Utah Department of Transportation (UDOT) Feasibility Study for Performance-Based Maintenance Contracting

May 15, 2013

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Executive Summary

This is the executive summary of an assessment of the applicability of performance-based highway maintenance contracting as a strategy for the Utah Department of Transportation (UDOT) to use to meet its increasing maintenance work load. The purpose of the assessment is to review the experience from other states and Canadian provinces in order to identify the circumstances under which UDOT will achieve the greatest business benefits from performance-based contracting for highway maintenance. The objective of this study is to use experience from elsewhere to minimize UDOT's costs from "learning by doing."

Background

As Utah's highway system has grown, UDOT management has sought to meet the increased maintenance workload by increasing the productivity and performance of the current labor force. However, the highway system will grow by a further 550 lane miles by 2017 and an acceptable level of service for the operation and maintenance of this growing system cannot be accomplished through increased productivity alone. Therefore, UDOT is assessing the business case of performing maintenance through a performance-based maintenance contract that encompasses multiple maintenance activities.

Increased Experience with Performance Based Maintenance Contracting in North America

Over the past 20 years, a number of states and provinces in North America have attempted to meet challenges similar to those faced by UDOT by outsourcing their highway maintenance activity. Some jurisdictions, such as the Florida Turnpike and Province of Ontario, have outsourced close to the entirety of their highway system maintenance to outside contractors, while others, including Utah, have outsourced certain individual maintenance activities under unit-price contracts. Whatever the contracting approach used by a state or province, the goal is always to achieve equal or greater levels of service on a growing highway system while limiting the cost to the public.

This report examines empirical findings from performance-based highway maintenance procurements in North America, in order to determine the most effective approach to maintenance contracting for UDOT. The evidence summarized herein is based on interviews with owners, maintenance contractors, and industry experts.

Summary Findings

Maintaining Utah Highways

- UDOT currently has maintenance responsibility for some 18,000 lane miles of state highways. This is expected to grow by about 5 percent over the next five years. Without contracting for maintenance, Utah cannot sustain current maintenance levels of service at existing staffing levels.

UDOT Experience with Maintenance Contracting

- In 2006, UDOT pursued a performance-based contract for nearly 25 center line miles of the Bangerter Highway (SR-154). The procurement was designed as a five-year "ROW-to-ROW" contract covering roadway, drainage, roadside, vegetation, aesthetics, and traffic services, plus unit-priced snow removal services. UDOT did not proceed with this contract because the bid prices were considerably higher than expected; however, the experience yielded valuable data, both quantitative and qualitative, on what to expect from any future maintenance contracts. The lesson learned was that any future procurement should be larger in terms of lane miles and that earlier structured dialogue with industry representatives regarding risk transfer and contract provisions will be beneficial.
- UDOT has some experience using unit-price contracts as a way of completing a portion of the maintenance on its highway system. From 2010 to 2012, UDOT outsourced 146 separate contracts totaling $18.6 million, or six percent of the total $317 million spent on maintenance over that period.[1] This does not include the contracting for maintenance-related pavement treatments through the Orange Book.

Lessons Learned in North America

The success factors for performance-based contracting are as follows:

- **Staged approach:** Performance-based contracting is a significant change for highway owners. In the most mature markets such as Canada and the United Kingdom, the large-scale successful adoption of this type of contracting has taken 15 to 20 years.[2] It requires culture change and new ways of risk sharing. Typically, agencies have started with unit-price contracting, and then pursued shorter-duration performance-based contracts and then longer-term contracts.

[1] UDOT OMS

[2] Interviews with Ontario Ministry of Transportation and British Columbia Ministry of Transportation. April – May 2012

- **Contract Size and Duration:** Contracts are more effective when multiple activities are bundled together (e.g., mowing and vegetation control, winter maintenance, and pavement-related work), over large geographies (at least 100 center line miles), with a sufficient duration (10 years and over).[3]

- **Procurement:** Owners go through a learning process in developing contract terms and managing the procurement process. This can impact how risk is understood by prospective bidders. Contracts should establish clear and specific guidelines for each activity, penalties for noncompliance, and considerations for ownership of assets and risk sharing. Among the considerations that warrant discussion with the industry are the use of state facilities for staging and storing equipment and materials. Other considerations include the potential for leasing or purchasing the owners' specialized equipment.

- **Level of Service and Performance Monitoring:** The owner must fully understand the level of service it is achieving in-house in order to provide a contractor's benchmark. This often requires considerable work to accomplish. Similarly, to manage risk transfer, contractors will require baseline information to assess their risk and price accordingly.[4]

- **Costs and Business Benefits Driven by Contract Duration and Risk Transfer:** Achieving economies of scale and duration are the largest factors in producing positive business benefits for states. How the contract is structured, especially duration and location, (discussed above) impacts how contractors can yield efficiency and price their bids. For a longer-term contract, vendors can invest in their own local infrastructure, efficiently use their own equipment, hire more local staff, and amortize expenses; this should also result in lower bids. An important driver of value in longer-term contracts is that the contractor is able to spread the risk and cost involved in acquiring asset knowledge in the first six months to a year of a contract over multiple years.

- **The length of the performance period affects how risk is priced.** Dialogue with industry indicates that it is through risk transfer that performance-based contracts ultimately yield the best long-term benefits for government. Such transfer occurs by definition in performance-based contracts.[5]

- **Evidence on Cost Savings:** There is no definitive evidence on the cost savings from experience in the United States. This is both because there is little data and where there is, it is not an apples-to-apples comparison. None of the interviewees had data on this. However, Ontario, Canada—with a mature performance-based maintenance program—is very satisfied with their program and believes it serves their taxpayers well. Some agencies claim cost savings upwards of 20% while

[3] Interviews with multiple state DOTs

[4] Interviews with Infrastructure Corporation of America and Florida Turnpike

[5] Interviews with Infrastructure Corporation of America

others claim that outsourcing maintenance achieves no measurable cost savings.[6] Fact-finding interviews corroborate that there is little before and after data from which to assess cost savings.

- **Staff and Organization:** For state departments of transportation (DOTs) to administer performance-based contracts requires cultural and managerial change to forge new working relationships. This is a perspective shared by both owners and contractors. Keys to success are open communication between the DOT and its management and staff, as well as between the DOT and its contractor(s). While the contract specifies performance requirements, success requires collaboration and sharing of asset knowledge with the owner and contractor working together.
- **Transition and On-going Management Costs:** The costs of transitioning to performance-based maintenance contracting, and the ongoing management and oversight of such contracts have varied among states. The transition to contracted maintenance, and particularly to a performance-based system involves incurring significant costs. These including the development of procurement documents, the management of procurement, and the redeployment of staff. In addition, there are costs involved to establish the performance baseline against which the contractor's performance is measured.

  In practice some states have recouped these by selling, leasing, or auctioning heavy equipment and facilities that are no longer needed. Once a transition has been made, costs of contract management vary depending on geography, size of district, activities involved, and size of the contractor's workforce. Overall, experienced agencies report that roughly one employee is needed for contract management and administration for every ten that perform maintenance work. Illustrative estimates provided by other states indicate that their ongoing costs for contract management are between 5 and 10 percent of the contracted amount.

Recommended Approach

Conduct a Performance-based Maintenance Pilot Contract

- Establish for five years with an option to extend for a further five
- Consider incorporation of Orange Book type work into the second five years
- Conduct a value-for-money realized analysis to monitor and assess the actual benefits and costs of contracting

It is recommended that UDOT approach the implementation of an initial performance-based contract for a single area or territory as a "pilot project" from which to grow its performance-based maintenance practice. A pilot project applying the lessons learned from

[6] Hyman, William. "NCHRP Synthesis 389: Performance-Based Contracting for Maintenance," Transportation Research Board. Washington, D.C. 2009

elsewhere as discussed in this document will enable UDOT to reduce the amount of "learning by doing". Pursuing a pilot will enable UDOT to adjust for and integrate any components unique to its own system and to use this experience as the basis from which to consider expanding performance-based contracting practices to additional regions. The pilot project should include a rigorous analytical assessment of the value-for-money derived by UDOT from the contract. This information will guide decision-making for exercising the second five-year option and whether to pursue further contracts.

Lessons learned from practice elsewhere were used to prepare a screening tool for reviewing UDOT's risks from performance-based contracting options. These lessons learned were used to develop two illustrative examples of pilot projects that minimize UDOT risk by providing sufficient scale to result in industry participation and to accomplish the UDOT objective of reallocating labor to maintain maintenance level of service elsewhere.

Pilot Option 1: Interstate Territory (I-15, I-215, and I-80)

The scope to include:

- All maintenance activities - Not accounting for any Orange Book work
- Center line miles: 131 (376 when ramps and negative direction miles are included)
- Lane miles: 1,257
- Annual full-time-employee equivalents available for redeployment 30.2[7]
- Current budget: $3.46M

Considerations:

- Covers multiple maintenance stations
- Maybe limitations on options for use of facilities and equipment by contractors

Pilot Option 2: Saratoga and South Valley Territory

The scope to include:

- All maintenance activities - Not accounting for any Orange Book work
- Center line Miles: 125 (144 when ramps and negative direction miles are included)
- Lane miles: 529
- Annual full-time-employee equivalents available for redeployment: 11.1[8]
- Current Budget: $1.17M

Analysis also considered a performance-based contract limited to a sub-set of maintenance activities – chemical vegetation control, mowing, sweeping, and pavement striping. These

[7] Estimated by dividing total labor hours over the selected Interstate territory by annual FTE hours (2,080). See Figure 7 for additional detail.

[8] Estimated by dividing total labor hours over the selected Interstate territory by annual FTE hours (2,080). See Figure 9 for additional detail.

maintenance activities were selected based of their ability to be "bundled" into a single contract, and because their sample size provided a sufficient basis from which to estimate future contract sizes. This found that the scale of work involved would be only viable in the Interstate Territory area and currently accounts for $600,000 of maintenance budget per year.

Continue or Increase Use of Unit-price Contracts for Certain Activities and/or Regions

Although the evaluation of unit price contracting was not the main focus of the analysis. UDOT has, to date, performed limited amounts of maintenance work through unit-price contracts. The department should continue to procure such contracts, with a particular emphasis on those that provide best value for money when compared to UDOT costs. This can take place concurrently with pursuing a performance-based contracting pilot.

Implementation Requirements

Implementation requires a managed process through which UDOT establishes a team to develop contractual documents and lead the competitive procurement process. This process requires the following implementation steps:

- Conduct industry outreach and dialogue as input into procurement strategy and contract structuring
- Establish the procurement process strategy (e.g. one step v. two step procurement), risk and responsibility allocation, evaluation and selection process and criteria
- Develop an optional Request for Qualification (RFQ) and a Request for Proposal (RFP) comprising the instructions to proposers, commercial terms and performance-based technical specifications including: baseline, performance standards, monitoring process, and if applicable hand back requirements
- Conduct the competitive procurement process including issuance of the draft RFQ and RFP, potential one-on-one meetings with proposers, evaluation of the statements of qualifications and bids, and selection of the preferred bidder
- Award and execute the contract
- Transition UDOT staff to manage and oversee contract provisions

Performance-based Contracting Screening Tool

As part of the study, a performance based maintenance contracting screening tool was developed using Microsoft Excel. This tool is calibrated to provide a weighted view of the risks to UDOT along the different dimensions required for successful contracting. It is

intended to be used to identify risk so that it can be avoided, mitigated and/or accepted and managed in the procurement process.

I. Introduction

This document presents the results of a feasibility study to identify the type of performance-based maintenance contracting which has the greatest potential for yielding business benefits to the Utah Department of Transportation (UDOT).

A. Analysis Scope and Objectives

The purpose of the study is to assess the circumstances under which performance-based highway maintenance contracting will serve the Utah Department of Transportation (UDOT) well as a strategy to meet its requirements to maintain an increasing highway asset inventory. This assessment reviews the experience from other states and Canadian provinces in order to identify the circumstances under which UDOT will achieve the greatest business benefits from performance-based contracting for highway maintenance. The objective of this study is to develop recommendations, based on experience from elsewhere, for pursuing performance-based maintenance that minimize UDOT's costs from "learning by doing" and maximize its business benefits.

The study was accomplished by researching experience elsewhere to identify the:

- Type of contracting, the geographic location, and the size of contracts that offer the most promise.
- Requirements for successfully letting and managing performance based maintenance contracts.
- Costs involved in managing maintenance contracting and the implications for on-going maintenance budgets.

1. Analysis Approach

To address the study objectives Parsons Brinckerhoff conducted the following fact-finding research and analysis:

- **Researched lessons learned in the United States, Canada and the United Kingdom and their implications for UDOT.** This was accomplished through a literature review to assess the current state-of-the-practice and telephone interviews to understand lessons learned from experience elsewhere with performance-based maintenance contracting.
- **Data Analysis.** Conducted data analysis of UDOT's maintenance contracting experience. In consultation with UDOT staff, identified two candidate geographic areas for a pilot performance-based maintenance contract that conform to the

parameters for success identified by the research of lessons learned from other states' experience.

2. Research into Lessons learned United States, Canada and the United Kingdom

Telephone interviews and literature review provided the source data for evaluating lessons learned.

- **Telephone Interviews.** Telephone interviews were conducted with state maintenance engineers, or their Canadian equivalent, from eight states and provinces with varying experience with outsourced highway maintenance, as well as with market experts within Parsons Brinckerhoff. The full list of interviewees can be found in Appendix A.

  Additional interviews with maintenance contractors, to obtain the private-sector perspective on what makes for successful maintenance contracting, as well as with academic researchers in the field of construction engineering and management.

  The telephone interviews were structured to provide perspective on the following questions:

  1. **Will the long-term costs of all highway maintenance be lower if maintenance were to be performed by contractors?** This includes consideration of capital and operating costs and the pricing of primary risks such as snow removal, slide repairs, and flood cleanups.

  2. **Is there a minimum contract size where the benefits of outsourced maintenance outweigh the costs?** This identifies information on the effect of contract duration and number of lane miles contracted, and attempts to identify a threshold at which economies of scale make outsourcing economically feasible.

  3. **What are the transitional costs to shift from in-house maintenance to contracted maintenance?** What were the agencies' costs of liquidating those parts of maintenance operations that were redundant under a total contract maintenance system? How much of the in-house work force was redeployed to other areas, and how much would need to be retained in order to perform oversight, documentation, quality assurance, and contract management functions.

- **Literature review.** To determine the current state of practice and understand the level of research performed to date, Parsons Brinckerhoff reviewed all available major publications pertaining to highway maintenance contracting published within the past 10 years. Sources included but were not limited to the following:

- National Cooperative Highway Research Program (NCHRP) and American Association of State Highway and Transportation Officials (AASHTO) reports
- State DOT studies
- Third-party and academic research
- Sample procurement and legislative documents provided by DOTs

Literature was obtained through a combination of internet research, recommendations from UDOT, and interviews with subject matter experts. A full list of resources consulted through the literature review can be found in Appendix A.

3. Data Analysis to Estimate UDOT's Costs to Compare to Any Performance-based Contract Costs

The purpose of the data analysis was to identify for the two candidate performance-based maintenance pilots UDOT's current expenditures on maintenance. This information identifies:

- The amount of UDOT labor and resources that would be available to be reallocated to other areas
- The baseline direct costs currently budgeted for maintenance from which, with the application of overhead data, and understanding the resources required for managing a contract, a baseline UDOT cost could be identified from which to compare the bid prices in performance-based maintenance procurement.[9]
- Data analysis involved identifying and quantifying UDOT's experience with both unit price and performance –based maintenance contracting.

Performance-based maintenance contracting in Utah. Parsons Brinckerhoff identified the most favorable opportunities for conducting a pilot, based on experience in other states. These two candidates are of the geographic scale and include the range of maintenance activities identified in the best practices research as being most favorable.

For the two candidate pilots, the estimated direct costs for UDOT to provide the maintenance services in the performance-based contracting scenarios were identified. The analysis focused on identifying the business impact for UDOT. This includes UDOT's costs of performing the maintenance activities and the UDOT labor resources, in terms of full time equivalents, that would be available to be redeployed.

[9] The full details of this estimate are not provided here because in the event of performance-based contracting pilot UDOT's value for money analysis should be confidential in order to not prejudice UDOT's negotiating ability in the procurement process and the overall competitiveness of the process.

The analysis of the two candidate pilots provides what is essentially the public sector comparator for the candidate performance-based contracting scenarios. This is the UDOT cost basis from which the proposed pricing from a contractor could be compared. These scenarios were identified in discussion with UDOT. To identify costs, data from UDOT's applicable maintenance and financial management systems were assembled to estimate the direct costs. The primary data source is UDOT's Operations Management System (OMS). For comparison to any performance-based contracting proposal an overhead will need to be added.[10]

Evaluation of UDOT's contracted maintenance experience. To provide context, data was assembled to review the type, size, and historical cost experience of UDOT's in-house and contractual maintenance activities. Data from UDOT's Operations Management System (OMS) for fiscal years 2010 through 2012 was assessed.

Implementation considerations and transitional costs to shift from in-house maintenance to performance-based maintenance

The analysis of experience from other states is used to identify implementation considerations and UDOT costs associated with managing a performance-based maintenance contract. The focus of this analysis identifies costs of liquidating those parts of maintenance operations that are redundant under a performance-based maintenance contract scenario and how much of UDOT's work force is available to be redeployed. The types of work, competencies required, and the costs to UDOT to perform oversight, documentation, quality assurance, and other contract management functions are considered.

A spreadsheet tool for considering, value for money, and risk, when evaluating performance-based contracting options was developed. The tool incorporates the lessons learned in other states on the factors that lead to more successful contracting outcomes.

B. Background on UDOT's Increasing Maintenance Work Load

UDOT's maintenance budget and staffing levels have not increased with growth in the size of the highway system that UDOT maintains. This provides some of the context for UDOT's interest in pursuing performance-based maintenance as a strategy for performing the increasing work load.

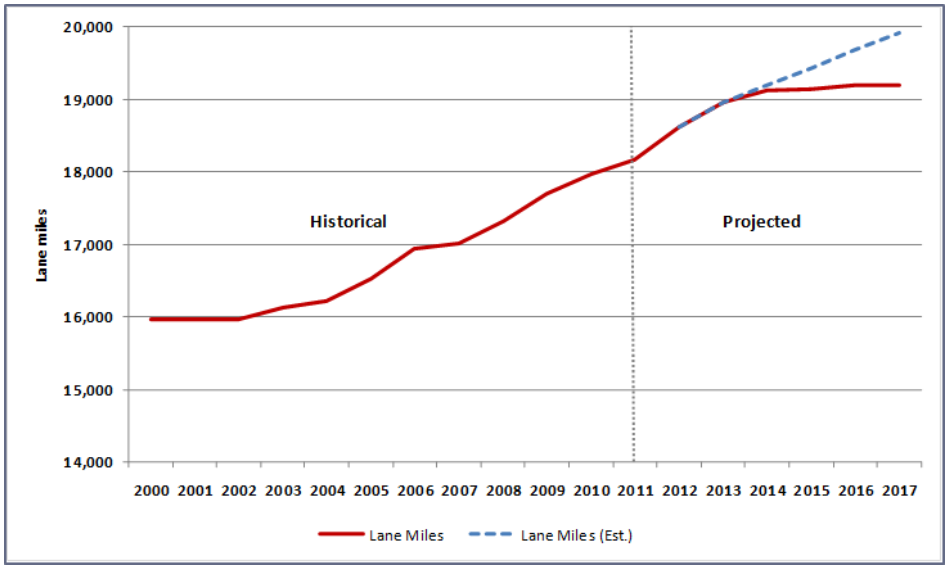
Historical analysis shows the extent to which Utah's highway system has grown and the maintenance work load increased. During this time, the maintenance budget, headcount, productivity increases, and general ability to provide the desired maintenance level of service (LOS) have not matched growth. .

[10] The full details of this estimate are not provided here because in the event of performance-based contracting pilot UDOT's public sector comparator information and value for money analysis should be confidential in order to not prejudice UDOT's negotiating ability in the procurement process and the overall competitiveness of the process.

Figure 1 demonstrates the historical and projected growth of the UDOT highway system from 2000 to 2017. From 2000 to 2011, the UDOT highway system grew by over 2,200 lane miles (14 percent). From 2011 to 2017, the system is expected to grow by an additional 1,000 lane miles (6 percent).[11]

Figure 1. Historical and Projected Growth of UDOT System

FY	Lane Miles	Increase from 2000
2000	15,962	0%
2001	15,962	0%
2002	15,962	0%
2003	16,124	1%
2004	16,225	2%
2005	16,517	3%
2006	16,934	6%
2007	17,010	7%
2008	17,318	8%
2009	17,704	11%
2010	17,968	13%
2011	18,168	14%
2012	18,615	17%
2013	18,951	19%
2014	19,113	20%
2015	19,147	20%
2016	19,195	20%
2017	19,195	20%



Source: Utah State Transportation Improvement Program, UDOT Maintenance Management System, Parsons Brinckerhoff analysis

"Lane Miles" data for years 2012 through 2017 represent the projected number of lane miles in future years based on approved projects in Utah's State Transportation Improvement Plan (STIP). This data is lower than the historical growth rate between 2000 and 2011 (represented by "Lane Miles (Est.) in Figure 1). During this period, UDOT maintenance staffing levels have decreased from a high of 587 full-time employees (FTE) in 2003 to 549 in 2010 (a decrease of over six percent).[12] If it is assumed that LOS was maintained between 2000 and 2011 through better management and adoption of improved business practices, it is not clear that similar improvements can be yielded to accommodate future system growth.

Therefore, at current levels of productivity, to maintain the current LOS going forward (579 FTEs at roughly 32.1 lane miles per FTE)[13], UDOT will need to add an additional 18

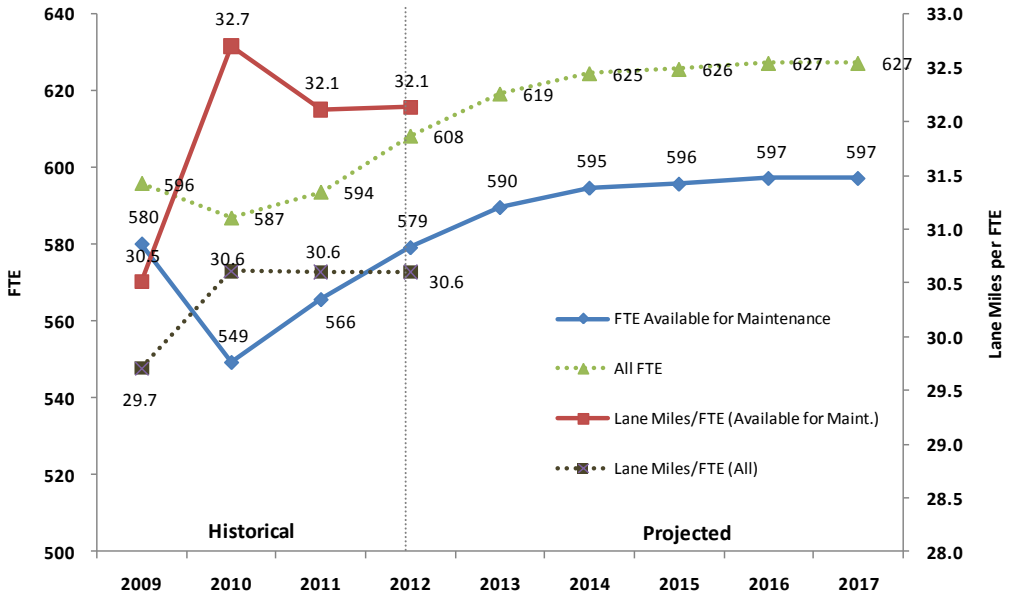
[11] According to the STIP, projects totaling 1,027 lane miles have been approved through year 2017. However, according to UDOT staff, the STIP may not accurately reflect the entirety of work to be performed over that period. For purposes of this analysis, only those projects approved in the STIP were considered when estimating future growth.

[12] Numbers derived from "Utah Maintenance Trends" presentation provided to Parsons Brinckerhoff by UDOT on October 2, 2012. 2003 FTE numbers provided by UDOT were reduced by 4.63%, the average percentage of maintenance employees used for construction inspection based on data provided by UDOT.

[13] Derived from data in e-mail from Rukhsana Lindsey received 30 April 2013.

FTEs (597 FTEs total) above 2012 levels to keep up with the increased maintenance workload. Figure 2 demonstrates the historical and projected maintenance FTEs required to complete work over the UDOT system from 2009 to 2017 as well as historical lane miles per FTE.

Figure 2. Historical and Projected Demand for Full-Time Employees



Source: UDOT, Parsons Brinckerhoff analysis

The above figure includes two sets of data: "FTE" and "Lane Miles/FTE" represent estimates based on maintenance-only employees, adjusted to remove maintenance employees that perform construction inspection; categories labeled "constructional FTEs include this labor. Based on discussions with UDOT, it was determined that estimates *not* including construction inspection most accurately represent total maintenance FTE.

It is reasonable to assume that an increase in lane miles might not necessarily require an increase in staffing levels; a DOT should consider leveraging materials, equipment and manpower more efficiently. Therefore, Figure 2 may reasonably be able to show an increase in lane miles per FTE while still improving LOS. However, as demonstrated by eCallogy Corporation's polling, UDOT's decreased staffing levels and increased lane miles have resulted in an overall decline in LOS, decreasing by nearly 5 percent according to UDOT's Maintenance Management Quality Assurance (MMQA) system.[14]

The analysis above demonstrates the need for UDOT to explore outside options for meeting its growing maintenance demands; namely, how can UDOT most efficiently replace the anticipated 18 additional FTE required by its growing system while not

[14] "Utah Maintenance Trends" presentation provided to Parsons Brinckerhoff by UDOT on October 2, 2012.

significantly increasing budget capacity? The specific issues examined to solve the problem statement are outlined in the following section.

C. Organization

The remainder of this report is organized into the following sections:

- **Section II. Industry Experience with Maintenance Contracting - Implications for UDOT.** This section presents the results of a review of the literature, interviews with agencies that have pursued performance-based maintenance contracting, and interviews with maintenance contractors.

- **Section III. Performance-based Maintenance Pilot Options.** This section details the scale and potential business impact from conducting a performance-based maintenance pilot contract. The results from lessons learned in other states are applied to describe to options for a pilot performance-based maintenance contract. These are options that would maximize the likelihood of success and business benefits to Utah, based on experience from other DOTs with maintenance contracting and Parsons Brinckerhoff's industry knowledge.
- **Section IV. Performance-based Contracting Tool.** This section provides explanation and guidance to UDOT on a performance-based contracting tool that was developed in excel for screening maintenance contracting options.

II. Industry Experience with Maintenance Contracting – Implications for UDOT

This section presents the results from:

- A series of in depth interviews with both owners and contractors that have been engaged in performance-based maintenance contracting in North America. This data source was supplemented by interviews with the contractors responsible for maintenance and asset management in the M25 Connect Plus Consortium who are responsible for a multi-year performance based maintenance contract in the United Kingdom.
- Literature review of papers, research reports, and presentations addressing maintenance contracting.

A. Lessons Learned from Other States and Canada

The majority of the states and provinces in North America—and in particular the eight states and provinces interviewed by Parsons Brinckerhoff with performance-based contracting experience—proceeded with maintenance contracting through an incremental process that started with task order, unit-price contracts and evolved to performance-based maintenance contracting. For performance-based contracting, the interviewees' practice has involved from single-activity contracting such as bridge painting through to contracting for multiple activities.

The evolution has occurred as state DOTs, pursuing performance-based contracts, have learned that greater efficiencies could be gained when procuring fewer contracts with bundled services rather than issuing a high volume of single-activity contracts. The following overall trends were identified by interviewees as their agencies have moved from unit-price to performance-based maintenance contracting:

- Contract duration has generally grown as maintenance programs mature.
- Agencies have had success with both single-activity and multi-activity contracts.
- Agencies differ in their opinions on whether activities such as emergency response and snow and ice control are managed more effectively in-house than by a private contractor.
- Starting small and learning by doing is reported as key. Interviewees reported as a starting point; implementing a pilot project with a low contract amount, limited

geography and short duration. Several DOTs have contracted for as few as 100 lane miles.

The interview results indicate that the success factors for state departments of transportation embarking on performance-based maintenance contracting fall into the following categories:

- **Staged approach over many years**

  Performance-based contracting is a significant procedural and cultural change. In the most mature markets such as Canada and the United Kingdom, the large-scale successful adoption of this type of contracting has taken 15 to 20 years.[15] It requires culture change and new ways of risk sharing. Typically, agencies have started with unit-price contracting, pursuing shorter-duration performance-based contracts and then longer-term contracts.

- **Contract size, duration and value for money**

  Contracts are more effective when multiple activities are bundled together (for example, mowing and vegetation control, winter maintenance, and pavement-related work), over large geographies (at least 100 center line miles), with a sufficient duration (10 years and over).[16] This experience indicates that drivers for the owner to yield value for money are i) the economies of scale a larger geographic area allows and ii) the ability of the contractor to develop asset knowledge over a longer performance period. These two factors combined with the risk transfer inherent in a performance-based contract, drive the owner's value for money. Contractors further report that the bundling of activities and the longer performance period enables them to apply an asset management perspective which reduces cost and the ability to manage work across multiple activities to improve productivity.[17]

  Under a performance-based maintenance regime, with longer-term duration, the contractor is incentivized to be efficient. Input from contractors indicates that their efficiencies arise from application of best management practices, ability to stick to the maintenance plan, and ability to apply flexible and new practices. The potential business benefits for the owner increase with longer-term contracts because this can result in more asset management incentives, and the contractors can implement new or improved practices and have a pay back.

- **Procurement**

  Owners go through a learning process in developing contract terms and managing the procurement process. There is an established body of knowledge and practice

[15] Interviews with Ontario Ministry of Transportation and British Columbia Ministry of Transportation. April – May 2012.

[16] Interviews with multiple state DOTs.

[17] Interviews with Infrastructure Corporation of America and multiple state DOTs.

for this type of procurement particularly around the risk transfer. Applying this is important to ensure value for money by understanding how the procurement process and contract provisions can impact how risk is understood by prospective bidders.

Contracts should establish clear and specific guidelines for each activity, penalties for noncompliance, and considerations for ownership of assets and risk sharing. Among the considerations that warrant discussion with the industry in the procurement process are the use by contractors of state facilities for staging and storing equipment and materials. Other considerations include the potential for contractors to lease or purchasing the DOT's specialized equipment. These considerations can reduce the redundancy between state owned facilities and equipment and those used by the contractor for area-based contracts.

- **Level of Service and performance monitoring**

  The owner must fully understand the level of service it is achieving in-house in order to provide a contractor's benchmark. This can involve additional work to develop a quantitative level of service baseline.[18] UDOT's MMQA process and measurements can provide a good starting point for this; however, dialogue is required with the industry around their perceptions of the risk associated with using the current measurement process. Experience elsewhere indicates that providing the measured performance baseline against which the contract performance is evaluated can often require considerable work to accomplish. Similarly, to manage risk transfer, contractors will require baseline information to assess their risk and price accordingly. Some state DOT's reported that their contractual performance was based on a higher level of service than the prior level. This is because it would not have been acceptable to customers and policy-makers for the state DOT to contract for the prior level of service.

- **Costs and Business Benefit**

  Achieving economies of scale and duration are the largest factors in producing positive business benefits for state DOTs. This is because the longer performance period affects how risk is priced. Dialogue with industry indicates that it is through risk transfer that performance-based contracts ultimately yield the best long-term benefits for government. Such transfer occurs by definition in performance-based contracts. The value for the owner appears to be tied to risk transfer and contractually agreed LOS for a specific budget. The longer performance period enables the contractor to develop asset knowledge and apply that over subsequent years. Put another way the learning costs are distributed across more years and so are less as a proportion of the contract.

[18] Interviews with Tennessee Department of Transportation and Florida Department of Transportation. May 2012.

How the contract is structured, especially duration and location, (discussed above) impacts how contractors can yield efficiency and price their bids. For a longer-term contractor, vendors can invest in their own local infrastructure, efficiently use their own equipment, hire more local staff, and amortize expenses; this should also result in lower bids.[19]

- **Quantitative evidence on what drives efficiencies and cost savings**

  There is no definitive evidence on the cost savings from experience in the United States. This is because there is little data and where there is, it is not an apples-to-apples comparison. None of the interviewees had data on systematic before and after costs for comparable work. However, Ontario, Canada—with a mature performance-based maintenance program—is very satisfied with their program and believes it serves their taxpayers well. Some agencies claim cost savings upwards of 20% while others claim that outsourcing maintenance achieves no measurable cost savings.[20] Fact-finding interviews corroborate that there is little before and after data from which to assess cost savings.

- **Staff and organization**

  For state departments of transportation (DOTs) to administer performance-based contracts requires cultural and managerial change to forge new working relationships. This is a perspective shared by both owners and contractors. Keys to success are open communication between the DOT and its management and staff, as well as between the DOT and its contractor(s). While the contract specifies performance requirements, success requires collaboration and sharing of asset knowledge with the owner and contractor working together.

  Agencies with a fully outsourced program report that they have reduced staffing levels by as much as 90% while maintaining level of service. Again they have no data on the relative costs between contracting and self-performing maintenance work

- **Transition costs**

  Transition costs include; 1) developing and implementing the procurement process and 2) the redeployment of staff to new locations and the training of staff for new roles in contract management. These costs should be factored in to the total cost of performance based contracting. It is important to note that these costs need to be budgeted for and will be incurred prior to the maintenance contracting over a relatively short period of time compared to a 10 year performance period. Interview results provide little guidance on order of magnitude costs, Parsons Brinckerhoff extrapolating from experience with the maintenance and operations

[19] Interviews with Infrastructure Corporation of America and Ontario Ministry of Transportation.

[20] Hyman, William. "NCHRP Synthesis 389: Performance-Based Contracting for Maintenance," Transportation Research Board. Washington, D.C. 2009

portions of P3 procurement support, provides as an indicative estimate that UDOT should expect to incur between $600,000 and $1.1 million in labor and professional services support in implementing an initial contract. This is indicative and would be dependent on the extent of advisory support in developing procurement documents, the approach to establishing the performance baseline, and training and repositioning of UDOT staff in support of a procurement.

Overall, the DOT should consider the following costs that may be incurred by transportation agencies when shifting to a performance-based maintenance contracting program[21]:

- Labor force transition costs if applicable
- Training and/or continuing education for former maintenance staff taking on new roles
- Due diligence, feasibility studies
- Procurement costs
- Liquidation of business units and/or assets no longer in use
- Personnel costs if hiring new management to oversee contracted maintenance
- "Mothballing," or preservation of facilities and equipment that will be retained for future use
- Establishment of a quality assurance system and performance guidelines
- Termination of current contracts for materials, facilities and equipment
- Insurance

The total cost of the above activities varies widely from state-to-state, and interviews did not identify any systematic quantification of the full costs associated with a transition. When asked about the transition's effect on an agency's budget, the agencies interviewed reported overall the net costs are small when compared to overall maintenance and administrative costs.[22] This estimate includes the items listed above in addition to any items that may be unique to a given state or agency.

Where significant costs are incurred, most agencies contacted stressed the fact that cost recovery is highly feasible. Some agencies have successfully recouped costs by selling, leasing, or auctioning unused heavy equipment and/or facilities.

- **On-going management requirements and associated costs**

[21] Interviews with multiple state DOTs.

[22] Interviews with Florida Turnpike and British Columbia Ministry of Transportation, 22 February 2013.

Interview results found that for those with performance-based maintenance contracts actual staffing levels, competencies required, work activities, and overall budget varied. Information collected from other agencies provides some general orders of magnitude information on on-going costs. Of note is that these agencies do not have systematic data on these costs. Ball park estimates provided in telephone interviews ranged from 1% of prior staffing levels to 5% and in one case 10% of original FTE for contract management and maintenance quality assurance oversight. Interviews found the following standard roles and work activities that make up on-going costs of managing performance-based maintenance contracts.

- **Contract management**

  All agencies contacted have retained administrative staff tasked with contract accounting, invoicing, payments, procurement, and maintaining performance and LOS measures.

- **Maintenance management and oversight**

  Nearly all agencies interviewed have retained staff to manage the day-to-day maintenance operations through routine quality inspections, liaise with the contractor, and ensure performance standards are met.

- **Training and development**

  Owners have retained staff to act as experts on any unique or specialized routes, maintenance activities, or equipment to be used or maintained by the contractor. This staff would be used to train contractors on an as-needed basis.

- **Equipment and materials procurement**

  For contracts such as those used by Harris County Toll Road Authority (HCTRA) where the owner provides materials to the contractor, the agency must retain staff to procure, oversee and maintain agency-owned materials and equipment and support its use by the contractor.

- **Incident management/emergency management**

  Several agencies contacted expressed the importance of retaining limited maintenance staff to handle unplanned maintenance events that lie outside terms of the contract.

The level of staffing required to perform the above activities varies by factors unique to the contract, including geography, size of district, maintenance activities involved, and size of the contractor's workforce. The agencies interviewed reported that after transitioning from in-house maintenance to strictly program management, staffing requirements

dropped by 85 to 95 percent; on average only one employee is needed to handle contract management and administration for every ten that performed the maintenance work.[23]

Finally, it should be noted that the learning curve for in-house management and oversight of contracts has to be climbed. As contract parameters change and both contractors and DOTs become more efficient, some roles change or become redundant and/or unnecessary.

B. Literature Review Results – Overview of Maintenance Contracting in North America

The fundamental conclusions from review of literature are that:

- The majority of maintenance contracting in the United States has been unit price.
- There is no definitive empirical data on the relative costs of owner performed versus contracted maintenance

1. History and Experience of Highway Maintenance Contracting

State DOTs and provinces throughout North America have outsourced highway maintenance for several decades, and much focus has been paid to best maintenance practices over the last 20 years. The vast majority of which has been unit price–based contracts.

The extent to which DOTs outsource highway maintenance varies greatly by state. As of 2002 (the last date a complete national survey was conducted), 21 out of 38 states surveyed in NCHRP Synthesis 313 had outsourced some portion of highway maintenance with varying degrees of success. Twelve states did not provide data to this study, though some of them do outsource highway maintenance, including Florida, Virginia, and South Carolina[24]; however, information on these states, as well as the Canadian provinces of Ontario and British Columbia, are included in this report through primary research.

Many factors motivate states to outsource a portion of their maintenance. Some of the primary motivations agreed upon across states include:

- Lack of resources
- Lack of specific skills or expertise

[23] Interviews with multiple transportation agencies.

[24] Warne, Thomas. "State DOT Outsourcing and Private-Sector Utilization," NCHRP Synthesis 313.Tansportation Research Board. Washington, D.C. 2003. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_313.pdf

- Schedule constraints
- Budget constraints

Figure 3 uses data from the NCHRP Synthesis 313 to show a considerable degree of homogeneity across states that outsourced maintenance activity. The study concluded that the two primary reasons for outsourcing maintenance activities are specialty skills or equipment and staff constraints.

Figure 3. States Outsourcing Maintenance Activities

State	Roadway Surface	Roadside	Drainage	Bridges	Traffic Signals	Traffic Signs
Arizona	Y	Y	N	N	Y	N
Connecticut	Y	Y	Y	Y	Y	N
Delaware	Y	Y	Y	Y	N	N
Dist. Of Columbia	-	Y	-	Y	-	-
Florida*	-	-	-	-	-	-
Illinois	Y	Y	Y	Y	Y	Y
Indiana	Y	Y	Y	Y	Y	N
Iowa	Y	Y	Y	Y	N	Y
Kansas	-	Y	N	Y	N	N
Massachusetts	-	Y	-	-	-	-
Michigan	-	-	-	-	Y	-
Mississippi	Y	Y	N	Y	-	-
Missouri	Y	Y	Y	Y	N	-
Montana	Y	Y	Y	Y	Y	N
Ontario*	-	-	-	-	-	-
Oregon	Y	Y	Y	Y	Y	Y
Rhode Island	Y	Y	Y	Y	N	N
South Carolina*	-	-	-	-	-	-
Tennessee	Y	Y	Y	Y	Y	Y
Texas	Y	Y	Y	Y	Y	Y
Utah	Y	Y	Y	Y	N	Y
Vermont	Y	Y	Y	N	Y	N
Virginia*	Y	Y	Y	Y	Y	Y
Washington	Y	N	N	Y	N	N
West Virginia	Y	Y	Y	Y	Y	-

* Denotes jurisdiction interviewed by Parsons Brinckerhoff and not included in NCHRP Synthesis 313

Of the states that responded to the survey, nearly all of them outsource Roadway Surfacing, Roadside, Drainage, and Bridge maintenance. Relatively few DOTs outsource Traffic Signal and Traffic Sign maintenance.

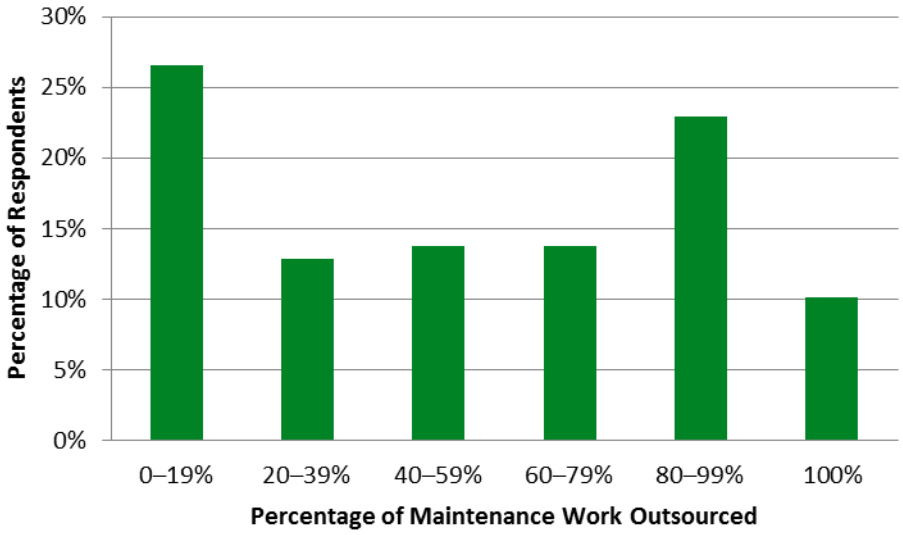
Furthermore, a DOT in one state may choose to outsource very different services than a DOT in another state, with varying levels of associated costs. The percentage of work outsourced varies from activity to activity, with roadway surface in the 80% to 99% range and drainage, traffic signals, and traffic signs in the 0% to 19% range. Additionally, annual

payments to contractors also varied considerably, from drainage, showing a $0 to $99,000 annual amount, to roadway surface, with an amount of more than $10 million.[25]

2. Amount of Maintenance Outsourced

The amount of work that the DOTs outsource varies greatly between states. Figure 4 displays the percentage of maintenance activities that were outsourced across the states.[26]

Figure 4. Percentage of Maintenance Outsourced



3. Approach to Contracting

While the data provided above does not distinguish between types of contract, unit-price contracts remain the standard method of outsourcing highway maintenance activity throughout most of North America. Having gained experience with unit-price contracting, some DOTs are moving toward performance-based contracting through which they seek to benefit from risk transfer, longer-term contracts, innovative services, and from economies of scale in total maintenance contracting.

25 Warne, Thomas. "State DOT Outsourcing and Private-Sector Utilization," NCHRP Synthesis 313.Tansportation Research Board. Washington, D.C. 2003. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_313.pdf

26 Warne, Thomas. "State DOT Outsourcing and Private-Sector Utilization," NCHRP Synthesis 313.Tansportation Research Board. Washington, D.C. 2003. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_313.pdf

The application of performance-based contracting, although growing, is not widespread and it is likely that unit-price contracts will continue to be used as the predominant contracting method in many states. The following are some of the benefits states cited from unit-price contracts:

- Shorter procurement process
- Larger pool of bidders
- Only looking to contract a single activity or single region
- Retention of owner control and flexibility

III. Performance-Based Maintenance Pilot Options

This section details the scale and potential business impact from conducting a performance-based maintenance pilot contract. The results from lessons learned in other states are applied to develop two illustrative options for a pilot performance-based maintenance contract. These are options that would maximize the likelihood of success and business benefits to Utah, based on experience from other DOTs and Canadian Provinces that have experience with performance-based maintenance contracting and Parsons Brinckerhoff's industry knowledge. The options demonstrate the validity of pursuing a performance based maintenance pilot in Utah.

A. Approach to Identification of Pilot Options

The results from the best practices analysis detailed in Section II provide the basis for the high-level identification and design of options for UDOT to pilot a performance-based maintenance contract. These results provide the following guidance for structuring a performance-based maintenance pilot contract:

- Contract for a single area or territory as a "pilot project" from which to develop experience with performance-based maintenance practice.
- Implement on a scale that includes the number of lane miles and multiple maintenance activities identified as resulting in a successful procurement.
- Design the pilot to allow UDOT to evaluate the business benefits that are realized in practice and ensure that performance-based contracting is a good public policy decision for Utah tax payers.

In this way the pilot options are developed to reduce risk and maximize the potential for beneficial risk to UDOT for each of the factors identified in the screening tool detailed in the following section.

A further objective is to understand the UDOT—labor and materials that can be redeployed if a performance-based maintenance contract is implemented. This provides perspective on resources then available to help accomplish maintenance level of service targets for the balance of the system given the forecast growth in the highway system and the resulting maintenance work required.

Because contracts will result from a competitive procurement, it is not possible to determine the net savings (or net cost) in advance. However, it is possible to determine the net resources—that is, the value of work in terms of overall budget and employees that would be necessary to conduct the maintenance in-house. These are the resources minus

those required for managing a contract that would be available. This also provides the starting point for a baseline cost comparison for a future contract.

1. Options

Following discussions between UDOT and Parsons Brinckerhoff, two different regions within UDOT's jurisdiction were identified as viable pilot project options. They both provide sufficient scale to result in industry participation and to accomplish the UDOT objective of reallocating labor to maintain maintenance LOS elsewhere. The options are:

- **Interstate Territory (I-15, I-215, and I-80)**
- Not accounting for any Orange Book work, a pilot in the interstate territory (I-15, I-215, and I-80) would cover approximately an annual amount of $3.45 million of currently budgeted expenditures and free up 63,000 man-hours of labor annual. Actual dollar terms of the contract are based on negotiations and/or a competitive bidding process, and as such are not included in this analysis.**The Saratoga and South Valley Territory**

  Not accounting for any Orange Book work, a pilot in the Saratoga and South Valley territory would cover about $1.17 million annually of currently budgeted maintenance activities and free up 23,000 man-hours annually.

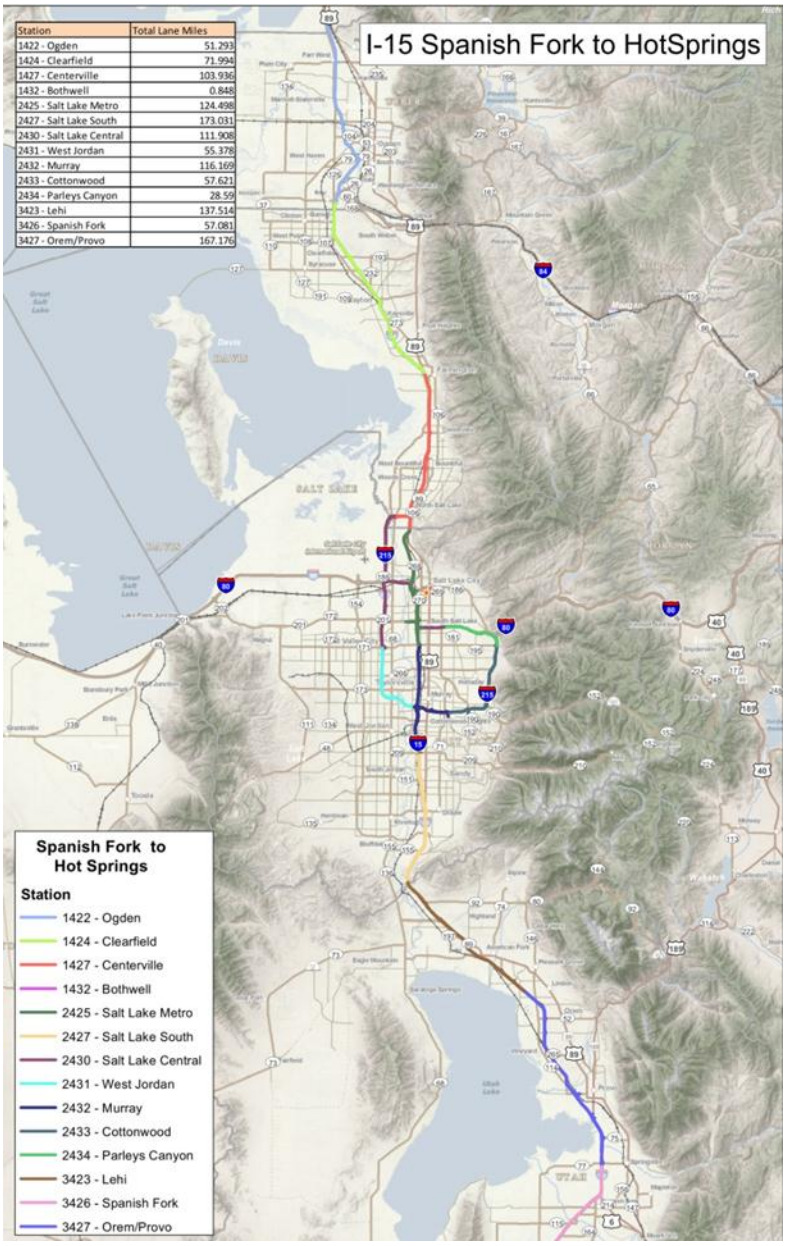
a. Option 1. Interstate Territory I-15, I-215 and I-80

This area consists of portions of I-15, I-215 and I-80. It is 376 center miles and 1,250 total lane miles. Analysis indicates that this option is at a scale that is most favorable for successful contracting. Successful contracting would free up enough UDOT personnel to perform the maintenance required on the growing system assuming continued increases in performance productivity. This option is not coterminous with maintenance stations but focuses on the Interstate. This may increase the complexity for UDOT management of reassigning forces.

A map of the three-interstate region can be found below in

Figure 5.

Figure 5. Map of Interstate Region



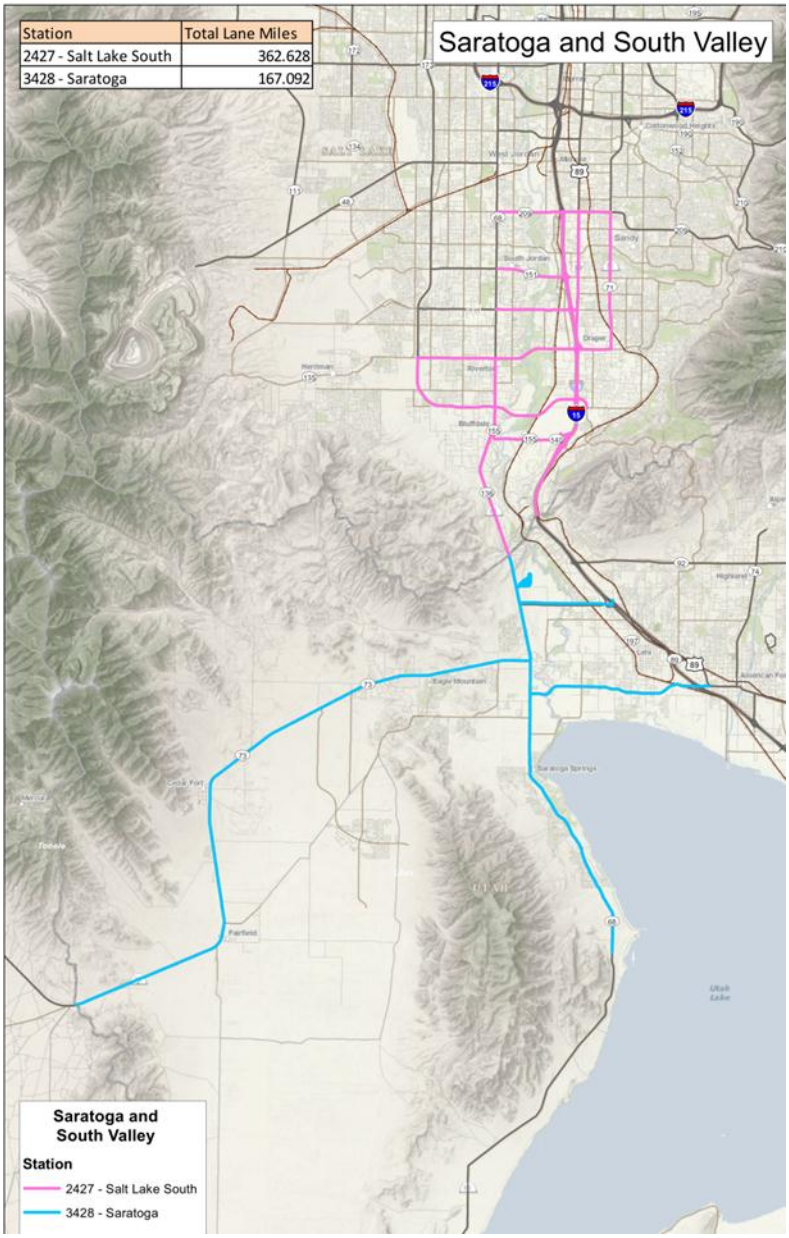
Source: UDOT

b. Option 2. Saratoga and South Valley territory maintenance stations

This pilot option consists of portions of all lane miles under the jurisdiction of the Saratoga and South Valley maintenance stations, consists of 145 center line miles and 530 total lane miles. This pilot is smaller in scale than Pilot Option 1; however, it does meet the scale that allows for effective contracting. It is also coterminous with the maintenance stations.

A map of the Saratoga and South Valley region is presented in Figure 6.

Figure 6. Map of Saratoga and South Valley Region



Source: UDOT

Pilot Option 2 was chosen as an alternative, but not a lesser way of compartmentalizing regions within UDOT's network in order to outsource maintenance. The total 145 center miles are on the lower end of what is considered desirable, and provides a more cautious alternative to the larger-scale interstate scenario.

B. Maintenance Resources Available to be Redeployed

The pilot options were analyzed to identify the baseline UDOT maintenance resources currently applied in each of the option areas so that the resources available to be redeployed can be assessed. Two analyses were conducted to identify the total baseline direct costs taken out of the annual maintenance budget, and FTEs available for reallocation, expected under a performance-based contract.

- First, the gross labor hours and total budget if contracting for all maintenance activities based on three-year average annual expenditures (FY 2010 through 2012)
- Second, the labor hours and budget to complete for the four major maintenance activities analyzed under unit price contracts chemical vegetation control, mowing, sweeping, and pavement marking.

The results for each are discussed in turn:

1. Option 1. Interstate Territory I-15, I-215 and I-80

a. All maintenance activities

Using data from OMS the total gross labor hours and budget available to be redeployed are presented in Figure 7. This analysis considers the anticipated annual and 10-year labor hours and budget to complete all maintenance activities currently budgeted through OMS within the interstate region. These figures represent an approximation of total baseline direct costs that would be available to be redeployed.

Figure 7. Expected In-House Lane Miles, Man-Hours and Budget ($millions) for Region

Route	Mile Posts	Total Center Line Miles	Total Lane Miles	Labor Hours	Annual Budget	10-year Exp.
I-15	253 - 353	287	975	47,000	$ 2.40	$ 24.00
I-215	0 - 29	76	236	13,000	$ 0.89	$ 8.90
I-80	117 - 127	13	47	3,000	$ 0.16	$ 1.60
Total		**376**	**1,258**	**63,000**	**$ 3.45**	**$ 34.50**

Source: UDOT OMS, Parsons Brinckerhoff analysis

This option covers multiple stations and a net estimate for resources freed up would account for on-going contracting management-related work required by the contract. Further analysis would be required to determine whether this includes labor that is currently directly charged to maintenance activities or whether it is from an overhead activity. Regardless, interviews conducted with other agencies that have performance based contracting experience indicate that this involves duties such as contract accounting and financial management, managerial positions for conducting field inspections of maintenance work and quality assessment, facilities, equipment and materials procurement and maintenance (if not included in the contract), and in some cases emergency maintenance.

If this option is pursued, value-for-money analysis and other maintenance planning and budgeting will need to consider that existing equipment and facilities in this territory would still be required by UDOT to perform maintenance off the Interstate System, as would other overhead activities. If the work load does not increase this may increase the overhead and/or decrease the productivity of the facilities. This is because the amount of lane miles and/or maintenance work performed using the fixed plant (facilities) decreases; however, equipment is mobile and could be available for redeployment. These considerations, along with application of overhead, would need to be considered when comparing bid prices from contractors in a competitive bidding environment in which all maintenance activities are being outsourced.

b. Orange Book Work

Experience in mature performance-based maintenance markets indicates that risk transfer is better managed and more favorable prices are secured when pavement seal coats and similar preservation treatments, like those in the Orange Book, are bundled with maintenance activities in longer term contracts. This provides a balance in seasonality of work and an economy of scale. It also, in longer term contracts, allows for coordination and efficiency between maintenance activities in the accomplishment of contractual performance targets. In the Interstate area examined in this study, Orange Book work has accounted for $9.4 million in total value in the period FY 2010 through 2012, or an average of $3.1 million per year.[27]

Incorporating Orange Book projects would require a move to a performance based specification and some change in practices. Therefore, while the business benefits of integration are identified, UDOT may only wish to consider incorporating this as part of an option second year phase of a pilot contract. The likely approach would be to specify the dollar value of work to be performed in the contract area over the 5 years.

c. Selected four maintenance activities

Figure 8 reports the anticipated annual and 10-year labor hours and budget to complete the four maintenance activities analyzed under unit price contracts - chemical vegetation control, mowing, sweeping, and pavement earlier in this report. These figures represent an approximation of total direct costs for which to compare offers from contractors in a competitive bidding environment in which only these four maintenance activities are being outsourced.

[27] Orange Book data provided by UDOT

Figure 8. Expected In-House Man-Hours and Budget for Major Activities within Region

Activity	Labor Hours	Annual Budget	10-Year Exp.
Chemical Vegetation Control	1,716	$124,105	$1,241,055
Mowing	1,122	$59,706	$597,057
Sweeping	7,524	$384,260	$3,842,598
Pavement Striping	187	$30,731	$307,307
Total	**10,549**	**$598,802**	**$5,988,017**

Source: UDOT OMS, Parsons Brinckerhoff analysis

It should be noted that the total costs are not net any additional overhead costs that UDOT would incur for contract management, procurement, or oversight.

2. Saratoga and South Valley Territory Maintenance Stations

a. All maintenance activities

Using data from OMS the total gross labor hours and budget available to be redeployed are presented in Figure 9. This analysis considers the anticipated annual and 10-year labor hours and budget to complete all maintenance activities currently budgeted through OMS within the Saratoga and South Valley region. These figures represent an approximation of total baseline direct costs that would be available to be redeployed.

Figure 9. Expected In-House Lane Miles, Man-Hours and Budget for Region

Route	Total Center Line Miles	Total Lane Miles	Labor Hours	Annual Budget	10-year Exp.
Saratoga	46	149	7,000	$ 0.35	$ 3.50
South Valley	99	380	16,000	$ 0.82	$ 8.20
Total	**145**	**529**	**23,000**	**$ 1.17**	**$ 11.70**

Source: UDOT OMS, Parsons Brinckerhoff analysis

This option covers all the work performed from these stations. A contracting approach could include use of the facilities and equipment. A net estimate for resources freed up would account for on-going contracting management-related work required by the contract. Further analysis would be required to determine whether this includes labor that is currently directly charged to maintenance activities or whether it is from an overhead

activity. Regardless, interviewees conducted with other states that have performance based contracting experience indicates that this involves duties such as contract accounting and financial management, managerial positions for conducting field inspections of maintenance work and quality assessment, facilities, equipment and materials procurement and maintenance (if not included in the contract), and in some cases emergency maintenance.

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Incorporating Orange Book projects would require a move to a performance based specification and some change in practices. Therefore, while the business benefits of integration are identified, UDOT may only wish to consider incorporating this as part of an option second year phase of a pilot contract.

c. Selected four maintenance activities

Figure 10, reports the anticipated annual and 10-year labor hours and budget to complete the four maintenance activities analyzed under unit price contracts - chemical vegetation control, mowing, sweeping, and pavement earlier in this report. These figures represent an approximation of total direct costs for which to compare offers from contractors in a competitive bidding environment in which only these four maintenance activities are being outsourced.

Figure 10. Expected In-House Man-Hours and Budget for Major Activities within Region

Activity	Labor Hours	Annual Budget	10-year Exp.
Chemical Vegitation Control	402	$ 19,000	$ 190,000
Mowing	178	$ 7,000	$ 70,000
Sweeping	2,072	$ 111,000	$ 1,110,000
Pavement Striping	*No data reported*		
Total	**2,652**	**$ 137,000**	**$ 1,370,000**

Source: UDOT OMS, Parsons Brinckerhoff analysis

C. Implementation Considerations for a Pilot Project

Implementation requires a managed process through which UDOT establishes a team to develop contractual documents and lead the competitive procurement process. Following lists the implementation steps:

- Conduct industry outreach and dialogue as input into procurement strategy and contract structuring
- Establish the procurement process strategy (e.g. one step v. two step procurement), risk and responsibility allocation, evaluation and selection process and criteria
- Develop an optional Request for Qualification (RFQ) and a Request for Proposal (RFP) comprising the instructions to proposers, commercial terms and performance-based technical specifications including: baseline, performance standards, monitoring process, and if applicable hand back requirements
- Conduct the competitive procurement process including issuance of the draft and RFQ and RFP, potential one-on-one meetings with proposers, evaluation of the statements of qualifications and bids, and selection of the preferred bidder
- Award and execute the contract
- Transition UDOT staff to manage and oversee contract provisions.

These implementation steps front load the management and administrative costs required for the procurement. This creates the requirement for a budget to prepare for and conduct the procurement in addition to the on-going oversight and management.

An important consideration for UDOT is to ensure that performance-based contracting is a good policy decision for Utah. Therefore, built into an implementation pilot should be a monitoring and evaluation of the actual costs for accomplishing the level of service secured through the contract over the performance period and comparing these to UDOT's cost. This should account for actuall on-going management and oversight requirements.

The following are necessary considerations to be addressed in applying the options detailed above. For each consideration the implications from the study research are highlighted.

1. Contract Structuring

- UDOT will need to balance learning by doing through smaller pilot projects with national experience that indicates that there are cost advantages when contracts are longer and include most activities.

  Recommendation: Contract for at least 5 years with an option to renew for a further 5 years.

- Mature performance-based maintenance contracts typically include at least 100 center line miles (or 400 lane miles), are 10-plus years in duration (including extensions), and include bundled services.

  Recommendation: Both options meet scale requirements

- UDOT will need to consider how to share risk, such as for materials, or how to respond in the event of a legislative action to reduce budget in the middle of a multi-year contract.

  Recommendation: This is a contractual detail which should be addressed if UDOT proceeds with the contract. Considerations to include address commodity prices, or caps on volumes of winter work. A related consideration is whether the state purchases materials such as salt reduce savings.

- DOT contracts are generally more effective when they are able to bundle activities that require maintenance on a similar cycle or require the same equipment; for instance, mowing and chemical/vegetation control could be bundled into a single contract since they are related activities that can be conducted on the same maintenance cycle. Combining Orange Book work and winter maintenance can provide seasonal balance for contractors and mitigate their risks resulting in better prices.

  Recommendation: Orange Book is currently programmed and budgeted through a different business process. There is likely good value to be achieved through combining. It would require performance based specifications for Orange Book work too. To manage policy and other change-related risk, this could be incorporated into an optional 5 year extension and the approach developed in collaboration with a contractor.

2. Procurement

- Rather than simply considering which activities to include in a contract, UDOT should consider specifically which maintenance activities do not make sense for an initial procurement due to complexity and/or familiarity of the contractor.

  Recommendation: This is a contractual detail which should be addressed if UDOT proceeds with the contract. The options identified include both all activities and a sample of four. An approach to this is through dialogue with contractors around risk transfer to determine if there are some activities which should be retained by UDOT.

- Some of Utah's geography may be difficult for contractors to manage, especially in the winter months.

Recommendation: Both options address these considerations and focus where there is a larger population base and contractor/subcontractor market.

- UDOT MMQA and inventory should provide an understanding of its own system before beginning the procurement process, which will allow the contractor to gain a greater understanding of technical requirements and performance expectations from which to price a bid. Among the considerations is whether UDOT would retain ownership over materials or allow contractors to use its equipment and facilities.

  Recommendation: This is a contractual detail which should be addressed if UDOT proceeds with the contract. Engagement with the contracting industry prior to procurement will provide additional information on this. This is a consideration in selecting a pilot location.

3. Level of Service

- Consideration is required of whether MMQA needs adapting to provide the benchmark or LOS standard for maintenance contracting. For longer-duration contracts, collaborating with the contractors to establish an agreed condition baseline is beneficial.

  Recommendation: This is a contractual detail which will require further analysis. Ultimately the question is the extent to which the current MMQA measurement needs adapting for contract management. This will require dialogue with contractors because it affects risk transfer.

- Managing and communicating the new approach to customers and stakeholders accustomed to contacting region offices with maintenance issues will be necessary.

  Recommendation: This is a pilot implementation detail that will involve establishing a business process and communicating it.

4. Costs and Business Benefits

- Achieving economies of scale and duration are large factors in producing positive business benefits; bundling services, contract periods, geographies, and materials will result in more positive returns for the agency.

  Recommendation: Both options meet scale requirements

- The greatest potential for benefits arises from risk transfer in the contracting process. This incentivizes the contractors to apply management expertise and business practices that are productive.

  Recommendation: A pilot of at least 5 years in duration with an option to renew addresses this. The 5 year window also recognizes that this is a learning

experience for the owner and reduces the risk of locking into a 10 year contracts as a first performance-based contracting.

- When contracts are large enough to achieve economies of scale (according to industry contacts a minimum of five years), contractors are able to invest in their own local infrastructure, efficiently use their own equipment, hire more local staff, and amortize expenses. In turn, contractors are able to submit lower bids.

  Recommendation: Both options meet scale requirements and the duration recommendation reinforces this

- Performance-based maintenance contracting enables maintenance activities to focus on the work required to meet LOS targets efficiently, and contractors are not subject to local and stakeholder requests to perform work that is not scheduled.

  Recommendation: This is a change management and communications issue that will need to be addressed during procurement.

5. Staff and Organization

- UDOT staff will need to learn the applicable competencies and address culture change in managing a performance based contract

  Recommendation: Prior to procurement the personnel who will have management responsibility should participate in the dialogue with the contracting industry to begin to learn their perspectives and what UDOT requires to be successful

- UDOT should maintain constant, open communication with its contractor(s). Having two knowledgeable parties means that a contract can be amended more quickly when problems arise, and future contracts can more closely match an agency's needs.

  Recommendation: These types of communications should begin prior to procurement.

IV. Performance-Based Contract Screening Tool – Methodology

As part of the feasibility study a screening tool was developed for UDOT staff to when considering maintenance contracting. The tool applies the results from experience to date and is intended to be used to identify risk areas and consider mitigation.

A. Measurement of Risk in the Tool

The screening tool is organized to display and apply weights to the factors that need to be in place to reduce the owner's risk in procurement. Risk is considered here as the risk to UDOT securing a good deal – that is value for money.

Both asset owners and contractors measure decisions (and financial implications associated with them) based on risk. The greater the risk retained by the owner, the less it is willing to pay for a contractors services. Conversely, if a contractor is asked to assume a great deal of risk, it will seek higher compensation in turn. In determining how to structure a maintenance contract, the owner wants to maximize the likelihood that it will get a good deal and therefore will seek to reduce the risk that the procurement will result in a contract which does not provide value-for-money. The owner's interest is in reducing the risk of an outcome which costs more than self performing and/or does not maximize the benefits from a competitive procurement process. In this way the owner must balance overall risk with the amount it is prepared to spend. This tool identifies the major risks an owner faces in performance-based maintenance contracting. The owner considers each risk factor and decides whether to avoid, mitigate, or accept that risk. It is designed to guide the owner in determining an appropriate level of risk it is willing to incur in a given contract. While total contract value is subject to the volatility of a bidding environment, determination of the amount of risk associated with a contract can help to ensure the owner achieves desired value-for-money.

When using the Screening Tool, the user selects a value for each of the twelve decision factors that most closely match the desired contract. As a value is selected, it is measured on a risk scale from minimum to maximum. The scales are based on national and some international experience with performance based maintenance contracts.

- **Minimum (conducive)**

  This factor contributes minimal risk to the contract, and increases the likelihood of beneficial risk from a competitive procurement. This makes the selected variable conducive to a contract resulting in positive value-for-money.

  Risk scale range: 0 to 3.9 Color on risk scale: green

- Intermediate (neutral)

  This factor contributes neutral risk, and most likely is not a significant contributor to overall contract risk; potential areas for risk mitigation still exist.

  Risk scale range: 4.0 to 7.9 *Color on risk scale:* yellow

- Maximum (revisit)

  This factor likely contributes substantial risk to the contract that could lead to fewer and/or less cost-effective bids; owner should consider mitigation measures to lower risk profile.

  Risk scale range: 8.0 to 12.0 *Color on risk scale:* red

1. Interpreting the risk output

The above risk scale is displayed along a horizontal axis next to each decision factor. Note that in some cases, selecting a different variable results in a higher or lower risk measurement, but does not affect the risk category (e.g., going from "bundled" to "single" activity increases the risk score, but both options are considered intermediate/neutral risk).

B. Explanation of Decision Factors

The Screening Tool is comprised of twelve decision factors within four categories, outlined below. These factors represent the most significant drivers of successful maintenance contracts, as outlined in the accompanying Feasibility Study for Performance-Based Maintenance Contracting.

1. Contract size and components (1st level)

These factors represent standard variables of a maintenance contract that typically have the greatest impact on overall contract risk.

a. Number of activities included

Contracting for a single activity poses only neutral risk to the owner, and moreover, most owners (including UDOT) have significant experience with unit price contracts. By increasing the number of activities included in a contract, even contracting all maintenance activities, the owner transfers to the contractor the majority of maintenance risk. At the same time, the contactor is able to mitigate its own risk and achieve greater economies of scale by utilizing its employees and equipment over a greater quantity of work.

b. Total center lane miles

The greater number of lane miles contracted, the more risk the owner is transferring to the contractor. Most mature PBC programs have achieved the greatest business benefits when contracting maintenance for over 400 center lane miles. Similarly, contractors are able to achieve the same benefits as when including multiple activities.

c. Contract duration (years)

In addition to transferring a greater amount of risk to the contractor, contracts of greater length allow the owner to understand many of its maintenance costs well in advance. In long-term contracts, contractors are able to spread their costs and risks over a longer period, amortize costs, develop greater asset knowledge, and arrange favorable deals for materials and equipment.

d. Seasonal activity

Winter maintenance in cold weather climates carries a great deal more risk than summer maintenance due to the volatility of inclement weather. Non-winter contracts carry the least amount of risk for the owner and contractor because prices are more certain. Conversely, uncertainties surrounding man-hours, materials, and upkeep of equipment during the winter months makes winter-only contracts the most risky for both parties.

e. Location of project

Roadways in more remote areas generally have decreased access to materials, equipment, and employees. Moreover, those locations are more difficult to respond to for emergency or off-hours maintenance. While these are all risk factors which the owner would generally prefer to transfer to the contractor, contractors are unable to mitigate these risks to the same extent as components 1.1 - 1.3. This inability to mitigate contractor risk means that it is less likely the owner will achieve value for money under an outsourced arrangement.

2. Contract components (2nd level)

These factors represent additional contract variables that affect the overall risk of a contract, albeit to a lesser degree than 1st level components.

a. Availability of maintenance stations for contractor use

The existence of state- or contractor-owned maintenance stations in close proximity to the contract area can act as a key mitigation measure for material and equipment risk. Transferring control of state maintenance stations to the contractor, or allowing the contractor to build/use its own stations both reduces overhead for the owner and allows more flexibility over materials and equipment for the contractor.

b. Percentage of state-owned equipment used by contractor

Allowing a contractor to use the owner's equipment is generally a neutral contract component with potential for marginal benefits. While the owner retains much of its

equipment risk and the contractor cannot amortize, in some cases the contractor may be able to reduce costs significant enough to outweigh the added owner risk on a value-for-money scale. Examples include maintenance requiring specialized equipment already owned by the state that would otherwise go unused under an outsourced program.

3. In-house

This factor is included to determine the LOS expectations for outsourced maintenance compared to maintenance conducted in-house.

a. Expected level of service relative to in-house

Increasing LOS standards for contractors compared to in-house maintenance increases risk from both a management and policy standpoint. While LOS may increase, the owner will necessarily pay a premium over what was previously budgeted. In addition, raising LOS expectations on the contractor may result decreased interest from the contracting community, in-turn decreasing the chance of achieving positive value-for-money.

4. Bidding environment

These factors represent ancillary factors outside the contract itself which can affect the overall level of contract risk.

a. Technical expertise required by contractor

Outsourcing maintenance activities that demand significant technical expertise or specialized equipment from the contractor can significantly limit the pool of qualified contractors, reducing competition and hence increasing risk. Moreover, costs for training and orientation required to maintain technical expertise generally cannot be recouped under contract, as they will either be included in the contract price, or the owner will maintain staff to provide training to the contractors.

b. Owner's contracting experience

An owner generally achieves greater business benefits and reduced risk in every generation of performance-based contract it enters. While "learning by doing" can be largely minimized through study of best practices, certain laws, policies, geographical characteristics, or other factors unique to each state or jurisdiction may only be understood once already under contract. This risk can be mitigated by the owner but there are upfront costs associated with mitigation.

c. Expected number of bidders

The greater number of bidders for a contract, the more likely it becomes that bidders will accept greater risk for a lower cost. With fewer bidders, the owner has less flexibility over which risks it transfers away to the contractor.

d. Special considerations

This category accounts for the inclusion of mitigation measures to control for risks associated with winter maintenance activities.

e. Contract provisions for winter maintenance

The extra risk incurred with maintenance during winter months can be mitigated through measures such as locked-in or lump-sum contracts for materials, or contract clauses allowing for increased payments in the event of abnormal conditions. The presence of such contract components greatly reduces the typical risks associated with winter maintenance.

C. Calculations

The process for measuring the scale of risk for each decision factor can be seen and adjusted in the "Calculations" sheet of the Screening Tool. In this sheet the user can view three sets of values:

1. Scaled Selection

This value represents the numerical equivalent of the selection made for each decision factor in the Screening Tool. Variables further to the right in the Screening Tool are associated with higher risk, and in-turn are assigned higher numerical values. These numbers are scaled depending on the number of possible options for a given decision factor; for example, a factor with only three options such as *Seasonal Activity* will encounter a greater incremental change in risk between each option. Factors with more options, such as *Total center lane miles*, experience a smaller incremental change in risk between each option.

2. R-Weight

R-Weight, or "risk weight" is a manual adjustment made to the scaled selection made by the Screening Tool. The purpose of weighting each selection is to adjust for the strength of influence of each decision factor on a contract's overall risk. Factors with a higher R-Weight generally contribute greater risk, while factors with a lower R-Weight contribute less risk. The weight given to each individual decision factor was assigned using professional estimates by Parsons Brinckerhoff based on the Feasibility Study's fact-finding process. The R-Weight may be adjusted for each factor depending on user preference.

3. Risk Score

This value is the product of the Scaled Selection multiplied by the R-Weight. Factors with the highest Risk Score represent those contributing the greatest level of risk in the

contract. Total Score is the sum of each individual Risk Score, and can be used by the user to compare various contract approaches and/or different combinations of inputs.

Appendix A: Bibliography

This appendix lists:

- Documents and literature that provide source material
- State DOT contractual documents that can provide good source material
- Agencies with whom fact finding interviews were conducted

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