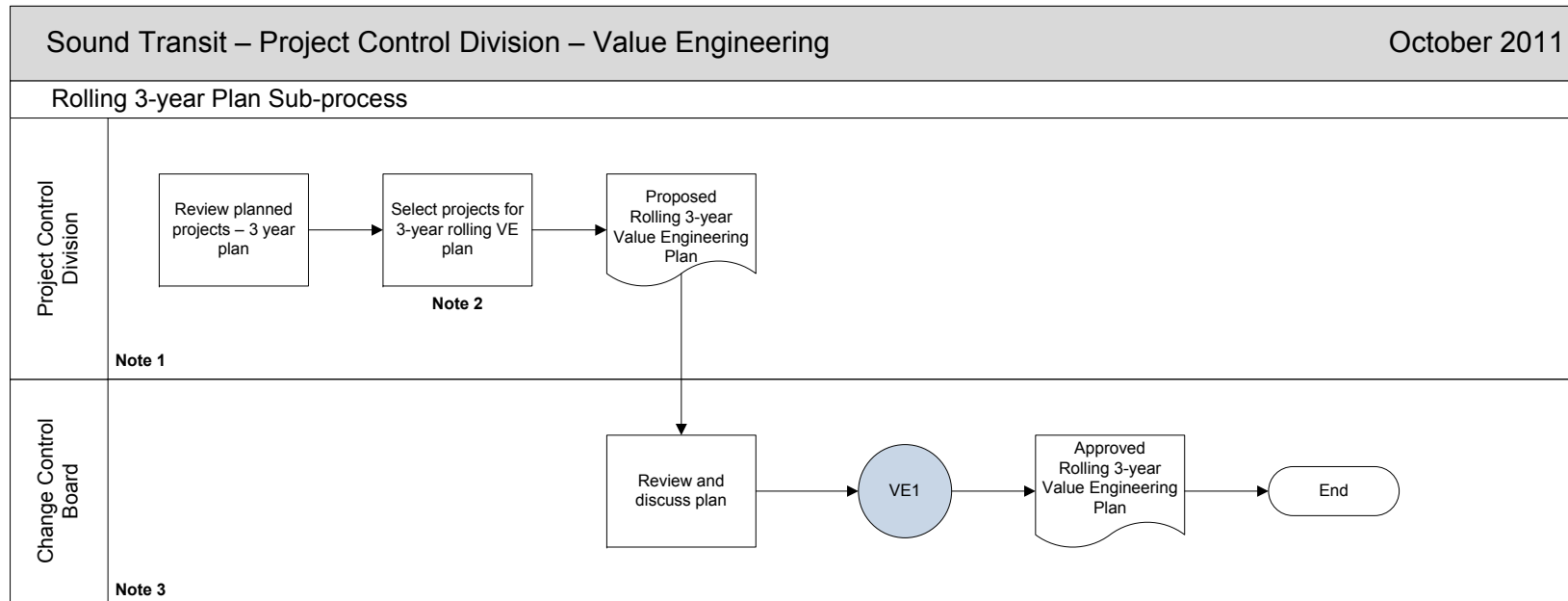
The following documents were reviewed during the performance audit; refer to the Methodology section beginning on page 6.

1. Complete organization charts
2. Procurement and Contract Administration Manual 2010
3. University Link Project Management Plan
4. 2005 U-Link VE Study – Faithful and Gould
5. 2007 VE Report
6. 2007 VE Report Review
7. 2007 VE Report Response
8. 2007 VE Report Response (2)
9. 2007 VE Report Response (3)
10. 2011 U-Link VE Summary
11. 2011 East-South Link HNTB Contract
12. 2011 East-South Link Meng Contract
13. 2010 South Link Huitt-Zollars Contract
14. 2011 South Link VE Study – Huitt-Zollars
15. 2005 North Link Faithful and Gould Contract
16. 2009 North Link Early Work Updates for VE – PowerPoint
17. 2009 North Link Alignment Recommendations
18. 2011 North Link Task Order
19. 2011 North Link VE Draft Preliminary Report
20. 2010 VE Study for I-90 Two-way Transit HOV Stage 3
21. 2010 Final I-90 Two-way Transit HOV CEVP Report
22. 2004 Mountlake Terrace VE Report
23. 2004 Mountlake Terrace Task Order
24. 2001 Issaquah Transit Center VE Study
25. 2010 South Tacoma Commuter Rail Project
26. 2007 Link Light Rail Performance Audit
27. 2008 ST Response to Link Light Rail Performance Audit
28. 2009 Update to 2007 Link Light Rail Performance Audit

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**APPENDIX C – VALUE ENGINEERING PROCESSES AND CONTROLS**

The following process maps depict the current VE processes and related internal controls; refer to Observation 7.



**Note 1:** The Project Control Division is a division of the Design, Engineering and Construction Management (DECM) department of Sound Transit tasked with controls and quality control for all construction projects.

**Note 2:** The minimal criteria for VE studies is the FTA requirements; in addition, the Project Control Division has developed criteria to also include complex projects in the \$25 million range will be included in the 3-year rolling VE plan based upon Project Management input.

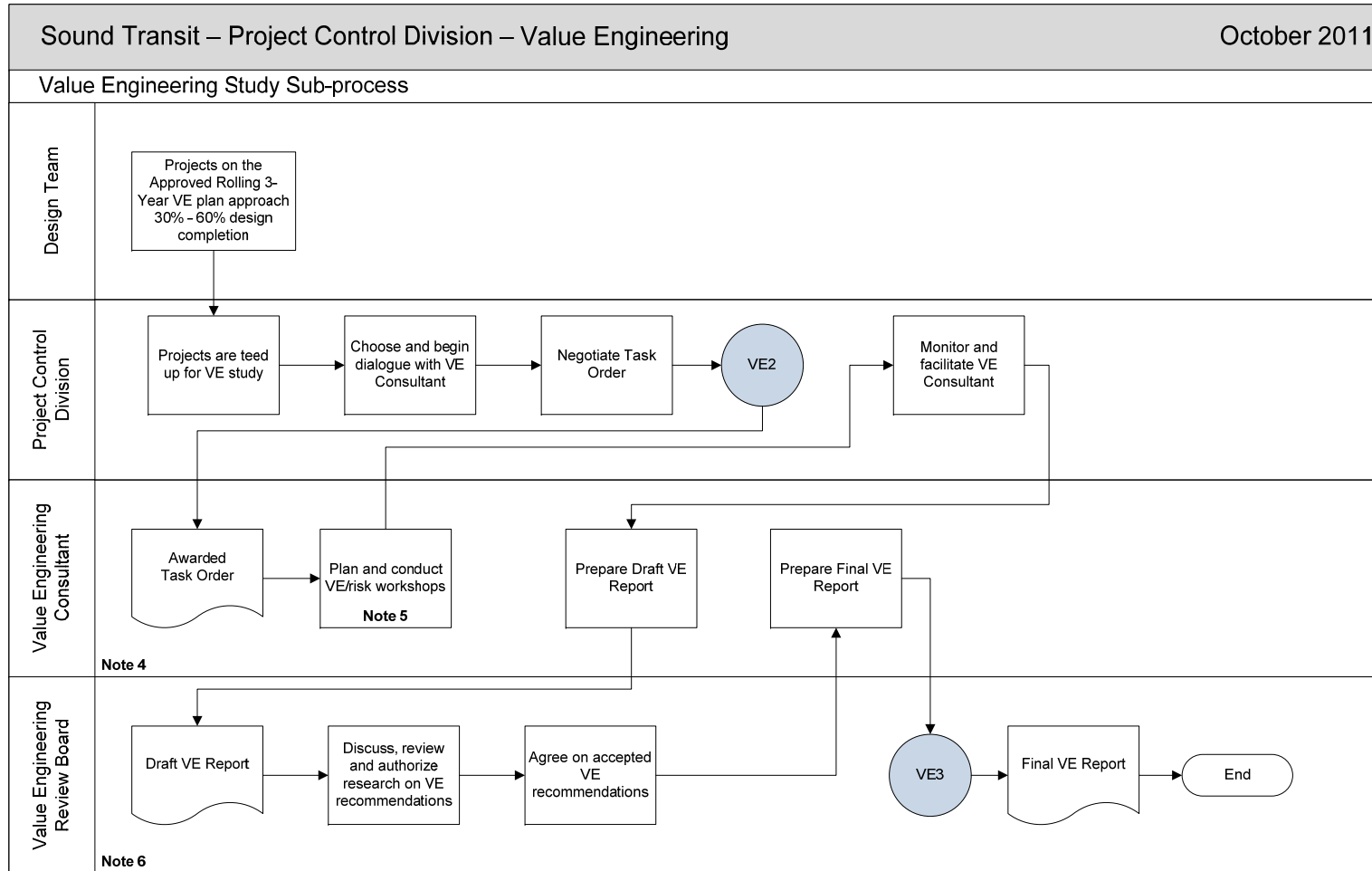
**Note 3:** The Change Control Board is comprised of 15 standing, senior personnel that have decision-making and approval authority over design/construction/procurement policies for Sound Transit.

**Control:**

**VE1** – The Change Control Board reviews and approves the Rolling 3-year Value Engineering Plan every three years (note this coincides with the contract cycles of the VE and risk consultants). (Completeness, Validity)

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**APPENDIX C – (CONT.)**



**Note 4:** Sound Transit Project Control Division has open contracts with two value engineering firms – HNTB and Meng.

**Note 5:** Project Control Division incorporates risk management in VE studies; this involves risks to not meeting project scope, schedule and budget objectives and decisions to avoid, mitigate or accept risk.

**Note 6:** Value Engineering Review Board (VERB) consists of 4 senior DECM personnel that have decision-making and approval authority over value engineering studies.

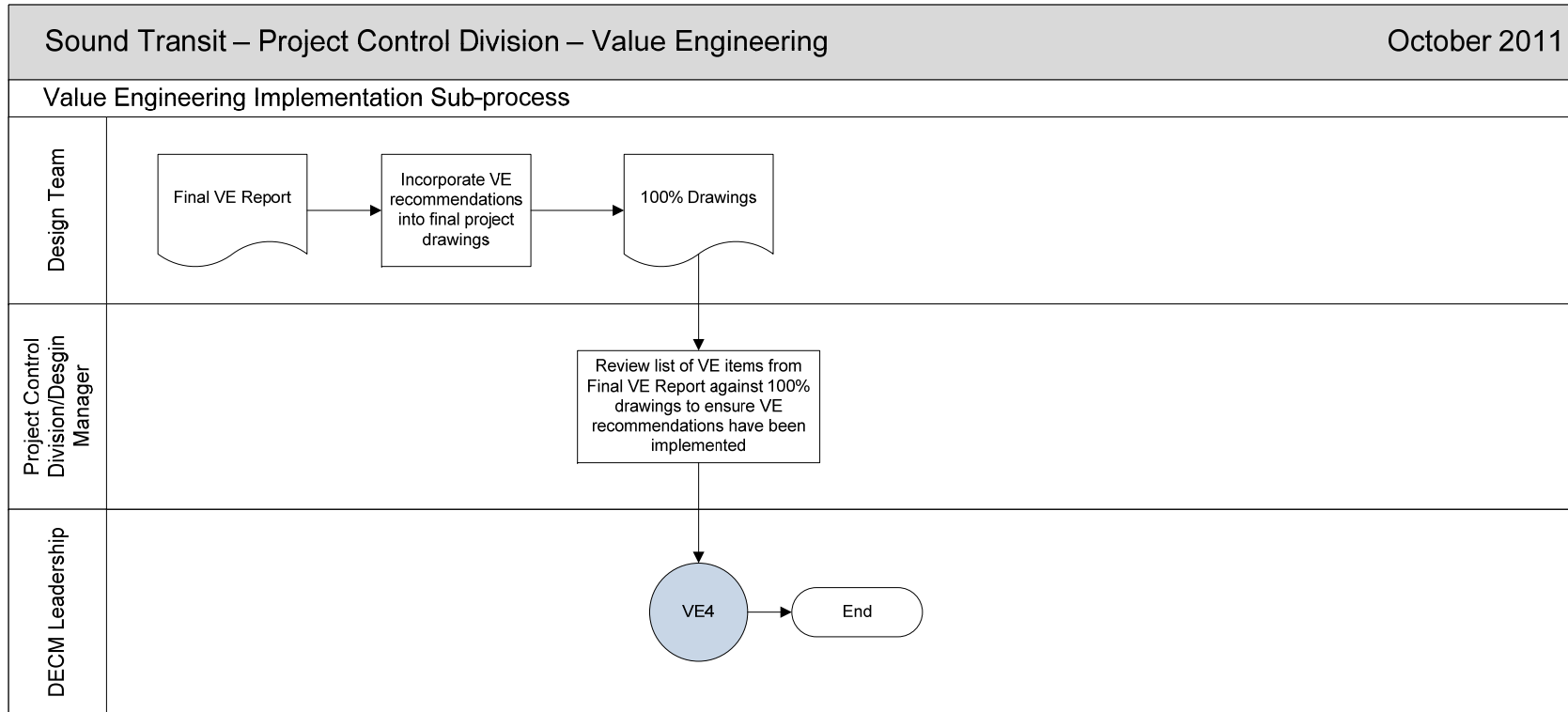
**Controls:**

**VE2** – VE Study Task Order is approved by the Project Control Manager and additional signors in accordance with existing procurement policy. (Validity)

**VE3** – Value Engineering Review Board reviews and approves Final VE Report. (Completeness, Validity, Accuracy)

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**APPENDIX C – (CONT.)**



**Control:**

**VE4** – Project Controls Manager and Project Director approve 100% drawings prior to RFP/Bid preparation and distribution to ensure accepted VE recommendations have been incorporated. (Completeness, Accuracy, Validity)