FINAL REPORT

Washington State Joint Transportation Committee

EFFICIENCIES IN THE CONSTRUCTION AND OPERATION OF STATE TRANSPORTATION PROJECTS

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EXECUTIVE SUMMARY

In 2013, the Washington State Legislature directed the Joint Transportation Committee (JTC) to conduct a study to identify the major cost drivers and evaluate efficiency initiatives in the construction and operation of Washington State highway and bridge improvement and preservation projects.

The study had three primary objectives:

1. To develop a broad understanding of the costs of transportation projects and what drives these costs
2. To specifically determine whether transportation projects in Washington State cost more than in other states
3. To identify potential reforms or efficiency measures

OVERSIGHT AND DIRECTION

The study was guided by a nine member Advisory Panel and technical support was provided by a Staff Work Group. In conducting our research and analysis, we investigated a wide range of potential cost drivers and practices. Given the relatively short project timeline, we conducted an initial screening analysis to focus our efforts on the cost drivers with the greatest potential for savings and on additional areas of specific interest to the Legislature and the Advisory Panel members.

Findings of Cost Analysis

The cost analysis was designed to help the JTC understand:

- How much does the Washington State Department of Transportation (WSDOT) spend on highway and bridge construction?
- Do transportation projects cost more in Washington State than in other states?
- What are the key drivers of WSDOT's project costs?

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Representative Ed Orcutt
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Carrie Dolwick, Transportation Choices Coalition
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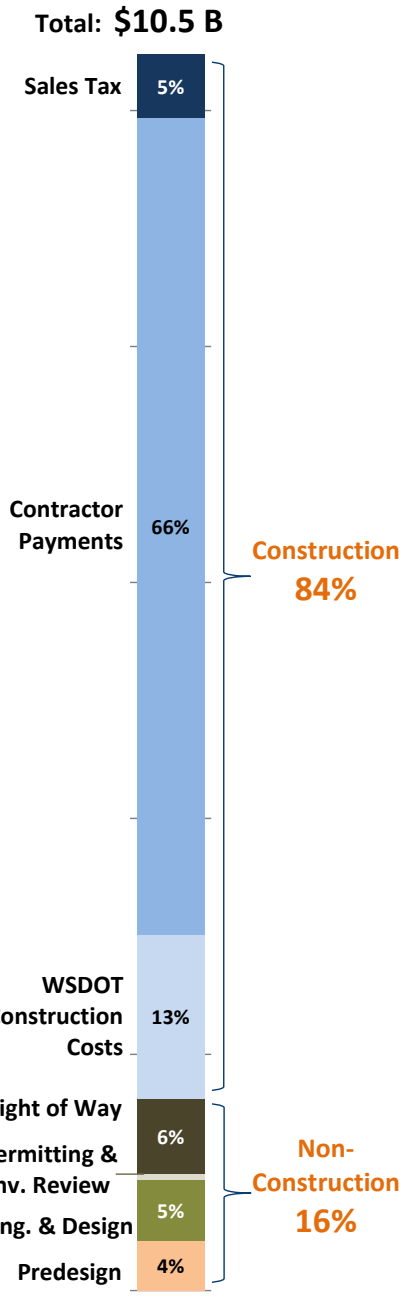
EXHIBIT 1
PROJECT COSTS BY MAJOR PROJECT PHASE, 2003-2012
(2012 $)



Source: WSDOT, 2013; and BERK, 2013

HIGHWAY AND BRIDGE CONSTRUCTION PROGRAM SPENDING

Historical project expenditures were analyzed to understand WSDOT spending on the Preservation and Improvement Programs. The analysis includes expenditures on projects completed between 2003 and 2012. All costs are presented in 2012 dollars, unless otherwise stated.

Within each Program, expenditures are categorized into project phases. The three overarching phases that WSDOT defines are:

- **Preliminary Engineering**. Includes engineering costs incurred prior to the date of construction, such as locating and designing, making surveys and maps, preparing plans, specifications and estimates, traffic counts, and other related general engineering prior to letting a contract for construction. Preliminary engineering encompasses predesign, engineering and design, environmental review, and permitting
- **Right of Way**. Includes appraisal fees, purchase of land or interest therein, and relocation assistance for persons displaced by the purchases.
- **Construction**. Includes all costs for the construction phase, such as payments to prime contractors, state force labor costs, supervision of construction activities, inspection and testing, and general project management during construction.

Costs by Expenditure Category. WSDOT spent approximately $10.5 billion on highway and bridge construction projects that were completed between 2003 and 2012. Exhibit 1 summarizes the project costs by major project phase.

Construction costs accounted for approximately 84% of total project costs:

- Contractor payments comprised 78% of construction costs, or 66% of project costs.
- 16% of construction costs (or 13% of project costs) come from WSDOT costs, which are primarily costs associated with construction and contract management, bid and award process, and inspections.
- 6% of construction costs (or 5% of project costs) comes from sales tax on construction.

Right of way comprised 6% of project costs. About three-quarters of this expense was for parcel acquisition.

Planning, predesign, design, permitting, and **environmental review** accounted for 10% of project costs.

Mitigation costs were analyzed using a set of case studies. In the sample, 16% of project costs went to mitigation, with a range among individual projects of between 2% and 45%.

Eighty-eight percent (88%) of WSDOT projects completed over the study period accounted for only 20% of expenditures. Meanwhile, projects over $25 million accounted for 3% of projects but 59% of expenditures.

At a programmatic level, this distribution suggests that opportunities for cost savings should focus on how WSDOT manages the planning, design, and delivery of large projects.

Project Delivery. The majority of construction costs are payments to construction contractors (78% of construction costs, or 66% of project costs). Given the magnitude of this expenditure area, we analyzed how well WSDOT manages and delivers its construction contracts. Data on construction contract awards and payments helps to illustrate how well WSDOT delivers projects from design to completion. Exhibit ES-1 summarizes construction contract award and expenditure data over ten years.

Exhibit ES-1
WSDOT Improvement and Presentation Program Contract Costs, 2003-12 (in year of expenditure dollars)

Contract Size	Number of Awards	Amount Awarded	Amount Paid	Difference*	% Difference
Less than $1 M	656	$289,408,293	$294,784,864	$5,376,572	2%
$1M to $5 M	487	$1,097,890,445	$1,119,652,051	$21,761,605	2%
$5M to $10M	80	$552,633,373	$578,422,918	$25,789,544	5%
$10M to $25M	67	$1,046,645,633	$1,108,441,013	$61,795,379	6%
$25M to $100M	33	$1,418,262,752	$1,550,438,468	$132,175,715	9%
$100M +	6	$1,355,417,590	$1,592,318,640	$236,901,050	17%
TOTAL	**1,329**	**$5,760,258,087**	**$6,244,057,954**	**$483,799,867**	**8%**

Source: WSDOT, 2013; and BERK, 2013.
Note: $190 M of the total difference is from the Hood Canal bridge project.

- Within the sample set of contracts, WSDOT paid approximately $484 M (8%) more than the original award amount over ten years.
- The largest variances between payments and awards were in contracts over $25 M, which accounted for nearly $369 M in payments above award.
- **Larger contracts had payments higher than awards more frequently and by a larger percentage than smaller contracts.**

COMPARISON TO OTHER STATES

A key question posed in this study is whether, and to what degree, WSDOT projects are more costly than those in other states. Given the challenges of identifying truly "comparable" projects to conduct direct project-to-project comparisons, we address this question in two ways:

- Project Cost Comparison
- Project Delivery Comparison

CONTRACT DEFINITIONS

Final Engineer's Estimate. Typically the final estimate prior to bid opening.

Award Amount. The initial amount for which WSDOT signs an agreement with the contractor to complete a project.

Final Payments or Final Expenditures. The total amount that WSDOT paid toward a contract after work is complete.

DESIGN-BUILD AT WSDOT

Design-Bid-Build WSDOT is responsible for project design and project construction is contracted out.

Design-Build is a newer method where WSDOT awards projects at an early stage of design to a contractor who is responsible for final design as well as construction.

The state Legislature authorized WSDOT to use Design-Build beginning in 2001 for projects over $10 M and a set of five pilot projects between $2 M and $10 M.

In the 2003-2012 project database, 16 contracts (approximately 1%) were contracted using Design-Build. Since Design-Build was more commonly used on large projects, such as the Tacoma Narrows Bridge, these contracts totaled about 24% of all construction contract costs (or about $1.8 B).

Overall, the analysis suggests that highway construction costs in Washington are generally in line with experiences elsewhere and that aside from charging sales tax on construction, there are no systemic or programmatic factors that would make costs in Washington higher than other states. The analysis did find that costs may vary among states due to factors outside the control of WSDOT or the Legislature, such as local labor rates, material prices, and competitiveness of bid environments.

Project-level Comparison. We reviewed two studies that compared WSDOT project costs to project costs said to be comparable in other states: *Highway Construction Costs*, WSDOT, 2004 and *Highway Capital Costs – Washington & U.S*, Bill Eager, 2013. Both studies approached the cost comparison question by selecting projects that were reasonably similar and comparing costs on a per-lane-mile basis. Comparing the conclusions where projects were common to both studies suggests that WSDOT projects are generally in line with experience elsewhere. This conclusion was reinforced when we updated the cost information where better data existed and added comparable projects.

Project Delivery. This analysis explores the relationship between estimates, awards, and payments in two other states, Oregon and Utah. The two western states were selected for different reasons: Oregon has a similar climate and is a neighbor state, while Utah is among the states that extensively use alternative contracting methods, including almost a decade of experience with General Contractor/Construction Manager (GC/CM). Oregon DOT and Utah DOT both provided data for a ten-year history of construction contracts. UDOT provided the same information as WSDOT – final engineer's estimate, award amount, and final expenditures by contract method. ODOT did not include data on engineer's estimates or on contracting method. Exhibit ES-2 summarizes the results of this analysis.

Exhibit ES-2
Project Delivery Metrics by State (2003-2012)

Metric	WSDOT	ODOT	UDOT
Difference from Estimate to Award	(9%)	-	(12%)
Difference from Award to Expenditure	8%	7%	12%
Difference from Estimate to Expenditure	(1%)	-	(2%)

Source: WSDOT, 2013; UDOT, 2013; ODOT, 2013; and BERK, 2013.

- **Overall, WSDOT's project delivery metrics do not differ significantly from those in Utah and Oregon.**
- In all three states, final contract expenditures were between 7% and 12% higher than awards.

- Utah and Washington exhibited a similar pattern of contract award amounts coming in lower than estimates (by 12% and 9%, respectively). For both states, final contract payments came in **slightly below** the final engineer's estimates as well.
- All three states experienced a pattern of large contracts coming in higher than award amounts more frequently and by a higher percentage than smaller contracts.

In general, the conclusion from the comparison with Oregon and Utah is that, at a programmatic level, bids tend to come in under project estimates (particularly Design-Bid-Build where the design is complete at the time of bidding) and that final payments exceed project awards due to a variety of factors including "traditional" contingency items. These items include unforeseen circumstances and changes in material cost, as well as other risk-related issues such as design errors or significant changes in scope. WSDOT's experience is in line with the two peer agencies reviewed.

KEY COST DRIVERS

Based on an analysis of costs within Washington State and other DOTs, we identified the following significant factors that could add costs to WSDOT projects relative to similar projects elsewhere:

1. **Project Scale**. Required and optional decisions around project design have an impact on how WSDOT builds an individual project.
2. **State-specific Regulations**. WSDOT must comply with federal and state-specific regulations, including state sales tax requirements, prevailing wage laws, and environmental laws, which can add costs to a project.
3. **Labor Costs**. Labor comprises a significant portion of construction costs and accounts for the vast majority of non-construction costs, including engineering, design, construction management, etc.
4. **Cost of Materials**. Materials account for 50% of contract costs (or about 33% of project costs), so variations here can have a substantial impact. The ability of WSDOT to effectively manage materials costs is limited.
5. **Risk Assignment**. Different project delivery methods allocate risk differently between the project owner and contractor. WSDOT's extensive use of Design-Bid-Build contracting places a significant share of project risk on the owner (WSDOT) in the event of cost over-runs.

Analysis of Key Cost Drivers

Project Scale

Project scale decisions affect project costs by governing *what* is built and *how much* is built. Project scale decisions fall into two main categories: design standards and design choices.

DESIGN STANDARDS

State and national design standards provide guidance on design decisions related to safety and mobility, such as design speed limits, vertical and horizontal design, lane width, and load bearing capacity. The American Association of State Highway and Transportation Officials (AASHTO) provide national guidance on design standards for interstate, highway, and road construction. WSDOT standards and AASHTO standards are similar.

- There are no variations that would likely result in significant differences in cost for WSDOT project construction.
- WSDOT is continually adjusting its standards to align with AASHTO and provide flexibility to project designers.

DESIGN CHOICES

DOTs make other design choices that impact project scope and fall under the discretion of the department, such as project objective, alignment, or aesthetics. These decisions can have significant impacts on project cost and effectiveness.

WSDOT's project design and delivery teams recently began incorporating elements of Practical Design (see sidebar). Recent changes include:

- **Changing frameworks for Design and Delivery**. Identifying how and where to apply flexibility in design standards, and focusing on project and program goals and outcomes from design through construction.
- **Combining Similar Projects**. Combining similar projects across the state into groups to streamline methods and create economies of scale.
- **Designing Incremental Improvements with Long-term Benefits**. Identifying how goals can be achieved through spending less money in the short-term, and ensuring money spent today can be leveraged in the future for greater benefit toward a specific goal.

WSDOT hopes its focus on Practical Design will begin to realize cost savings as projects designed and delivered under the new processes are completed. **The experience of Missouri (see sidebar) suggests the potential for significant costs savings with Practical Design.**

PRACTICAL DESIGN

Practical Design is an emerging approach to transportation system design. The purpose is to meet a state's transportation needs at a reasonable cost.

According to a 2013 Transportation Research Board report, six DOTs have adopted Practical Design Policies, including Utah and Oregon.

Given how recently Washington and other states have adopted Practical Design, the benefits of the approach are not likely to be in evidence in the historical data available.

As an example of Practical Design's potential, Missouri adopted a formal Practical Design policy in 2005 and claims to have saved approximately $400M on projects included in its 2005-2009 Statewide Transportation Improvement Program (STIP). Savings were invested in additional transportation projects.

State-specific Regulations

SALES & USE TAX

Sales & use tax paid on construction accounted for approximately 5% of 2003-2012 preservation and improvement project costs ($534M). Washington has a sales & use tax of 6.5%. Local option sales taxes can bring the effective tax rate up to 9.5% in some areas. The sales tax, along with property and business and occupation taxes, is the foundation of Washington's tax structure. The State relies on sales tax for 60% of its revenue, the highest in the nation.

An important component of the tax base is tax applied to construction labor and materials. This tax treatment extends to public and private construction activities including WSDOT projects. Revenues from the sales & use tax collected from construction contracts support the State General Fund and local government activities. Since 1971, projects on state-owned highways have been taxed to a greater degree than projects on other publicly-owned roads and highways including city, county and federal facilities.

Exhibit ES-3 shows the different treatment and cost implications of the higher burden for state-owned highways that are no longer subject to the same exemption as highways owned by other jurisdictions.

Exhibit ES-3
Summary of WSDOT Sales Tax Application

	State-owned Highways	City, County, Political Subdivision, & Federal-owned Highways
Sales & Use Tax	• Applied to full contract price • Materials that become part of structure not taxed at purchase • Materials used by contractor during construction taxed at purchase	• Not applied to full contract price • All materials taxed at purchase
State tax cost* for $1 million contract	• $71,100	• $39,000

Note: * State sales tax rate of 6.5% only. Contract assumptions: 10% consumed materials, 40% installed materials; 50% other costs.

Without this exemption, sales tax is charged based on the full contract price as with private construction activity. In addition, for materials that are consumed during construction, there is a double tax with sales tax paid at the point of purchase and again when those costs are included in the total contract billing.

As a result of this differential treatment, the state sales tax cost is approximately 82% higher for projects on state-owned highways than other public highway projects – estimated to be $71,100 per $1 million of construction versus $39,000 per $1 million of construction. The actual budget impact of this higher tax burden is even greater than stated since all of the local option sales taxes, which vary based on the location of the project, would also apply.

PREVAILING WAGE

The purpose of state prevailing wage law is to "protect workers from substandard earnings and to preserve local wage standards" (Everett Concrete Products, Inc. v. Department of Labor and Industries. Washington State Supreme Court, 1988). Prevailing wage laws require WSDOT's contractors to pay a minimum wage to each type of worker based on surveys that determine an appropriate (or prevailing) wage for the area in which a project is constructed. Both Washington and the federal government have prevailing wage laws.

State and federal prevailing wages are difficult to compare due to differences in job classifications and how prevailing wages are set. Analysis of the impact of prevailing wage requirements on cost found that:

- **Research studies are split on whether or not prevailing wage laws make projects more expensive.**
  - A 1998 JLARC Highways Audit found that 0.44% of state highway program costs could be attributed to the requirement to pay the higher of the state rate or federal rate on federal-aid projects.
  - There are no specific studies on the impact of prevailing wage vs. no prevailing wage for WSDOT projects.
  - Nationally, studies vary on the impact of prevailing wage requirements on construction costs with no agreement as to whether these laws have an impact on overall wage levels in an area.
- **Aspects of the state program add administrative burden, such as the use of a paper based survey and determining the higher of the two wages (federal or state) on federal aid projects.**
- **As a result of a series of court decisions, the state prevailing wage applies to a broader range of activities than the federal law. There have been nine rule changes since 1993, five of which amended scope of work definitions for specific work activities.**

LABOR COSTS SUBJECT TO PREVAILING WAGE

Due to data limitations it was not possible to specifically identify the labor portion of the $10.5 billion in project costs that was specifically subject to the prevailing wage law. There was no way to cross-walk Labor & Industries affidavits with specific WSDOT contracts.

Based on discussions with contractors working with WSDOT, a "typical" contract may be composed of 30% labor subject to prevailing wage, 10% labor not subject to prevailing wage, 50% materials/equipment and 10% overhead and profit.

Using these metrics, labor subject to prevailing wage is estimated at $2.1 billion (or 20%) of the $10.5 B in project costs.

- In the last ten years, federal aid projects accounted for 82% of contracts awarded and would have paid the federal prevailing wage, even if there were no state prevailing wage.
- The prevailing wage law acts as a floor on rates and may increase costs in some circumstances, though market factors likely play a greater role.

ENVIRONMENTAL REVIEW, PERMITTING & MITIGATION

- **Environmental review** is a process which aids in understanding the potential impacts of a proposed project by evaluating alternatives and identifying impacts to be analyzed in an environmental document, in accordance with the State Environmental Policy Act (SEPA) and National Environmental Policy Act (NEPA) goals and policies.
- **Permitting** is a process that provides legal authority to proceed with a project subject to commitments to address any environmental impacts.
- **Mitigation** includes actions taken to avoid, minimize or address environmental impacts.

WSDOT projects are subject to environmental review and permitting regulations from federal, state, and local agencies. For environmental review, NEPA and SEPA are the primary regulations that impact project design decisions. Current WSDOT practices reflect the implementation of recommendations from several streamlining efforts over more than a decade.

- **The vast majority of WSDOT projects are excluded from NEPA and SEPA review.** In 2011-2013, 94% of projects had a NEPA Categorical Exclusion and 84% had a Categorical Exemption from SEPA.
- Some projects require approval from both federal agencies and state or local agencies – requiring review under SEPA and NEPA. Agencies are allowed (and encouraged) to prepare and issue combined documents that meet the requirements of both. This results in one environmental submittal under NEPA and SEPA.
- **For smaller, routine projects, SEPA is more onerous than NEPA.** The SEPA checklist is more time consuming than the documentation prepared for Federal Highway NEPA Categorical Exclusions (CE). NEPA CEs have been updated many times in the past few years, whereas SEPA has not.

The environmental review process can increase public acceptance and lead to improvements/efficiencies in overall project design. However, it is worth noting that views are mixed. There are those that perceive that environmental regulations are overly burdensome, and those that believe SEPA is not stringent enough and that some impacts are not being mitigated under current law.

CONTRACT BID INFORMATION

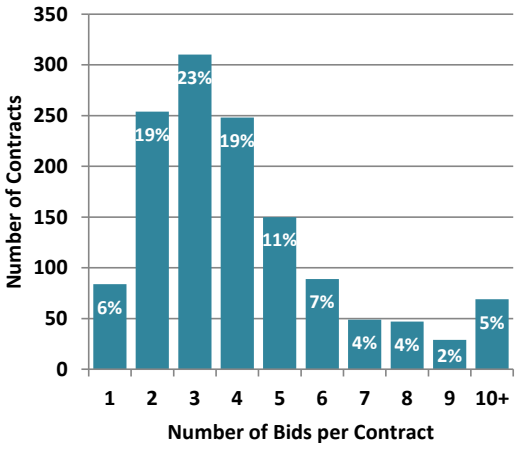
Competition for construction contracts ensures WSDOT has multiple qualified bids to choose from, and encourages contractors to submit competitive bids.

On average, WSDOT received 4.3 bids per contract over the past ten years. Contracts between $5 M and $100 M received the highest number of bids, while contracts over $100 M received an average of 2.8 bids.

Competition was fairly balanced throughout the state. While contracts in the Northwest Region received the most bids (an average of 5.0 bids per contract), all other regions still averaged between healthy bid levels of 3.7 and 4.2 bids per contract.

Exhibit ES- 4 shows the percent of WSDOT contracts that received a certain number of bids. 76% of contracts received 3 or more bids.

EXHIBIT ES- 4
CONTRACTS BY NUMBER OF BIDS
(2003-2012)



WSDOT does not track mitigation costs on individual projects, making it impossible to determine what portion of the total expenditures in our cost analysis result from mitigation-related items. The study relied on WSDOT case studies completed in 2003, 2006, 2009 and 2013 to assess mitigation costs.

Costs related to mitigation accounted for an average of 16% of total project costs for the sample projects, though on individual projects the impact ranged widely. More than half of mitigation costs were related to stormwater requirements. **Stormwater facilities, wetland mitigation and noise abatement comprised approximately 87% of mitigation costs.**

Labor Costs

Labor (wages and benefits) comprises a significant portion of construction costs and accounts for the vast majority of other costs (engineering, design, construction management, etc.). Labor costs vary widely by state.

Statewide average wage levels in Washington's construction and engineering sectors are consistent with the national average. However, there is variation among states.

- Construction labor rates vary from 23% higher (Massachusetts) to 26% lower (Idaho), excluding Alaska which has the highest construction labor rates in the US.
- Engineering labor rates vary from 23% higher (California) to 27% lower (Arkansas).

Large differences in wage rates can drive significant differences in projects, as labor comprises about 40% of contract costs, which includes labor subject to prevailing wage (30% of contract costs) and labor not subject to prevailing wage (10% of contract costs). WSDOT has little ability to influence wages, except through the use of its competitive bidding process as a way to ensure it gets reasonable labor rates on its projects.

Prevailing Wage Impacts on Labor Costs. The state prevailing wage law does two things that could impact the labor costs of WSDOT projects. First, the law places a floor under labor rates to be paid on WSDOT projects. The floor is the state rate for state-funded projects and the higher of the state or federal rate for federal-aid projects. Second, the wording of the state law has led the courts to conclude that the application of the state law is broader than the application of the federal prevailing wage law.

Based on the analysis of prevailing wage and review of existing studies, there is no consensus that prevailing wage generally adds to labor costs in the broader labor market. It is unclear to what extent prevailing wage laws drive overall wage levels.

Cost of Materials

Materials make up an average of about 50% of contract costs ($3.5 billion over the study period, or 33% of project costs). While there is no database of specific material prices by state, some states maintain a Construction Cost Index (CCI) that tracks selected standard bid items over time. The CCI provides a point of comparison for construction cost growth; however, there are limitations:

- Based on CCI analysis from 1990 to 2012, WSDOT's materials costs have increased at approximately the same rate as national averages and as other states.
- **While materials are a large share of costs, WSDOT does not have significant control over the price.** Costs are set by the market, and potential savings from interstate purchases of materials to achieve lower prices are typically negated by transportation costs.

Risk Assignment

Project delivery method selection can impact project efficiency, project design, and cost. Using a rigorous project delivery method selection process, WSDOT should decide the following on a project by project basis:

- Risk allocation between owner and contractor based on who is in the best position to manage the risk
- Project delivery methods that best align responsibility based on project needs and the correct mix of core competencies
- Competitiveness of the bid process and construction management to meet schedule and budget requirements
- Beyond selecting the appropriate project delivery method, it is important that each available method has a corresponding management and implementation structure in place to ensure successful application

Impact of Contracting Methods. Washington and Utah provided data on the type of contracting method used for each project. Both states use Design-Bid-Build and Design-Build contracting, while Utah also uses GC/CM contracting. (While Oregon did not provide this information, our understanding is that they primarily use Design-Bid-Build contracting, with some use of Design-Build.)

- Both Design-Build and Design-Bid-Build contract awards tend to come in below estimates. However, Utah's GC/CM contract awards come in an average of 3% above the engineer's estimate.
- Project delivery metrics do not vary meaningfully by contracting type.
    - In Washington, if the Hood Canal expenditures are removed, Design-Bid-Build and Design-Build metrics look nearly identical.
    - If you remove projects completed through GC/CM, Utah shows a similar pattern to Washington when comparing the two contract types.

CONSTRUCTION COST INDEX

The Construction Cost Index (CCI) tracks selected standard bid items over time. The CCI provides a point of comparison for construction cost growth across the nation, with the following limitations:

- In Washington, CCI bid items represent 7 of potentially hundreds of bid items for a project. CCI bid items account for approximately 18% of contract costs.
- Each state's index includes a similar set of items, but specific definitions for items and methodologies for calculating the index vary by state.
- FHWA stopped creating a composite index after 2006 due to its limited use and value and questions about data reliability.
- A 2007 FHWA report noted that costs of commodities used in highway construction primarily varied across states due to the difference in the cost of transporting commodities.

Exhibit ES-5
Project Delivery Metrics by Contracting Method, 2003-2012

Contracting Method	Estimate to Award		Award to Payment		Estimate to Payment	
	WSDOT	UDOT	WSDOT	UDOT	WSDOT	UDOT
Design-Bid-Build	(9%)	(14%)	10%	11%	(1%)	(5%)
Design-Build	(7%)	(17%)	5%	14%	(2%)	(5%)
GC/CM	-	3%	-	13%	-	16%
All Contracts	**(9%)**	**(12%)**	**8%**	**12%**	**(1%)**	**(2%)**

Source: WSDOT, 2013; UDOT, 2013; and BERK, 2013.

- GC/CM stands out as having a different pattern between estimates, awards, and payments than the other contracting types.
  - GC/CM is different in many ways from the other two methods. GC/CM contractors in Utah are selected through a competitive bidding process that assesses qualifications. Once a contractor is selected, UDOT and the contractor negotiate a final award amount.
  - Since the contractor is brought on so early in the process, estimates are made earlier in the design stage than with Design-Bid-Build.
- Utah data covers the period when GC/CM was new to the Department. From 2005-2008, contract payments came in nearly 20% over award amounts. Over 2009-2012, payments came in 8% higher than awards.

Based on the analysis of the three states, likely benefits of using alternative contracting methods lie outside of simply expecting payments to come in closer to award amounts. There is not one type of contracting that appears to regularly save more money relative to contract estimates or contract awards. **This suggests that contracting method decisions should be primarily about factors such as risk assignment, relative core competencies of the agency and contractor, availability and capabilities of agency staff, budget certainty and schedule.**

- On big projects, where errors can be costly, Design-Build may mitigate risk. Large errors may be paid for by contractors and not WSDOT.
- Involving contractors in project design through Design-Build or GC/CM can make for better project design and improve constructability.
- On complex projects, GC/CM and Design-Build can result in efficiencies since construction teams can conduct early constructability reviews.
- On smaller and less complex projects, the traditional Design-Bid-Build approach appears to be very effective and is widely used even where other options exist, as seen in the Utah example.

DEFINITION: GENERAL CONTRACTOR/ CONSTRUCTION MANAGER

A general contractor is selected during the design phase to increase collaboration between owner and contractor and provide more input into constructability, cost and schedule.

GC/CM involves two contracts with a contractor: one for preconstruction services with a provision for a guaranteed maximum price (GMP) and another for construction. The owner is not liable for costs in excess of the GMP unless the scope changes. However, the owner is responsible for design, which is typically done with consultant services.

Potential Actions

What can be done to increase efficiency and reduce cost in WSDOT construction program? The following tables, organized by key driver, describe the potential actions, the magnitude of the potential impact, and whether the action would be administrative or statutory. For each alternative, we attempted to calculate the magnitude of the potential cost savings. Our starting point was to estimate the dollars involved (to the extent possible) with the available data and then assess the likely influence of the potential action to reduce that dollar amount.

For example, with sales tax, reinstating the public exemption would have reduced the tax paid by WSDOT over the 10 year period by $227 million. We deem this potential saving to be high because the dollars involved are high and the action would have a significant influence on the potential savings.

With prevailing wage, while the dollars involved are significant (estimated $2.1 billion) the potential actions outlined would not produce significant savings overall. A 1% reduction would equal about $21 million. Based on a 1988 JLARC Highway Audit that found that 0.44% of state highway program costs could be attributable to the requirement to pay the higher of the state rate or federal rate on federal-aid projects, 1% seems optimistic.

	Potential Action	Administrative or Statutory	Potential Impact
PROJECT DESIGN			
1	Adopt Practical Design methods to guide project scoping and design decisions. • Incorporate Practical Design into project prioritization and selection process. • On projects greater than $10 million, include a Practical Design review to determine the cost effectiveness of the preliminary design and identify alternatives considered.	Administrative	High
SALES & USE TAX			
2	Reinstate Public Road Construction exemption on state-owned highways. • Exempt WSDOT projects on state-owned highways from tax on total contract amount. • Contractor would pay tax on all materials at point of purchase. • Lowers tax paid; no risk with respect to federal projects. • Reduces general fund and local government sales tax revenue.	Statutory	High
3	Direct receipts from state sales and use tax collected from contractors on state-owned highways to transportation fund. • Legislature could direct receipts to the Motor Vehicle or Multi-Model Account. • Tax paid is the same, but is returned to transportation. • Does not impact local government sales tax revenue. • Reduces state general fund revenue.	Statutory	High
4	Exempt WSDOT projects on state owned roads from the requirement for contractors to pay sales and use tax at the point of purchase on materials that are consumed during construction. • Legislature could create an exemption for WSDOT projects on state owned highways that would allow contractors to treat these purchases as re-sales that are not subject to sales and use tax at the point of purchase. • The effect would be to eliminate the double taxation of these purchases, which are currently taxed at the point of purchase and taxed again when included in the total contract billing.	Statutory	Medium

Potential Action	Administrative or Statutory	Potential Impact
PREVAILING WAGE		
5 Exempt WSDOT projects from the state prevailing wage act. • Retain the federal prevailing wage on federal-aid projects. • Potential wage savings; reduction in administrative burden related to determining the higher of the two wages; could lead WSDOT to program federal funds differently and use them on fewer projects.	Statutory	Low
6 Exempt WSDOT federal-aid projects from the state prevailing wage act. • Use federal wage rates only on federal-aid projects. • Potential wage savings; reduction in administrative burden related to determining the higher of the two wages; eliminate costs related to off-site construction where state prevailing wage applies but not federal prevailing wage - could lead WSDOT to program federal funds differently and use them on fewer projects.	Statutory	Low
7 Change Washington State Prevailing Wage language to match the Federal Prevailing Wage language "payment of prevailing wages to mechanics and laborers employed directly on the site of work." • Potential wage savings due to narrowing the range of activities covered by prevailing wage – would no longer apply to off-site activities.	Statutory	Low
8 Establish a threshold below which WSDOT projects are not subject to the prevailing wage act. • Potential wage savings; reduction in administrative burden; could produce more bids in some areas of the state if prevailing wage is a barrier.	Statutory	Low
9 Modify how Labor & Industries sets the state rate. • Options: (a) Use federal rate as state rate, (b) Use collective bargaining agreements as basis for state rate, or (c) Require annual survey. • Savings are in more efficient determination of prevailing wage; eliminate large jumps for those wages where the prevailing wage is not the same as the rate established by collective bargaining agreements. In these cases, the wage rate is not modified until a new survey is conducted. This means there can be very large jumps in the prevailing wage rate, which is disruptive.	Statutory and Administrative (L&I)	Low

	Potential Action	Administrative or Statutory	Potential Impact
ENVIRONMENTAL REVIEW & PERMITTING			
10	Allow smaller projects that qualify for a NEPA categorical exclusion (CE) but not a SEPA categorical exemption to submit NEPA documentation only (and not the SEPA checklist). • This would require a change to the SEPA rules. Currently, under SEPA WSDOT can only use NEPA Environmental Impact Statement (EIS) and environmental assessments. This would allow WSDOT so supply their documentation in support of a NEPA CE to satisfy SEPA checklist requirements. • This would affect smaller projects.	Administrative	Low
11	Expand SEPA exemptions to match the NEPA categorical exclusions. • NEPA categorical exclusions have been updated several times over recent years, whereas SEPA categorical exemptions have not. • This would allow small, routine transportation projects to be exempt from SEPA as they are currently under NEPA.	Statutory	Low
PROJECT DELIVERY METHODS			
12	Grant broad authority to WSDOT to determine project delivery methods. • Potential wage savings due to narrowing the range of activities covered by prevailing wage – would no longer apply to off-site activities.	Statutory	See note
13	For mega-projects, the highest-level executives within WSDOT should consider all possible scenarios before selecting the contracting approach, and then consider how authority should be aligned for the specific projects. (Mega-Project Assessment)	Administrative	See note
14	When selecting a contracting method, the Department should: perform a thorough risk analysis and quantify all project risks; consider the amount of risk that should be retained versus transferred to the contractor; on mega projects, the Chief Engineer should review and approve the delivery strategy. (Mega-Project Assessment)	Administrative	See note
15	Modify existing WSDOT authority for Design-Build. • Complete analysis of five pilot projects and potentially lower the threshold from $10M million to $2M. • Allow for projects of any size that meet the statutory criteria.	Statutory	See note
16	Specifically authorize GC/CM project delivery for WSDOT projects and authorize a separate review process from the Capital Projects Advisory Review Board. • Clarify process and availability of GC/CM for highway projects.	Statutory	See note

	Potential Action	Administrative or Statutory	Potential Impact
PROJECT DELIVERY METHODS			
17	Apply the same rigorous risk assessment process used in the original project delivery method selection to decisions about possible changes or modifications in the selection of a contracting method. • On complex projects with multiple components and contracts, any change in contracting method or contract modification should be reviewed using the same level of risk assessment as the original selection. Documentation should identify how a change in approach benefits the State.	Administrative	See note
18	Explore implementing a pavement warranty program and consider other opportunities to use contractor warranties (performance and/or materials and workmanship) in lieu of inspections.	Administrative	See note
19	Give Design-Build contractors additional design flexibility to support innovation and cost containment by not restricting them to the Design Manual.		
OTHER POTENTIAL ACTIONS			
20	Improve data collection to better inform management and policy choices. • Finding: There were many questions posed in this study that were difficult or not possible to reasonably address due to a lack of data or incomplete information. Some of these questions inform important policy and management issues. • This was particularly relevant to mitigation costs, change order documentation, right of way acquisition, environmental review and permitting and prevailing wage.	Statutory & Administrative	
21	Focus federal funds in fewer projects to limit the impact of federal aid conditions on WSDOT project costs. • Finding: WSDOT spreads its federal funds throughout its program which added federal aid project conditions to 82% of its projects completed in 2003-2012. • A major challenge for WSDOT in this regard is the general lack of flexibility to move funds between projects. For example, nickel funds are limited to nickel projects, so to consolidate federal funds on a nickel project likely requires switching money primarily among other nickel projects.	Legislature & WSDOT	
22	WSDOT should prepare a report to the legislature on fish passage barrier removals that outlines what the plan is, the methodology and amount of the cost estimates, and how performance on the fish passage barrier removals that were part of the court order will be tracked.	Legislature & WSDOT	

Contract Magnitude Notes

- Magnitude of Impact (12-17): Alternatives are related to shifting risk assignment and responsibility, which affects who pays for errors and cost overruns. While shifting risk does mean that it will be priced into contractor bids, it provides more budget certainty.
- Magnitude of Impact (18): Potential savings to contractors with respect to time and to WSDOT with respect to staff.
- Magnitude of Impact (19): Could potentially lead to more cost effective solutions based on current conditions in materials prices or state of the practice.

Significant Data Limitations Identified during the Study

As we conducted the analysis necessary to understand the impacts of the identified cost drivers, limitations in the data affected which drivers could be thoroughly investigated. In some instances, data that would answer specific questions was not tracked by WSDOT or other state agencies. In other cases, data tracking was inconsistent and therefore did not provide a meaningful sample for our analysis. The following table summarizes the topic areas where we were unable to fully address key questions quantitatively.

Areas of analysis where lack of data was a significant limitation:	
Mitigation	Project costs do not identify the mitigation-related components.
Environmental Review and Permitting	A significant share of WSDOT "predesign" work is categorized as "consultant agreements." There is no way to break these costs into the categories that the Legislature would like to better understand such as environmental review, permitting, and preliminary design.
Prevailing Wage	Neither WSDOT nor L&I track whether the state or federal rate was in effect for a particular position on a particular job. The L&I affidavit database likely contains a mix of actual wages paid and the prevailing wage. The "contract number" field on L&I's affidavit form is inconsistently filled out, making it challenging and time consuming to link prevailing wage affidavits back to specific WSDOT projects, if it is possible at all. Data validation efforts surfaced a number of obvious data entry errors in hourly wages or hours worked by contractors, raising significant data quality concerns.
Change Orders	The "reason" field in the change order database is inconsistently used. Many large change orders have no reason listed. The existing reason codes are not specific enough to provide usable insight into a project's history.
Right-of-Way	WSDOT's right of way database is inconsistently filled out, even though the fields exist in the database. WSDOT has recently implemented a new database that will improve tracking and allow this type of analysis going forward.

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INTRODUCTION

Project Background

In 2013, the Washington State Legislature directed the Joint Transportation Committee (JTC) to conduct a study to identify the major cost drivers and evaluate efficiency initiatives in the construction and operation of Washington State highway and bridge improvement and preservation projects.

Washington's preservation and maintenance backlog is significant and population growth is putting strain on existing transportation infrastructure. However, there is insufficient revenue available to make needed investments as gas tax revenues, the primary source of funding, have been declining as vehicles become more fuel efficient. There is also a perception that the problem is not insufficient revenue, but inefficient use of funds by WSDOT. Even among those less skeptical about WSDOT's project delivery, there is a perception that a number of factors contribute to excessive project costs, ranging from environmental review, to project management practices, to prevailing wage laws. For example, concerns raised by legislators during public work sessions included issues such as:

- Environmental costs, such as long permitting processes and high mitigation expenses;
- Adherence to state and federal regulations and standards, such as prevailing wage costs and administration requirements or tax laws and financing practices that drive up costs; and
- Specific project scoping and estimating challenges such as the size of contingency funds for each project; instances where state standards are higher than federal standards; and adding "non-project specific elements" such as the inclusion of bike and pedestrian elements in highway projects or allocations of departmental/programmatic costs to individual projects.

ADVISORY PANEL MEMBERS

- Representative Judy Clibborn
- Senator Curtis King
- Senator Tracey Eide
- Representative Ed Orcutt
- Cam Gilmore, WSDOT
- Carrie Dolwick, Transportation Choices Coalition
- Mike Ennis, Association of Washington Businesses
- Vince Oliveri, Professional and Technical Employees, Local 17
- Duke Schaub, Associated General Contractors

STAFF WORK GROUP MEMBERS

- Beth Redfield, JTC
- Mary Fleckenstein, JTC
- Alyssa Ball, House Transportation Committee
- Amy Skei, House Transportation Committee
- Clint McCarthy, Senate Transportation Committee
- Lyset Cadena, Senate Democratic Caucus
- Debbie Driver, House Democratic Caucus
- Jackson Maynard, Senate Majority Coalition
- Dana Quam, House Republican Caucus
- Jim Albert, OFM
- Jay Alexander, WSDOT
- Pasco Bakotich, WSDOT
- Keith Metcalf, WSDOT
- Megan White, WSDOT

Study Objectives

The study had three primary objectives:

1. To develop a broad understanding of the costs of transportation projects and what drives these costs
2. To specifically determine whether transportation projects in Washington State cost more than in other states
3. To identify potential reforms or efficiency measures

Study Approach

OVERSIGHT AND DIRECTION

The study was guided by a nine member Advisory Panel and technical support was provided by a Staff Work Group. The project began with an investigation of a wide range of potential cost drivers and practices. Given the relatively short project timeline, we conducted an initial screening analysis to focus our efforts on the cost drivers with the greatest potential for savings and on additional areas of specific interest to the Legislature and the Advisory Panel members.

ANALYTIC APPROACH

Both the initial screening of cost drivers and the in-depth analysis were conducted using data received from WSDOT. Our primary source of information on project costs was an expenditure database that contained all improvement and preservation projects completed between 2003 and 2012.

This database:

- Included 2,292 completed projects. It did not include projects that are not yet complete, such as the 520 bridge.
- Contained more than 100,000 individual rows of data. Each row represents a unique expenditure category on a unique project.
- Each project is broken into cost components called "work operation codes" that identify the different phases and components of each project. There are more than 250 codes in the database.

All costs, unless otherwise noted, were adjusted to 2012 dollars.

SIGNIFICANT DATA LIMITATIONS IDENTIFIED DURING THE STUDY

As we conducted the analysis necessary to understand the impacts of the identified cost drivers, limitations in the data affected which drivers could be thoroughly investigated. In some instances, data that would answer specific questions was not tracked by WSDOT or other agencies. In other cases, data tracking was inconsistent and therefore did not provide a meaningful sample for our analysis. The following table summarizes the topic areas where we were unable to fully address key questions quantitatively.

Areas of analysis where lack of data was a significant limitation:	
Mitigation	Project costs do not identify the mitigation-related components.
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Prevailing Wage	Neither WSDOT nor L&I track whether the state or federal rate was in effect for a particular position on a particular job. The L&I affidavit database likely contains a mix of actual wages paid and the prevailing wage. The "contract number" field on L&I's affidavit form is inconsistently filled out, making it challenging and time consuming to link prevailing wage affidavits back to specific WSDOT projects, if it is possible at all. Data validation efforts surfaced a number of obvious data entry errors in hourly wages or hours worked by contractors, raising significant data quality concerns.
Change Orders	The "reason" field in the change order database is inconsistently used. Many large change orders have no reason listed. The existing reason codes are not specific enough to provide usable insight into a project's history.
Right of Way	WSDOT's right of way database is inconsistently filled out, even though the fields exist in the database. WSDOT has recently implemented a new database that will improve tracking and allow this type of analysis going forward.

DATA LIMITATIONS

The analysis conducted on each of these drivers is described in the **Cost Drivers** chapter, beginning on page 35. To the extent that these issues remain important areas of interest to the Legislature, effort should be made to improve the data availability and quality.

PROJECT COST ANALYSIS

The purpose of the overall project cost analysis is to understand how highway construction funds have been spent over the last decade (2003-2012). Specifically, what are the biggest expenditure areas and how have expenditures changed over time? A broad understanding of spending patterns allows us to drill down further into the areas that represent the greatest costs to assess how the different drivers impact overall costs.

The cost analysis consists of three separate analyses:

1. **Historical Expenditures**. This section looks broadly at how and where WSDOT has spent its money over the past decade.
2. **Contracting and Project Delivery**. This section looks at how well WSDOT manages its contracted services to deliver projects on budget.
3. **Comparison to Other States**. This section seeks to address how costs in WSDOT compare to costs in other states.

Historical Expenditures

Historical project expenditures were analyzed to understand WSDOT spending on highway and bridge construction. This analysis focuses on the Preservation and Improvement Programs at WSDOT, which encompass the majority of highway construction projects.

- The **Preservation Program** includes projects focused on paving and safety restoration, structures preservation, seismic retrofits, and preservation of drainage/electrical systems.
- The **Improvement Program** includes projects that improve mobility, reduce or prevent collisions, support economic development and mobility, and mitigate environmental impacts.

KEY FINDINGS:
HISTORICAL EXPENDITURES

Construction costs, accounted for approximately 84% of project costs:

- 66% of project costs come from contractor payments.
- 13% of project costs come from WSDOT construction costs, which include construction and contract management, procurement, and a small portion of state force work.
- 5% of project costs come from sales tax on construction.

Right of way comprised 6% of project costs. About three-quarters of this amount was for parcel acquisition.

Planning, predesign, design, permitting, and **environmental review** accounted for 10% of project costs.

Mitigation costs are difficult to split out, so were analyzed using a set of case studies.

- In the sample, 16% of project costs went to mitigation, with a range among projects of between 2% and 45%.

DATA STRUCTURE

Within each Program, expenditures are categorized into project phases. The three overarching phases that WSDOT defines are:

- **Preliminary Engineering.** Includes engineering costs incurred prior to the date of construction, such as locating and designing, making surveys and maps, preparing plans, specifications and estimates, traffic counts, and other related general engineering prior to letting a contract for construction. Preliminary engineering encompasses predesign, engineering and design, environmental review, and permitting.
- **Right of Way.** Includes appraisal fees, purchase of land or interest therein, and relocation assistance for persons displaced by the purchases.
- **Construction.** Includes all costs for the construction phase, such as payments to prime contractors, state force labor costs, supervision of construction activities, inspection and testing, and general project management during construction.

The goals of this study necessitated more detail on phases. Toward this end, WSDOT provided ten years of expenditure data for projects completed from 2003 to 2012 that included three attributes that could be used to categorize expenditures:

- **Work Operation Codes.** WSDOT tracks expenditures using more than 250 unique work operation codes. These codes allow for grouping into categories such as project management, payments to construction contractors, WSDOT staff construction activity, environmental documentation, and right of way acquisition and management.
- **Project Type.** The database lists the type of project constructed, such as Urban Mobility, HOV Lanes, Paving/Safety Restoration, or Noise Reduction. There are more than 25 types of projects listed in the database.
- **Operationally Complete Date.** Each project lists the date the project was completed, which allows tracking of expenditure trends over time.

APPROACH TO DATA ANALYSIS

To align the data more closely with the goals of this project, BERK worked with WSDOT staff to assign each of the 250 work operation codes to the following six project phases that align with the cost drivers. Four of the drivers - predesign, engineering and design, environmental review, and permitting - are part of the preliminary engineering phase:

- **Predesign.** All expenditures that occur on a project prior to beginning engineering and design.
- **Engineering & Design.** All expenditures that occur on a project to create designs and put the project out for advertisement.

- **Environmental Review.** All expenditures related to scoping and conducting environmental analyses.
- **Permitting.** All expenditures related to acquiring environmental, construction, and local agency permits.
- **Right of Way.** All expenditures related to purchasing right of way, including appraisal, relocation, and contract management.
- **Construction.** All expenditures related to completing project construction, such as contractor payments, contract management, inspection and testing, etc.

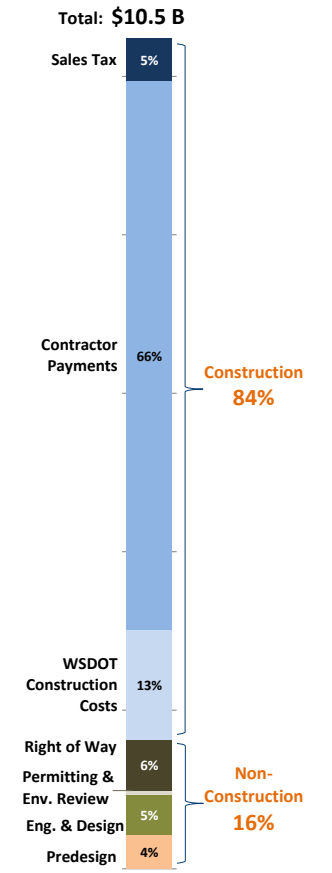
Within each of these phases, additional levels of detail were identified where the data allowed.

PROJECT COSTS BY MAJOR PROJECT PHASE

The first step in the cost analysis was to look at WSDOT spending by major project phase. This initial window into project costs shows where the majority of funds are spent, and therefore where potential opportunities for cost savings lie. Exhibit 1 summarizes the project costs by major project phase.

- Construction costs, which include WSDOT construction activities and administration, contractor payments, and sales tax, accounted for 84% of project costs over the ten-year period.
  - Construction as a proportion of project costs decreased from approximately 91% for projects completed in 2003 to 77% for projects completed in 2012. This trend was largely due to the larger size of the more recent projects, with greater right of way and predesign costs.
  - The largest portion of construction costs was for contractor payments, which comprised about 78% of construction costs (or 66% of project costs).
- Non-construction costs accounted for approximately 16% of project costs.
  - Approximately 6% of project costs were for acquisition of right of way. Right of way, as a proportion of all non-construction expenditures, has increased over time.
  - Planning, predesign, design, permitting, and environmental review account for approximately 9% of project costs.
  - Within non-construction expenditures, proportions of costs vary widely across size categories.
    - Projects less than $5 million had a higher proportion of non-construction expenditures on engineering and design.
    - The larger the project, the higher the proportion of expenditures that went toward Right of Way.

EXHIBIT 1
PROJECT COSTS BY MAJOR PROJECT PHASE, 2003-2012
(2012 $)



Source: WSDOT, 2013; and BERK, 2013

Mitigation costs, which can span preliminary engineering, right of way, and construction phases, cannot be easily split out using WSDOT's work operation code system. Efforts to quantify the amount spent on mitigation are described on page 54.

EARLY STAGES OF PROJECT DEVELOPMENT

Costs expended during the early stages of project development amounted to about $900M of the $10.5B in project costs included in this analysis. It is important to note that decisions about scope and design made during these phases influence the scale of future construction costs.

Project Costs by Project Phase: Preliminary Engineering-Predesign ($423 million)

There are 46 WSDOT expenditure categories rolled up into the Predesign phase definition used in this study. Exhibit 2 summarizes the ten largest expenditure categories within the Predesign phase

Exhibit 2
Components of Predesign Expenditures, 2003-2012 (2012 $)

WSDOT Expenditure Code	2003-2012 Expenditures	
Agreements for Prelim. Engineering	$ 250.0 M	59%
Traffic Data Collection & Analysis	$ 30.0 M	7%
Traffic Design And Plans	$ 19.3 M	5%
Survey, Location	$ 18.1 M	4%
Hydraulics	$ 16.1 M	4%
Base Map/Right Of Way Plans	$ 13.2 M	3%
Project Data	$ 12.8 M	3%
Respond to Design-build RFIs	$ 10.5 M	2%
Proj Mgmt Plan Dev & Maint	$ 10.3 M	2%
Public & Agency Involvement	$ 7.2 M	2%
All other categories in this phase	*$ 35.3 M*	8%
Predesign Total	**$ 422.8 M**	

Source: WSDOT, 2013; and BERK, 2013.

Agreements for preliminary engineering (consulting contracts) comprise the majority of Predesign expenditures. These agreements cover a range of topics, but WSDOT does not track the purpose of these agreements to allow any further analysis of the type of expenditures.

Project Costs by Project Phase: Preliminary Engineering-Engineering & Design ($513 million)

There are 62 WSDOT expenditure categories rolled up into the Engineering & Design phase. Exhibit 3 summarizes the ten largest expenditure categories within the engineering and design phase.

The largest single expenditure category within this phase is general project management, which is primarily WSDOT staff labor hours dedicated to managing the project development process. The second largest category is agreements (consulting contracts) related to project engineering and design.

Exhibit 3
Components of Engineering & Design Expenditures, 2003-2012 (2012 $)

WSDOT Expenditure Code	2003-2012 Expenditures	
General Project Management	$ 185.5 M	36%
Agreements	$ 55.6 M	11%
Contract Plan Preparation	$ 35.8 M	7%
Hq Geotech Work	$ 27.7 M	5%
Roadway Design	$ 26.6 M	5%
Ps&E Review And Ad Ready Prep	$ 21.4 M	4%
Direct Project Support for PE	$ 21.4 M	4%
Structure Design And Plans	$ 18.4 M	4%
Training	$ 12.2 M	2%
Design Documentation	$ 12.1 M	2%
All other categories in this phase	*$ 96.3 M*	19%
Engineering & Design Total	**$ 513.0 M**	

Source: WSDOT, 2013; and BERK, 2013.

Project Costs by Project Phase: Preliminary Engineering-Permitting ($13.5 million)

There are six WSDOT expenditure categories rolled up into the Permitting phase, shown in Exhibit 4 below. Overall, permitting cost $13.5 million over the ten-year period.

Exhibit 4
Components of Permitting Expenditures, 2003-2012 (2012 $)

WSDOT Expenditure Code	2003-2012 Expenditures	
Environmental Permits	$ 11.6 M	85%
Consultant/Local Agcy Ps&E Rev	$ 1.1 M	8%
Other Agency Permits/Acces Mgt	$ 0.4 M	3%
Consultant/Lag Ps&E Review	$ 0.3 M	2%
Construction Permits	$ 0.1 M	1%
Consult/Local Struct Ps&E Revw	$ 0.1 M	0%
Permitting Total	**$ 13.5 M**	

Note: PS&E stands for Plans, Specifications and Estimates
Source: WSDOT, 2013; and BERK, 2013.

Environmental permits make up the majority (85%) of permitting expenditures, although they represent a small portion of total project costs. Since the cost of permits is relatively low, the majority of these expenditures are related to the staff time necessary to procure permits and prepare the necessary documents.

PERMITTING & ENVIRONMENTAL REVIEW

The Permitting & Environmental Review phases account for a relatively small percent of project costs, though it is likely that some environmental review costs are included in the $250 million of consulting contract expenditures shown earlier as part of Predesign.

To the extent that mitigation requirements are identified as part of the environmental review process these costs would be included in construction costs.

Project Costs by Major Project Phase: Preliminary Engineering-Environmental Review ($40.4 million)

There are 26 WSDOT expenditure categories rolled up into the Environmental Review phase. Exhibit 5 summarizes the ten largest expenditure categories within the Environmental Review phase.

Exhibit 5
Components of Environmental Review Expenditures, 2003-2012 (2012 $)

WSDOT Expenditure Code	2003-2012 Expenditures	
NEPA/SEPA Compliance	$ 19.0 M	47%
ESA Compliance	$ 7.5 M	19%
Environmental Discipline Report	$ 6.4 M	16%
Environmental Review Summary	$ 2.5 M	6%
Compliance with Salmon ESA Req.	$ 1.2 M	3%
Discipline Studies-Wetlands	$ 1.0 M	3%
Environment Discipline Studies	$ 0.9 M	2%
Early Environmental Scoping	$ 0.6 M	1%
Additional Regulatory Compliance	$ 0.4 M	1%
Discipline Studies-Historic	$ 0.2 M	1%
All other categories in this phase	*$ 0.6 M*	2%
Environmental Review Total	**$ 40.4 M**	

Source: WSDOT, 2013; and BERK, 2013.

National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) compliance activities, which include WSDOT staff time to address project compliance with environmental laws and regulations, are the largest single expenditure category within environmental review, totaling about $19 million over ten years. **The costs specifically identified as related to NEPA and SEPA review are likely to understate the total environmental review costs.** This is due to the fact that some portion of environmental review costs are buried in general consultant agreement expenditures and cannot be pulled out separately. Since these agreements can include services related to all aspects of Preliminary Engineering, they were included as a lump sum in the Predesign phase. This was one of the many data limitations that emerged in the study.

Project Costs by Project Phase: Right of Way ($638 million)

There are 22 WSDOT expenditure categories rolled up into the Right of Way phase. Exhibit 6 summarizes the ten largest expenditure categories within the Right of Way phase.

Exhibit 6
Components of Right of Way Expenditures, 2003-2012 (2012 $)

WSDOT Expenditure Code	2003-2012 Expenditures	
Acquisition - Parcel Payment	$ 470.9 M	74%
Acquisition - Labor Costs	$ 42.8 M	7%
Relocation - Other Costs	$ 30.7 M	5%
Agreements	$ 27.1 M	4%
General Project Management	$ 23.4 M	4%
Appraisal	$ 12.2 M	2%
Inventory	$ 5.9 M	1%
Condemnation/Preparation-Trial	$ 5.2 M	1%
Relocation - Labor Costs	$ 4.8 M	1%
Appraisal Review	$ 3.6 M	1%
All other categories in this phase	*$ 11.4 M*	2%
Right of Way Total	**$ 638.1 M**	

Source: WSDOT, 2013; and BERK, 2013.

Payments for parcel acquisition make up the majority of right of way costs at $471 million over ten years. The remaining right of way costs are generally associated with acquisition, disposition and management of property.

Project Costs by Project Phase: Construction ($8.8 billion)

As noted above, construction costs accounted for approximately 84% of project costs.

Exhibit 7 shows the different components of the costs broadly categorized as the construction phase.

Exhibit 7
Components of Construction Expenditures, 2003-2012 (2012 $)

Construction Components	2003-2012 Cost	
Contractor Payments	6,926,815,000	78%
Sales Tax	533,650,000	6%
Project Management	501,633,000	6%
Other Construction Costs	485,397,000	5%
Inspection & Testing	307,998,000	3%
WSDOT State Force Work	90,653,000	1%
TOTAL	**8,846,146,000**	

Source: WSDOT, 2013; and BERK, 2013.

CONSTRUCTION LABOR

Labor costs are discussed in greater detail in the cost driver section addressing the state prevailing wage law. The 40% figure cited here is based on contractor interviews and represents a "typical" project. This includes all construction labor, not only the portion of labor that would be subject to state prevailing wage laws.

- The majority of construction expenditures went toward contractor payments (78% of construction costs, or 66% of total costs) Based on discussions with contractors, contractor payments include the following major elements:
  - Construction labor comprises about 40% of contract payments, or about 26% of project costs.
  - Supplies, both consumed and installed, comprise about 50% of contract payments, or about 33% of project costs.
  - Contractor overhead and profit make up the remaining 10% of most contracts (about 7% of project costs).
- WSDOT costs, which are primarily associated with construction and contract management, bid solicitation and award, inspection, and a small amount of state force work account for 16% of construction costs (about 13% of project costs).
  - Construction work by WSDOT's state force totaled 1% of all construction costs during the sample period. State force work means that WSDOT's maintenance or traffic operations staff are doing construction work.
  - By law, WSDOT is limited to $60,000 in state force labor per "unit of work," which effectively means per project.
- **Sales & Use Tax** is also a major component of project expenditures, accounting for approximately $534 million over ten years (6% of construction costs, or about 5% of total costs). The vast majority of sales & use tax expenditures occurs in the construction phase and is generated from sales tax paid on contracts. Laws and application of sales tax are explored further in the Cost Drivers chapter (page 41).

MITIGATION

Defining mitigation is a subjective exercise that generates disagreement about what should or should not be considered mitigation. Depending on how it is defined, mitigation can include many aspects of a project:

- Mitigation can take the form of **design changes** during the environmental review or permitting process to avoid environmental impacts. Sometimes these design changes add to overall project costs. These mitigation costs are difficult to track in a database.
- Some projects have **impacts that need to be mitigated**, which become project requirements. Since they are done concurrently with other project design and construction activities, it is difficult to separate these costs from general project costs.

- WSDOT also does some projects where the **whole project can be considered mitigation-like.** In these cases the project is meeting an environmental need that has arisen from the transportation system. An example is a stand-alone fish passage barrier removal project.

Mitigation-like costs are found in two places within WSDOT project expenditure data:

- **Project Types.** Some projects are categorized as primarily focused on mitigation-like expenditures. These project types include Environmental Retrofits as well as some Mobility and Economic projects that may also be considered mitigation in some circumstances, such as bicycle connections and scenic highway improvements. These costs are simple to identify, as the entire project can be categorized as a mitigation expenditure.
- **Project Components.** The majority of mitigation-related expenditures are included within overall project costs. For example, costs related to stormwater management may be imbedded in the project design and become just another scope element in the bid and construction process.

On projects where mitigation costs are contained within the project, WSDOT does not track costs in a way that allows identification of mitigation-related costs. To better understand the role of mitigation in project costs, WSDOT conducted four mitigation case studies in 2003, 2006, 2009, and 2013.

Each study analyzed between 7 and 14 projects selected to represent a broad mix of project types and sizes. It is important to note that not all WSDOT projects include mitigation elements. Because mitigation costs are imbedded in overall project costs, it is impossible to easily identify which of the projects completed over the ten-year period did or did not have mitigation costs.

WSDOT worked with the project managers of each of the case study projects to identify all mitigation-related expenditures, including design alterations. Given the timeline of this study, this labor-intensive process was not feasible to replicate. Exhibit 8 summarizes the findings of the four reports WSDOT has completed. Overall, about 16% of costs on these projects were related to mitigation.

Exhibit 8
Summary of WSDOT Mitigation Case Study Reports, 2003-2013 (YOE $)

Study Period	Projects Analyzed	Total Project Cost	Total Mitigation Cost	Average Mitigation Percent	Range of Mitigation Percents	
					Low	High
2003	14	426,868,000	78,304,000	18%	2%	34%
2006	7	641,277,610	111,057,000	17%	2%	24%
2009	14	670,290,000	105,214,400	16%	5%	35%
2013	11	241,940,000	31,331,807	13%	2%	45%
TOTAL	**46**	**1,980,375,610**	**325,907,207**	**16%**	**2%**	**45%**

Source: WSDOT, 2013; and BERK, 2013.

TYPES OF MITIGATION

WSDOT uses the following definitions for mitigation in its case studies.

Temporary. Temporary embankments, water quality monitoring, stream by-passes, dust prevention, erosion control, etc.

Stormwater. Conveyance to treatment facility, pipes, inlets, manholes, flow control structures, fencing, property acquisition, etc.

Wetland. Retaining walls, altered alignment, bridges, property acquisition, wetland construction, fencing.

Stream. Long bridge spans, retaining walls, riparian area enhancements, etc.

Noise. Property acquisition, concrete foundations and walls, other barriers, clearing and grubbing, wall aesthetic treatments.

Context Sensitive Solutions. Community gateways, concrete stamping and coloring, unique railing or fencing, special landscaping, shared-use paths.

Over the four studies, 46 projects totaling almost $2 billion in project costs were evaluated. Within the selected sample, 16% of project expenditures went to mitigation elements, with a significant range among individual projects of between 2% and 45%.

- The majority of mitigation expenditures in these case studies went toward stormwater facilities (51%).
- Wetlands restoration was the second largest mitigation expense, at 21% of studied expenditures.
- Other mitigation expenditures included noise walls (15%), stream protection (10%), context sensitive solutions (2%), temporary mitigation (0.7%), and dust control (0.3%).

Project Delivery & Contracting

By far the greatest share of WSDOT construction costs takes the form of contractor payments (78% of construction costs, or 66% of project costs). Given this fact, **the effectiveness of WSDOT's approach to contracting may be the most significant area in which to explore potential cost efficiencies.** Key questions in our analysis of historical data around project delivery and contracting were:

- Where has WSDOT spent the most on contracting?
- Where has WSDOT spent more than expected on contracting?
- Do contracting methods impact WSDOT's project delivery?
- Is WSDOT's contracting experience different from that of other states?

This section describes and quantifies the estimate, bidding, award, and payment processes. The analysis used prime construction contracts. There are fewer contracts than projects because WSDOT may complete multiple projects under a single contract.

WSDOT's project database contains 2,293 projects completed through use of 1,525 prime contracts. WSDOT provided a separate contract database that tracks the lifecycle of each contract. The contracts database matches a subset of the projects database where projects completed under the contract were finished between 2003 and 2012. Therefore, contracts for projects completed prior to 2003 or after 2012 were excluded leaving 1,329 contracts encompassing $6.2 billion of contract costs (in Year of Expenditure dollars). To facilitate comparison between estimates, awards, and payments, dollars in the following analysis are not adjusted for inflation

COMPETITIVE ENVIRONMENT

For the majority of projects, WSDOT hires a contractor through a bidding process to deliver the completed project. Competition for construction contracts ensures WSDOT has multiple qualified bids to choose from, and encourages contractors to submit competitive bids. Exhibit 9 shows the number of bids received by contract size over the past ten years.

On average, WSDOT received 4.3 bids per contract over the past ten years. Contracts between $5M and $100M received the highest number of bids, while contracts over $100M received an average of 2.8 bids, which likely reflects the fact that there are fewer contractors with the financial and technical capacity to take on highly complex large-scale projects.

KEY FINDINGS: PROJECT DELIVERY & CONTRACTING

- WSDOT receives an average of 4.3 bids per contract, reflecting a healthy level of competition across project sizes and regions.
- WSDOT paid approximately 8% more than the original award amount over the past 10 years. Contracts over $25 million accounted for 76% of this difference.
- Design-Build contract payments came in closer to awards (5% over) than Design-Bid-Build (10% over). However, the Design-Bid-Build difference was largely driven by one project.
- WSDOT's project delivery metrics do not differ significantly from data provided by Utah and Oregon DOTs.
- In all three states, final expenditures came in between 7% and 12% higher than awards. Oregon was the lowest, at 7% over, Washington was at 8% and Utah was 12% over.
- Utah has been using GC/CM contracting since 2004.
- GC/CM results show expenditures greater than estimates most likely due to the nature of the procurement process and complexity of projects selected for this approach.
- WSDOT and ODOT do not use GC/CM.

CONTRACTS WITH 1-2 BIDS

Generally, WSDOT has benefitted from a healthy competitive bidding environment, with 75% of all awards receiving at least 3 bids.

However, 25% of awarded contracts received just one or two bids. Reviewing the bid/award/payment history on these contracts highlights the value of competition.

The contracts with only one bid generally resulted in awards that were higher than the engineer's estimate and final payments which exceeded awards to a greater degree than other contracts.

CONTRACT MILESTONE DEFINITIONS

Final Engineer's Estimate. Typically the final estimate prior to bid opening.

Award Amount. The initial amount for which WSDOT signs an agreement with the contractor to complete a project.

Final Payments or Final Expenditures. The total amount that WSDOT paid toward a contract after work is complete.

Exhibit 9
Number of Bids by Contract Size, 2003-2012

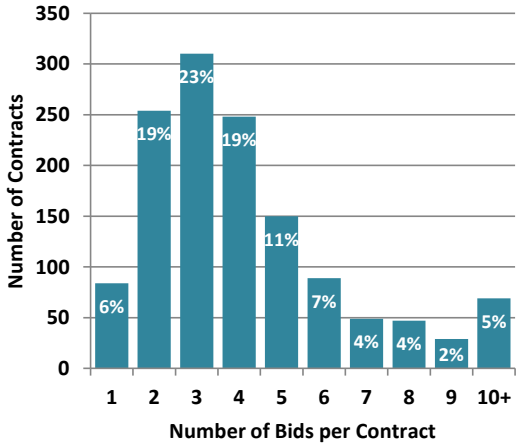
Contract Size	Number of Awards	Number of Bids	Average
Less than $1 M	619	2,589	4.2
$1M to $5 M	480	1,981	4.1
$5M to $10M	84	385	4.6
$10M to $25M	60	362	6.0
$25M to $100M	36	186	5.2
$100M +	6	17	2.8
TOTAL	**1,285**	**5,520**	**4.3**

Source: WSDOT, 2013; and BERK, 2013.
Note: The data only included bid information for 1,285 out of the 1,329 prime contracts included in the contract analysis.

On a regional level, competition was fairly balanced throughout the state. While contracts in the Northwest Region received the most bids (an average of 5.0 bids per contract), all other regions still averaged healthy bid levels between 3.7 and 4.2 bids per contract.

Exhibit 10 shows the percent of WSDOT contracts that received a certain number of bids. Three quarters (75%) of contracts received three or more bids.

Exhibit 10
Contracts by Number of Bids, 2003-2012



Source: WSDOT, 2013; and BERK, 2013.

PROJECT DELIVERY

As noted above, WSDOT uses a bidding process to hire contractors:

- WSDOT engineers create an estimate for budgeting purposes and to secure money from appropriate sources. The estimate is not shared with bidders.
- Firms bid on the project and WSDOT uses a scoring system to award the project to the highest scoring bidder. Price plays a significant role in scoring.
- Throughout the project, change orders may be authorized on a project that increase or reduce the final project total.

Given that payments to contractors make up a majority of all construction costs, understanding how well WSDOT manages the contracting process is important to understanding if this category of expenditures represents a potential area for significant cost savings.

Payments Compared to Awards

Data on construction contract awards and payments helps illustrate how WSDOT brings projects from design to completion. Comparing total payments on a contract to the original award amount helps measure how estimated project costs change during the construction period. Contract costs may change after a contract is awarded for many reasons:

- Market changes in the price of materials
- Unforeseen circumstances requiring changes to the quantity of work or materials
- Delays or other schedule adjustments
- Errors or omissions in original project plans
- Management decisions to add value to a project
- Requests from third parties

Exhibit 11 summarizes the WSDOT data on contract award amounts and final contract expenditures by contract size.

Exhibit 11
WSDOT Contract Awards and Expenditures, 2003-2012 (YOE $)

Contract Size	Number of Awards	Amount Awarded	Amount Paid	Difference	% Difference
Less than $1 M	656	$289,408,293	$294,784,864	$5,376,572	2%
$1M to $5 M	487	$1,097,890,445	$1,119,652,051	$21,761,605	2%
$5M to $10M	80	$552,633,373	$578,422,918	$25,789,544	5%
$10M to $25M	67	$1,046,645,633	$1,108,441,013	$61,795,379	6%
$25M to $100M	33	$1,418,262,752	$1,550,438,468	$132,175,715	9%
$100M +	6	$1,355,417,590	$1,592,318,640	$236,901,050	17%
TOTAL	**1,329**	**$5,760,258,087**	**$6,244,057,954**	**$483,799,867**	**8%**

Source: WSDOT, 2013; and BERK, 2013.

- Within the sample set of contracts, WSDOT paid approximately $484 million (8%) more than the original award amount over 10 years.
- The largest variances between payments and awards were in contracts over $25M, which accounted for nearly $369 million of payments above award amounts.

A significant portion of the difference between awards and expenditures is due to the Hood Canal Bridge East Half contract. This contract was originally awarded at $204 million, but ended up with payments of $394 million (a difference of $190 million, or 39% of total award to payment differences over the ten-year study period).

POTENTIAL SAVINGS

At WSDOT, potential savings from engineer's estimates tend to be invested back into each project through change orders.

For smaller projects, these reinvestments are consistent with WSDOT's contingency allowances.

The difference between final payments and awards increases as project size increases.

This significant difference was driven by the discovery of cultural resources at the original graving dock site in Port Angeles, where pontoons and anchors were to be built. WSDOT relocated the graving dock and WSDOT, the Lower Elwah Klallam Tribe, and other state and federal agencies have undertaken an extensive archaeological recovery effort at the original graving dock site.

Exhibit 12 shows the percent of contracts with final payments below awards, within 4% of awards, 4-10% above award, and more than 10% above awards. The 4% break was used to approximate WSDOT's risk management techniques:

Standard Contingency. On most projects, WSDOT assumes a standard 4% contingency factor for project managers to use for small changes necessary during construction.

Large Project Risk Analysis. WSDOT conducts a more comprehensive risk analysis on projects over $10 million to ensure the agency has adequate funds to handle unforeseen changes.

Exhibit 12
Contracts by Percent Expenditures Above Awards, 2003-2012

Contract Size	Number of Awards	Less then award	Within 4% of award	4-10% above award	10%+ above award
Less than $1 M	656	50%	20%	13%	17%
$1M to $5 M	487	44%	23%	17%	16%
$5M to $10M	80	35%	25%	18%	23%
$10M to $25M	67	25%	30%	18%	27%
$25M to $100M	33	6%	24%	33%	36%
$100M +	6	17%	50%		33%
TOTAL	**1,329**	45%	22%	15%	18%

Source: WSDOT, 2013; and BERK, 2013.

- Over the ten-year study period, approximately 33% of contracts had final payments of more than 4% above the original award.
- 22% of contracts had payments within 0% to 4% of the original award.
- 45% of contracts resulted in payments lower than the award.
- Larger contracts were more likely to end up with payments over the original award amount. More than two-thirds of contracts between $25M and $100M had payments 4% or more above award amounts.

Impact of Contracting Method

WSDOT is authorized by the legislature to use two types of contracting: Design-Build and Design-Bid-Build (see the sidebar for a brief overview). Exhibit 13 shows how awards and payments compared across the two contracting methods.

Exhibit 13
WSDOT Contract Awards and Expenditures by Contracting Method, 2003-2012 (YOE $)

	Design, Bid, Build Contracts			
Contract Size	**Contracts**	**Awards**	**Payments**	**Percent Over**
Less than $1 M	656	289,408,293	294,784,864	2%
$1M to $5 M	485	1,092,373,050	1,113,790,298	2%
$5M to $10M	79	543,469,692	565,500,178	4%
$10M to $25M	65	1,012,829,633	1,073,999,217	6%
$25M to $100M	27	1,043,828,549	1,160,766,282	11%
$100M +	2	323,924,730	508,113,314	57%
TOTAL	**1,314**	**4,305,833,948**	**4,716,954,153**	**10%**

	Design-Build Contracts			
Contract Size	**Contracts**	**Awards**	**Payments**	**Percent Over**
Less than $1 M	-	-	-	-
$1M to $5 M	2	5,517,395	5,861,753	6%
$5M to $10M	1	9,163,681	12,922,740	41%
$10M to $25M	2	33,816,000	34,441,796	2%
$25M to $100M	6	374,434,203	389,672,186	4%
$100M +	4	1,031,492,860	1,084,205,327	5%
TOTAL	**15**	**1,454,424,139**	**1,527,103,801**	**5%**

Source: WSDOT, 2013; and BERK, 2013.

- 1,314 out of the 1,329 contracts studied (about 99%) used the Design-Bid-Build method. On these projects, final expenditures exceeded original award amounts by approximately 10%.
  - Larger contracts tended to land higher than award amounts more frequently and by a larger percentage than smaller contracts.
  - The Hood Canal Bridge East Half used Design-Bid-Build, and its awards and payments are in the $100M + category. At $190M above award, this contract drives the majority of cost differences in this category.
  - Excluding the Hood Canal Bridge, Design-Bid-Build contract payments were 5.4% higher than awards.
- For projects built using the Design-Build method, WSDOT spent 5% more than the original award amount.
  - This compares fairly equally with the Design-Bid-Build method if the Hood Canal Bridge is excluded from the analysis.
  - **However, unlike the Design-Bid-Build projects, contracts completed through Design-Build *do not* exhibit a trend of larger contracts coming in higher over award amounts than smaller contracts.**

WSDOT CONTRACTING METHODS

Design-Bid-Build is the traditional project delivery method. WSDOT is responsible for design, and the construction component of the project is contracted out. This is the most commonly used transportation contracting method with the least amount of risk allocated to the contractor.

Design-Build is a newer method where the design and construction phases are combined into one contract and awarded to a contractor. This method shifts more risk to the contractor as they are responsible for the design work. The hand-off from WSDOT to the contractor typically takes place at 20-30% design.

There are pros and cons to both types of contracting methods. The impacts of contracting methods are explored in more detail in the Cost Drivers chapter on page 59.

CHANGE ORDERS

At a programmatic level, WSDOT's bid/award/payment experience suggests that awards generally come in under engineer's estimates, but that change orders consume most of the potential savings. Further, actual savings on smaller projects tend to be reinvested in larger projects.

Change orders are an expected part of construction projects and WSDOT generally includes a 4% allowance to account for unforeseen costs.

Comparison to Final Engineer's Estimates

Before going to bid, WSDOT's engineering department creates a construction contract estimate for budgeting purposes. One of the challenges of this process is to ensure that the budget is based on reasonable expectations of costs in the face of market conditions, which can vary widely over time. Estimates are based on historical contract costs and prepared a few years before contracts go out to bid. Estimates include assumptions about inflation to approximate future conditions. Highly competitive bid environments can lead to a greater share of bids over estimate, since contractors can be more selective about which projects they take on and construction labor and materials costs can be bid up, and can increase engineers estimates for future bids, since historic bids are used to inform future estimates.

Estimates are used to procure funding from the Legislature and to build a complete project budget. When WSDOT delivers a project under budget, the difference is treated as "project savings" which become available for redistribution through the appropriations process. When bids come in below engineer's estimates, it creates an opportunity to potentially free up funding for other purposes. However, the experience has been that most of these potential savings are reinvested in the project through change orders.

Exhibit 14
WSDOT Contract Estimate, Award, and Expenditures, 2003-2012 (YOE $)

Contract Size	Number of Awards	Total Estimate	Total Award	Total Expenditure	Difference: Estimate to Award	Difference: Award to Expenditure	Difference: Estimate to Expenditure
Less than $1 M	656	328,122,144	289,408,293	294,784,864	-12%	2%	-10%
$1M to $5 M	487	1,228,097,186	1,097,890,445	1,119,652,051	-11%	2%	-9%
$5M to $10M	80	602,236,999	552,633,373	578,422,918	-8%	5%	-4%
$10M to $25M	67	1,194,932,068	1,046,645,633	1,108,441,013	-12%	6%	-7%
$25M to $100M	33	1,515,942,965	1,418,262,752	1,550,438,468	-6%	9%	2%
$100M +	6	1,431,673,052	1,355,417,590	1,592,318,640	-5%	17%	11%
TOTAL	**1,329**	**6,301,004,415**	**5,760,258,087**	**6,244,057,954**	**-9%**	**8%**	**-1%**

Source: WSDOT, 2013; and BERK, 2013.

Looking at contracts completed over the past ten years summarized in Exhibit 14:

- Bid awards have come in 9% (or $541 million) below the final engineer's estimates.
- Given that payments have exceeded award amounts over the same time period by 8%, final payments come in an average of about 1% less than final engineer's estimates (or about $57 million).

WSDOT Project Delivery Compared to Other States

The Oregon and Utah Departments of Transportation provided ten years of contract history for comparison to WSDOT. The two western states were selected for different reasons: Oregon has similar climate and is a neighbor state, while Utah is among the states that extensively use alternative contracting methods, including almost a decade of experience with GC/CM. Utah data included estimates, awards, payments, and contract type. Oregon provided award and payment information, but did not provide estimates or contract method. All three project datasets reflected a large sample size:

- Utah provided data on 969 contracts totaling $3.87 B in awards.
- Oregon provided data on 1,243 contracts totaling $3.96 B in awards.
- WSDOT's database included 1,329 contracts and $5.76 B in awards.

Using this information, we analyzed the same metrics as noted above for Washington across all three states to understand if WSDOT's experience in project delivery is different from the other two states.

Overall, WSDOT's project delivery metrics related to estimates, awards, and payments are similar to information provided by UDOT and ODOT. Exhibit 15 summarizes the key metrics across all three states.

Exhibit 15
Contract Estimate, Award, and Expenditure Comparison, 2003-2012

Metric	Washington	Oregon	Utah
Difference from Estimate to Award Amount	-9%		-12%
Difference from Award to Payment Amount	8%	7%	12%
Difference from Estimate to Payment Amount	-1%		-2%

Source: WSDOT, 2013; UDOT, 2013; ODOT, 2013; and BERK, 2013.

- In all three states, final contract expenditures were between 7% and 12% higher than awards. Oregon was lowest, at 7% over, and Utah was highest, at 12% over.
- Washington and Utah provided estimate information that showed:
  - Contract award amounts came in an average of 9% below estimate for Washington and 12% below estimate for Utah.
  - Final contract expenditures came in an average of 1% below estimate for Washington and 2% below estimate for Utah.

OTHER STATES' EXPERIENCE

The pattern in bid/award/payment was similar among Washington, Oregon and Utah.

- Awards were lower than estimates.
- Payments were greater than awards.
- Larger projects tend to have higher payment to award ratios.

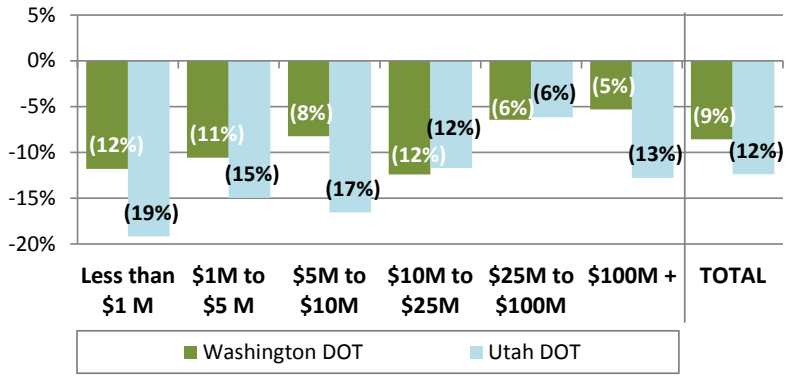
The GC/CM experience exhibits a different pattern with payments coming in consistently higher than engineer's estimates. This seems to be the result of two significant features of this approach:

- Awards are based on qualifications and a contract price is negotiated
- Projects selected for this method likely include features which would benefit from contractor involvement early in the process

As a result, it is likely that the risk management benefits and fixed price are judged to be of sufficient value to warrant higher payments. The additional cost can be interpreted as a form of insurance to protect from major cost overruns.

The following exhibits show the difference in the above metrics by project size for the three states.

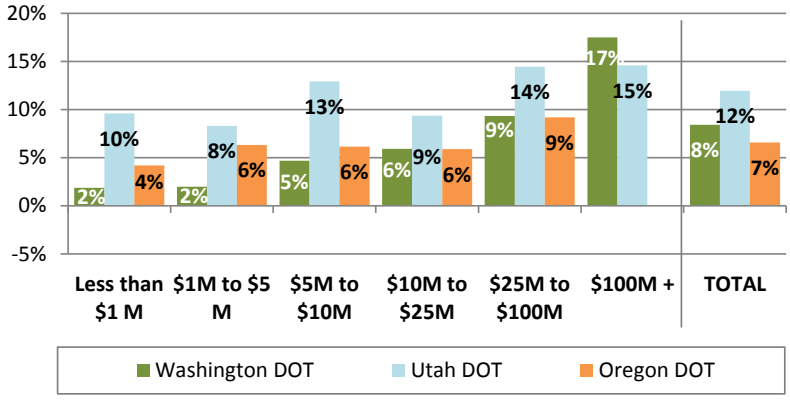
Exhibit 16
Contract Award and Estimate Metrics by Project Size and State, 2003-2012



Source: WSDOT, 2013; UDOT, 2013; and BERK, 2013.

- Both Utah and Oregon exhibit patterns where contract awards regularly came in below final estimates. Utah's awards tended to come in further below estimates than Washington's across most project sizes.

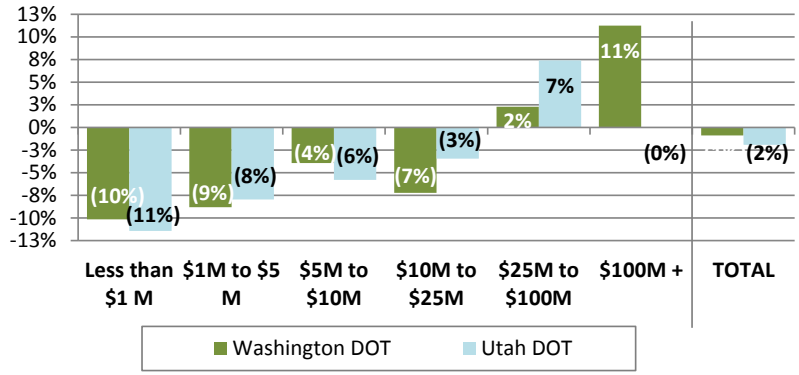
Exhibit 17
Contract Award and Payment Metrics by Project Size and State, 2003-2012



Source: WSDOT, 2013; UDOT, 2013; ODOT, 2013; and BERK, 2013.

- In Washington, contracts over $25 M accounted for $369 M out of $484 M (76%) of expenditures above award amounts over 10 years.
- In Oregon, projects less than $25 M came in an average of 5.9% over award. Projects over $25 M landed about 9.2% over.
- In Utah, the differences between awards and final payments did not change as much with project size as in the other states.

Exhibit 18
Contract Estimate and Payment Metrics by Project Size and State, 2003-2012



Source: WSDOT, 2013; UDOT, 2013; and BERK, 2013.

- In Utah, the difference between final engineer's estimates and final payments exhibited the same pattern as Washington, where final payments on larger projects came in closer to or above estimates than on smaller projects. In Utah:
  - Payments were less than estimates by 6.4% on projects below $25 M.
  - Payments were higher than estimates by 3.8% on projects over $25 M.

Project Delivery Method by State

Washington and Utah provided data on the type of contracting method used for each project. Both use Design-Bid-Build and Design-Build contracting, while Utah also uses GC/CM contracting. While Oregon did not provide this information, our understanding is that they primarily use Design-Bid-Build contracting, with some use of Design-Build. Exhibit 19 summarizes the difference in project delivery metrics across award types for WSDOT and Utah.

Exhibit 19
Contract Estimate, Award, and Expenditure Comparison by Contracting Method, 2003-2012

Contracting Method	Estimate to Award		Award to Payment		Estimate to Payment	
	WSDOT	UDOT	WSDOT	UDOT	WSDOT	UDOT
Design-Bid-Build	(9%)	(14%)	10%	11%	(1%)	(5%)
Design-Build	(7%)	(17%)	5%	14%	(2%)	(5%)
GC/CM	-	3%	-	13%	-	16%
All Contracts	**(9%)**	**(12%)**	**8%**	**12%**	**(1%)**	**(2%)**

Source: WSDOT, 2013; UDOT, 2013; and BERK, 2013.

DEFINITION: GENERAL CONTRACTOR/ CONSTRUCTION MANAGER

A general contractor is selected during the design phase to increase collaboration between owner and contractor and provide input into constructability, cost, and schedule.

GC/CM involves two contracts with a contractor: one for preconstruction services with a provision for a guaranteed maximum price (GMP) and another for construction. The owner is not liable for costs in excess of the GMP unless the scope changes. However, the owner is responsible for design, which is typically done with consultant services.

- Design-Build and Design-Bid-Build contract awards tend to come in below estimates. However, Utah's GC/CM contract awards come in an average of 3% above the engineer's estimate.
- The previous analysis shows that project delivery metrics do not tend to vary meaningfully between Design-Build and Design-Bid-Build contract awards.
    - For example, in Washington, if the expenditures on the Hood Canal Graving Dock are removed, Design-Bid-Build and Design-Build metrics look nearly identical.
    - If you remove projects completed through GC/CM, Utah shows a similar pattern to Washington when comparing the two contract types.
- GC/CM stands out as having a different pattern between estimates, awards, and payments than the other contracting types.
    - GC/CM is different in many ways from the other two methods. GC/CM contractors in Utah are selected through a competitive bidding process that assesses qualifications. Once a contractor is selected, UDOT and the contractor negotiate a final award amount.
    - Since the contractor is brought on early in the process, estimates are made earlier in the design stage than with Design-Bid-Build.
- The data from Utah covers the period when GC/CM was new to the Department. For the first four years GC/CM was used (2005-2008), contract payments came in nearly 20% over award amounts. Over the past four years (2009-2012), payments came in 8% higher than awards. Although patterns in GC/CM changed slightly over the decade, the relationships between cost points are still different than the patterns exhibited by Design-Build and Design-Bid-Build.

CHANGE ORDERS

When a contract adjustment is necessary on a project, WSDOT authorizes a change order with the contractor to add, delete, or modify work and costs in the original contract. Through change orders, final contract payments can be higher (or lower) than the original award amount. Change orders occur for many reasons, including decisions to improve a project. They do not necessarily represent an error in project design or management.

Change orders are tracked in WSDOT's contract database, which was developed in 2007. Dates, amounts, and authorization reason codes are recorded. This change order analysis contains a subset of 173 contracts with $3 B in contract payments and $246 M in change orders (in year of expenditure dollars). Since more than one reason can be assigned to a single change order, it is not possible to identify exactly how many dollars were changed for each reason. Our analysis found the following breakdown of change order amounts assigned to reason codes:

- 23% ($57.8 M) of change order dollars are coded as Unanticipated Conditions, defined as "*situations different than assumed during design*."
- 18% ($44. 5 M) are coded as Engineer's Judgment, defined as "*A change that is a good idea… makes the project work better.*"
- 8% ($19.0 M) are coded as Administrative, defined as "*administrative functions that do not relate to the actual work, such as prevailing wage and sales tax.*"
- 7% ($18.4 M) are coded as Plan Error-Information, defined as "*plans contain a mistake that resulted from the designer working with insufficient information.*"
- 6% ($14.9 M) are coded as Plan Error-Mistake, defined as "*plans contain a mistake that, given the information available to the designer, should not have been made.*"
- 43% of change order dollars ($105 M) have no specified reason.

While change orders are approved and documented through an established process, the information related to the change orders is inconsistently recorded in the WSDOT change order database. **WSDOT could improve its change order tracking and reason code assignment going forward to make it easier to assess project management and delivery performance.** Ensuring change orders are more consistently assigned a reason code in the database will reduce the number of dollars with no reason listed. Additionally, adding more detail to the reason codes available will allow WSDOT to better understand and manage the factors that drive changes in contract costs.

Comparison to Other States

KEY FINDINGS:
COMPARISON TO OTHER STATES

Overall, highway construction costs in Washington appear to be generally consistent with experiences in other states. Costs vary widely, but are primarily driven by individual project specifications.

Some factors, such as tax policies and contracting authority, could be addressed by the State. However others, such as labor and materials, are driven by market factors and prevailing wage laws that are outside the control of WSDOT.

Literature Review. A review of two studies, augmented with new research, found that costs on individual projects vary and are likely driven primarily by project characteristics and local market conditions.

Labor Costs. Average wages for construction and engineering service jobs in Washington are close to the national average and have grown consistently with national trends.

Materials Costs. WSDOT's materials costs have increased at approximately the same rate as national averages and with other states since 1990. WSDOT does not have significant control over the price of materials.

A key question posed in this study is whether, and to what degree, WSDOT projects cost more than those in other states. The analysis presented on the following pages focuses on how WSDOT costs compare to costs in other states.

Given the challenges of identifying truly "comparable" projects to conduct direct project-to-project comparisons, we address this question in two ways:

- **Project-level Comparison.** Based primarily on a literature review that summarizes and critiques two studies that attempted to compare WSDOT construction costs to comparable project costs in other states.
- **Analysis of Key Project Components.** Explores the degree to which each major cost element might vary meaningfully between Washington and other states, with a specific focus on Utah and Oregon.

Overall, the analysis suggests that highway construction costs in Washington are generally in line with experiences elsewhere and that aside from charging sales tax on construction, there are no systemic or programmatic factors that would make costs in Washington higher than other states. The analysis did find that costs may vary among states due to factors outside the control of WSDOT or the Legislature, such as local labor rates, material prices, site-specific conditions or features, and competitiveness of bid environments.

PROJECT-LEVEL COMPARISON

Approach

This analysis is based on a review of two studies that compared WSDOT project costs to comparable project costs in other states.

- *Highway Capital Costs – Washington & U.S.*, by Bill Eager (March 2013) - summarizes costs from a sample of projects in Washington and across the U.S. and analyzes trends in FHWA's construction cost index.
- *Highway Construction Costs,* by WSDOT (July 2004) - analyzes 21 projects in Washington and 15 projects from 12 other states.

Before reviewing the specific findings, it is important to understand the challenges and limitations of direct project to project cost comparisons:

- No two projects are the same. This becomes increasingly important as projects get bigger, more complicated, and more expensive.
- Even comparing project costs within WSDOT's program results in a wide range of overall costs and cost per lane mile as a result of the specific characteristics of individual projects, such as soil conditions, mitigation requirements, need for new right of way, connection to existing highway system, topography and slopes, and drainage requirements.

- External factors have an impact on project costs, particularly the competitive environment in the construction sector, which can result in significant variations in bids over time for similar work.
- Finally, when comparing across states, there are basic differences that will affect costs, such as overall labor rates, regulatory differences, site conditions, and tax treatment of construction work.

Summary of Findings

The two studies had opposing high-level conclusions about how WSDOT projects compare to other states.

According to the WSDOT study, WSDOT projects are more or less in line with other states' projects on a cost per lane mile basis.

- This study analyzed 21 projects in Washington and 15 projects from 12 other states. A description of each project, its total cost, lane miles, and location information are all included.
- WSDOT acknowledges challenges in comparability of projects and data collection. Online data collection was supplemented with phone interviews to verify and collect additional information on the projects.

The Bill Eager study suggests that WSDOT's project costs are significantly higher than project costs in other states per lane mile.

- This study looks at 130 projects categorized by location type (i.e. urban, suburban, etc.).
- The study focuses heavily on a comparison between specific WSDOT projects and a set of "US averages" for projects categorized as similar. The study only identifies a few of the projects included in its national averages, and does not provide project details for those projects.

Comparison of Study Conclusions

BERK reviewed the two studies and conducted additional research on seven projects to assess how project costs compare across states. While the two studies had different high-level conclusions, review of the data behind the studies shows that the conclusions are supported by similar project data.

Looking only at comparisons of specific projects, the results of the studies are in greater agreement than the overall conclusions would suggest. We analyzed projects included in both studies, adjusting all costs to 2012 dollars. The averages from the Eager study were not included, as the project data behind them was not identified. Some projects were included in both studies, but the estimated costs per lane mile were different. This highlights the difficulty of conducting these types of comparisons, and/or the impact of using budgeted or planned dollars in these studies.

CONCLUSIONS FROM *REVIEW OF COST STUDIES*

Both the WSDOT and Eager studies approached the cost comparison question by selecting projects that were reasonably similar and comparing costs on a per-lane-mile basis. Comparing the conclusions where projects were common to both studies, the findings suggest that WSDOT projects are generally in line with experience elsewhere,

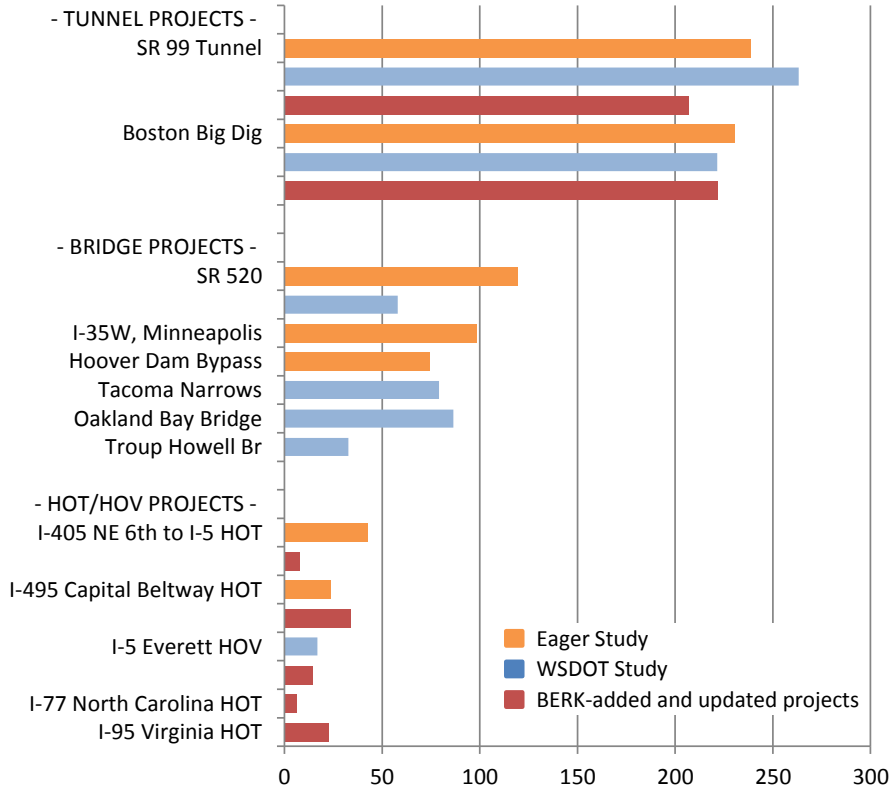
This conclusion was reinforced when BERK updated the cost information where better data existed and added a few additional comparable projects.

The degree to which the Eager study suggested that WSDOT project costs were potentially much higher than experience elsewhere was almost exclusively based on the inclusion of average per-mile costs for a number of unspecified projects.

Given the inherent challenge of defining truly comparable projects, it is impossible to draw meaningful conclusions from comparisons that do not include project-specific information.

Exhibit 20 shows the results of (1) updating all Eager and WSDOT study analyses to 2012 dollars and (2) independently researching seven projects to find updated lane mile and budget information.

Exhibit 20
Updated Project Costs per Lane Mile for Selected Projects (in millions of 2012 $)



Source: *Highway Capital Costs – Washington & U.S*, Bill Eager, 2013; *Highway Construction Costs*, WSDOT, 2004; WSDOT website, 2013; Massachusetts DOT website, 2013; North Carolina DOT website, 2013; Virginia DOT website, 2013; and BERK, 2013.

Looking at the projects specifically identified and that are reasonably comparable between the two studies, the two studies do not appear to be using significantly different data to draw opposing conclusions. The WSDOT conclusions rely heavily on the wide range found among all projects and among WSDOT projects to imply that project costs vary for many reasons.

The Eager study implied WSDOT projects could cost as much as 3 to 4 times higher per lane mile than national averages. However, these averages include an unspecified project list. If you remove the "averages of other projects" data points from the Eager study and focus only on the named projects, the two studies are more similar. We also researched two additional HOT projects that were not included in either original study, to provide additional points of comparison within that project type.

Tunnel Projects. Although exact project costs are slightly different, both studies make a similar conclusion that the SR 99 Tunnel is in line with but slightly more expensive per lane mile than the Big Dig.

- After adjusting all costs to 2012 dollars, the Boston Big Dig cost about 7% more per lane mile than the updated budget for the SR 99 Tunnel, which has changed since the completion of both studies.
- WSDOT's study used a range of prices given the uncertainty around the project in 2004; Exhibit 20 uses the average of this range. The original estimates for the SR 99 Tunnel included in the WSDOT study were created prior to choosing the deep-bore design.
- Estimates per lane mile for the Boston Big Dig and the SR 99 Tunnel in the two studies range from $204 M to $303 M, with the more recent estimates for the SR 99 Tunnel ($230 M) and the Big Dig ($222 M) falling in the middle and different from each other by only 3.6%.

Bridge Projects. The studies include a mix of floating, suspension, and truss bridges with different cost profiles. Bridge type likely drives a lot of the variance in per mile bridge cost.

- Estimates per lane mile for the bridge projects range from $32 M to $115 M.
- The 520 floating bridge is at the high end of the range, while the Tacoma Narrows suspension bridge falls in the middle.
- The WSDOT and Eager studies present very different costs for the 520 bridge. While some of this is likely due to the different estimates available at the different points in times the analyses were completed, **the Eager study focused on the most expensive part of the project – the floating bridge from I-5 in Seattle to Medina while the WSDOT Study included the full project, from I-5 to Bellevue.**

HOV/HOT Projects. Cost ranges are wide for these projects, as some switch existing lanes into HOT or HOV lanes, while others build new lanes, and some projects are a mixture of both.

- Projects range from $6 M per lane mile up to $41 M per lane mile, reflecting a wide range of project specifications.
- WSDOT's projects, I-405 HOT lanes ($16 M) and I-5 HOV lanes near Everett ($41M), fall near the middle and top of the range, respectively.
- The updated estimate for I-405 NE 6th to I-5 HOT is significantly lower than the Eager Study estimate. Our researched cost is based on information currently available on the WSDOT website. Since the Eager Study did not provide project details, we cannot confirm which data were used to support the cost per lane mile in that study ($41 million/lane mile).
- Variation in these projects likely stems from the number of interchanges that align with other major freeways, the number of new lanes that need to be built, and the amount and price of right of way purchases.

PROJECT DEFINITIONS

Big Dig: includes much more than just a tunnel – the project also included two new bridges, an extension of an existing surface highway, and rebuilding surface streets and open space through downtown Boston.

SR 99 Tunnel: includes the effort to build the tunnel, as well as replacing Alaskan Way with a surface street, demolishing the existing viaduct, building an overpass at the Port of Seattle, and linking the tunnel to existing streets north and south of downtown.

ANALYSIS OF KEY PROJECT COMPONENTS

A second approach to understanding WSDOT project costs relative to projects in other states is to analyze how components of project costs vary among states. The biggest opportunities for savings exist in the biggest areas of expenditures, namely labor and materials.

Labor Costs

Based on industry averages, about 40% of contract costs ($2.8 B over the study period, or 26% of project costs) are comprised of labor, which includes labor subject to prevailing wage (30% of contract costs) and labor not subject to prevailing wage (10% of contract costs). A large portion of the $2.4 B spent on permitting, environmental review, predesign, engineering, design, and in-house construction-related costs also includes labor, which is not subject to prevailing wage.

To understand if Washington's labor costs are higher than in other states, we used US Bureau of Labor Statistics data for average wages by state for the construction and engineering industries. Overall average wages for construction and engineering service jobs in Washington State are close to the national average.

- Construction Wages: Washington State average of **$53,688** in 2012 and a national average of **$52,929** (includes all construction sectors).
- Engineering Services: Washington State average of **$85,304** in 2012 and a national average of **$89,084**.

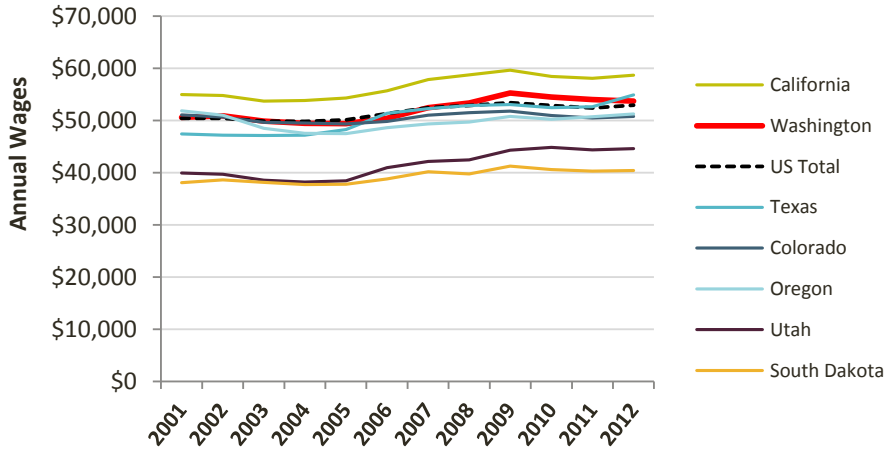
Washington's construction and engineering labor costs are consistent with the national average. However, there can be wide variation among states.

- Nationally, construction labor rates vary from 23% higher (Massachusetts) to 26% lower (Idaho), excluding Alaska which has the highest construction labor rates in the US.
- Engineering labor rates vary from 23% higher (California) to 27% lower (Arkansas).

While not as wide as the national perspective, there is still a significant labor cost range for selected peer and neighbor states shown in Exhibits 21 and 22.

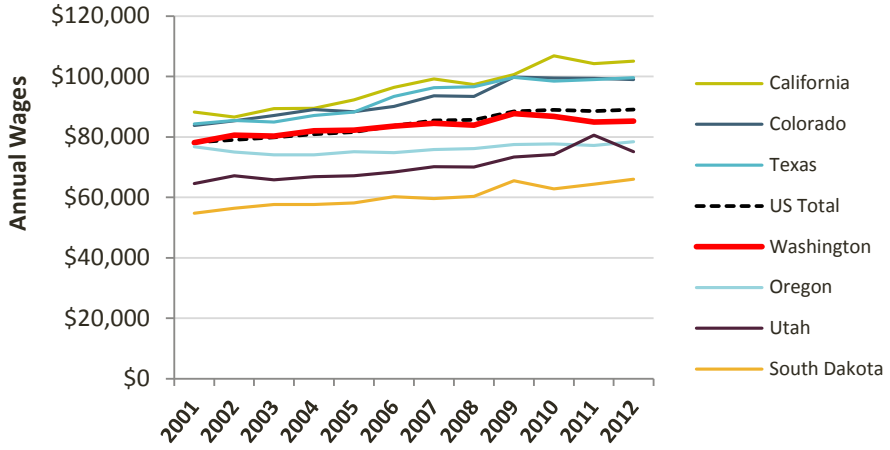
For construction labor, Washington is closer to the high end of this range, while for engineering services it is closer to the mid-point. In both cases the trend over time has generally matched the national average and that of selected peer states.

Exhibit 21
Construction Wages, 2001-2012 (2013 $)



Source: US Bureau of Labor Statistics, 2013; and BERK, 2013.

Exhibit 22
Engineering Services Wages, 2001-2012 (2013 $)



Source: US Bureau of Labor Statistics, 2013; and BERK, 2013.

Cost of Materials

Materials make up an average of about 50% of contract costs ($3.5 billion over the study period, or 33% of project costs). While there is no database of specific material prices by state, some states maintain a Construction Cost Index (CCI) that tracks selected standard bid items over time. The CCI provides a point of comparison for construction cost growth; however, there are limitations:

CCI bid items comprise a portion of total costs. In Washington, CCI bid items account for approximately 18% of contract costs. Washington tracks the following seven of potentially hundreds of bid items: 1) Roadway Excavation; 2) Crushed Surfacing; 3) Hot Mix Asphalt; 4) Concrete Pavement; 5) Structural Concrete; 6) Steel Reinforcing Bar; and 7) Structural Steel.

WASHINGTON WAGES

Adjusted for inflation, Washington wages have been consistent with national trends from 2001-2012.

Exhibit 23
Washington State CCI Bid Items as Portion of All Project Costs, 2009-2013

Bid Item Costs	2009*	2010	2011	2012	2013**	5-Yr Total
CCI Bid Items	$63,779,439	$137,534,045	$137,319,842	$65,564,357	$48,446,689	$452,644,371
Other Std. Bid Items	$202,735,347	$379,905,022	$704,049,371	$262,189,051	$162,272,587	$1,711,151,379
Non-Std. Items	$1,164,117,540	$82,848,203	$124,777,875	$67,074,799	$35,816,667	$1,474,635,083
Total Costs	$1,430,632,327	$600,287,270	$966,147,089	$394,828,207	$246,535,942	$3,638,430,834
CCI Bid Item Percent	**4%**	**23%**	**14%**	**17%**	**20%**	**12%**
Excluding the SR 99 Tunnel Contract						
Total Costs	$373,337,119	$600,287,270	$966,147,089	$394,828,207	$246,535,942	$2,581,135,627
CCI Bid Item Percent	**17%**	**23%**	**14%**	**17%**	**20%**	**18%**

* Six months: July through December
**9 months: January to October

Source: WSDOT, 2013; and BERK, 2013.

- CCI bid items account for 18% of contract costs (excluding SR 99 Tunnel).
- Data includes standard and non-standard bid items used in WSDOT projects for the last five years (July 2009 to October 2013).
- Data includes the low, second, and third bid. The analysis used the average of the three bids' unit price multiplied by the quantity to estimate the average cost.

Difference in CCI definition across states. Each state's index includes a similar set of items, but definitions for items and methodologies for calculating the index vary by state.

Questions about data reliability. FHWA stopped creating a composite index after 2006 due to its limited use and value and questions about data reliability.

Commodity transport costs as an underlying driver. A 2007 FHWA report noted that costs of commodities used in highway construction primarily varied across states due to the difference in the cost of transporting commodities.

Acknowledging those limitations, the CCI analysis does imply that WSDOT's bid item costs have trended similarly to a selection of peer states since 1990. Exhibit 24 shows how the indices have trended over time in Washington and a selection of other states. Bid item costs include materials, labor, equipment, overhead, and profit. Items are weighted based on the value in contracts awarded.

WSDOT's materials costs have increased at approximately the same rate as national averages and with other states since 1990 (Texas started its series in 1997). Notwithstanding the fact that there is considerable variation among the states and all states exhibited significant market-driven shocks, **construction costs on standard bid items in Washington follow the overall trend line and tend to be on the low to mid-point in the range.**

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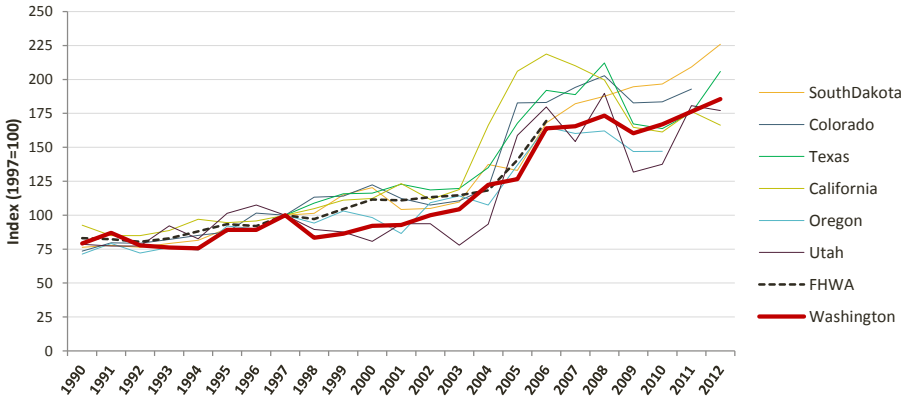
Exhibit 24
Construction Cost Index History by State, 1990-2012



Source: WSDOT, 2013; FHWA, 2013; Oregon DOT, 2013; Colorado DOT, 2013; California DOT, 2013; Utah DOT, 2013; South Dakota, DOT, 2013; Texas DOT, 2013; and BERK, 2013.

While materials are a large share of project costs, WSDOT does not have significant control over the price of materials. Material costs are set by the market, and interstate purchases of materials to achieve lower prices are typically negated by the costs of transporting the materials. However, when purchasing fabricated materials created off-site, there may be enough of a cost advantage through the combination of cheaper materials and lower wage rates out of state to offset transportation costs, for example, in border communities.

Summary of State Comparisons

Overall, our analysis suggests that the highway construction picture in Washington doesn't look much different than other states. Project costs vary widely, but are primarily driven by individual project specifications. Project-level comparisons do not provide many answers because comparable projects are nearly impossible to find.

The answer, on any given project, is that cost depends on where it is built. It could be more expensive to build in Washington if you compare it to a state with (1) no sales tax on construction activity, (2) general labor rates that are 25% below Washington's, and (3) materials that are less expensive. However, this type of comparison ignores the realities of WSDOT's inability to affect the labor and materials market in which it operates, and the policies it must follow.

There are some factors that could be addressed by the State, such as tax policies and contracting authority. However some costs, such as labor and materials, are driven by statewide market factors and prevailing wage determinations that are outside the control of WSDOT.

COST DRIVERS

The previous chapter focused on historical spending patterns for WSDOT's construction program and compared this to experience in other states. This chapter focuses on quantitative and qualitative analysis of individual major cost components.

Introduction to Key Cost Drivers

Cost drivers fall into one of five categories identified as factors that drive project costs and *could* add costs to WSDOT projects relative to similar projects in other states.

1. **Project Scale**. Both required and optional decisions around project design impact how WSDOT builds an individual project.
2. **State-specific Regulations**. WSDOT must comply with federal and state-specific regulations, including state sales tax requirements, prevailing wage laws, and environmental laws, which can add costs to a project.
3. **Labor Costs**. Labor comprises a significant portion of construction costs and accounts for the vast majority of non-construction costs, including engineering, design, construction management, etc.
    - As discussed in the comparative cost section, labor costs can vary widely by state. WSDOT's labor costs are primarily driven by overall wage levels in the Pacific Northwest, but may also be affected by state-specific regulations such as the prevailing wage law.
    - Quantity of labor (time and/or efficiency in delivery of services) can vary based on practices, differential design, and regulatory requirements. As a result, quantity issues are likely to be related to decisions about project scale.
4. **Cost of Materials**. Materials account for 50% of contract costs (or about 33% of project costs), so variations here can have a substantial impact. The ability of WSDOT to effectively manage materials costs is likely to be limited

CHAPTER OVERVIEW

This chapter discusses key findings from the individual cost driver assessments and is organized as follows:

Introduction

Project scale

- Design standards
- Design choices

State-specific regulatory factors

- Sales tax
- Prevailing wage
- Environmental review & permitting

Risk assignment

- Project delivery methods

Other cost drivers

- Right of Way
- Cost of Materials

due the significant advantages of local suppliers with respect to transportation costs.

5. **Risk Assignment**. Different project delivery methods allocate risk differently between the project owner and contractor. WSDOT's extensive use of Design-Bid-Build contracting places a significant share of project risk on the owner (WSDOT) in the event of cost over-runs.

The following table summarizes the eight key cost drivers analyzed below. The labor cost issues are addressed primarily as part of the prevailing wage discussion, and to a lesser degree in the project scale, materials cost and project delivery sections.

Key Cost Drivers Included in Analysis

Project Scale	Design Standards Design Choices
State-specific Regulations	Sales Tax Prevailing Wage Environmental Review & Mitigation
Risk Assignment	Project Delivery Methods
Other Drivers	Right of Way Cost of Materials

Project Scale

Project scale decisions affect project costs by governing *what* is built and *how much* is built. Project scale decisions fall into two main categories: design standards and design choices.

Design Standards

Background

Design Standards are industry guidelines used when building, maintaining, or retrofitting roads and bridges. WSDOT's design work is based on the WSDOT Design Manual, which integrates industry best practices and design standards and provide guidance on the geometry and load-bearing ability of roads, and help ensure safe transportation infrastructure.

The American Association of State Highway and Transportation Officials (AASHTO) provides national guidance on design standards for interstate, highway, and road construction. AASHTO's mission is to advocate for transportation-related policies and provide technical assistance to states in their efforts to efficiently and safely move people and goods. AASHTO's publications provide recommended ranges of values for given elements in the roadway or roadside environment and the expected safety impact of using one value over another.

AASHTO provides recommended standards in the following broad categories:

- **Design speeds** for different types of roadways (e.g. interstate, major arterial) in rural and urban environments.
- **Lane width** of each road lane by road type and geography, differentiating between rural and urban lanes, as well as truck and car lanes.
- **Shoulder width** by road type and geography, adjusting for each side of the road and taking into consideration whether it is a truck lane or not.
- **Bridge width** including lanes on bridges.
- **Structural capacity,** the load capacity a road is able to undertake.
- **Horizontal alignment** of a road, such as curves, transitions, and alignments.
- **Vertical alignment** of a road, including factors such as angles and crests.
- **Grade of the road** (percentage grade).
- **Stopping sight distance**, the sum of the distance traveled during perception time (time to realize that braking is needed) and the reaction time and the distance necessary to stop the vehicle for intersections and road stops.

AASHTO's design standards serve as national guidelines. According to FHWA, at least 30 other states and Washington publish their own design standards that build on AASHTO standards and incorporate state-specific regulations.

KEY FINDINGS:
PROJECT SCALE

Design Standards. WSDOT and AASHTO standards are similar.

- There are no variations that would likely result in significant differences in cost for WSDOT project construction.
- WSDOT is continually adjusting its standards to align with AASHTO and to provide flexibility to project designers.

Design Choices. Project scoping decisions determine the size of a road, alignments, and aesthetics. These decisions fall under the discretion of the project team, and can have significant impacts on project cost and effectiveness.

WSDOT is implementing tenets of **Practical Design** into its processes.

- **Changing Frameworks for Design and Delivery:** how and where to apply flexibility in design standards.
- **Combining Similar Projects:** to streamline methods and learn from past experiences.
- **Designing Incremental Improvements with Long-term Benefit:** spending less money in the short term in a way that represents an investment toward future needs and achieves the same goals.

WSDOT CHANGES TO STANDARDS

Object Height. Governs the vertical alignment of roads (e.g., when a road changes from an uphill to a downhill slope) by designating how gentle the curve needs to be. WSDOT relaxed the standard so that alignments can be slightly steeper if necessary.

Intersection Angle. Governs the angle at which a street can intersect with a highway. Relaxing this standard from 75 degrees to 60 degrees gives designers more flexibility and reduces the need to realign existing intersections when making road improvements.

Intersection Lane Alignment. Governs how a single lane must line up across an intersection. WSDOT relaxed this standard in low speed environments to allow shifts of up to six feet. This provides more leeway at intersections where right or left turn lanes are needed on only one side as through lanes may be slightly offset to accommodate additional lanes.

Deceleration Lanes at Intersections. WSDOT reduced the required length of deceleration lanes at intersections.

WSDOT Design Standards

In an effort to determine whether WSDOT is "overdesigning" projects we assessed how WSDOT's Design Manual compares to AASHTO's national guidance. Through a comparison undertaken by WSDOT and the consultant team, it appears that WSDOT standards and AASHTO standards today are very similar. **While there are small variations throughout the many details included in the design standards document, there are no variations that would likely result in significant differences in cost for WSDOT project construction.**

Over the past three years, WSDOT compared its standards to AASHTO's standards and made some changes to bring the two closer into alignment. During the 2000s, when projects were delivered through the WSDOT Nickel and TPA programs, WSDOT chose to relax certain design standards and align more with AASHTO standards. The biggest changes to WSDOT standards are listed in the text box and were primarily made to give designers more flexibility.

In addition, WSDOT has changed its design standards process to improve efficiency and increase flexibility in design decisions. One of the major changes was defining more project types and allowing additional criteria to be used when choosing which standards apply. This creates a finer tool for WSDOT to use for each project, and avoids overdesigning projects that would be on the cusp under a system with fewer project classifications. Some other DOTs use a more rigid system that only allows three to four project types and therefore three to four sets of design standards.

Other Standards and Guidelines

In addition to project design standards, WSDOT's Design Manual, Environmental Procedures Manual, and Highway Runoff Manual all include specific guidance on regulations pertaining to mitigation, such as wetlands, stormwater drainage and treatment, and noise walls. These manuals represent years of research and collaboration between WSDOT and subject matter experts, as well as other state agencies, consultants, and outside reviewers. Guidelines receive periodic updates to reflect changing regulatory landscapes, advancements in practice, and other identified improvements.

Design Choices

Design standards aim to put boundaries around how a road should be built to provide a safe and effective means of transportation. Design choices made during project scoping go beyond basic design and determine the size of a road, alignments, and aesthetics. DOTs make other design choices that impact project scope and fall under the discretion of the department, such as project objective, alignment, or aesthetics. These decisions can have significant impacts on project cost and effectiveness.

Types of Project Scoping Decisions

The design of a project is a combination of thousands of individual variables. At the most basic level, these variables include:

Project Size. How much traffic should the road be designed to accommodate? How many lanes should it have? Should there be HOV lanes or bike lanes? How many miles of the road should be built or improved?

Project Alignment. Where should the road be built? Should it go around or through significant geographic features? How sharp or gentle should the curves and grades be? How will the project align with intersecting roadways?

Project Type. What type of road should be built to address capacity? Should it be a major arterial or a highway? Should it be a tunnel, bridge, or surface road? Should it include tolling? What type of materials should be used?

Project Aesthetics. What aesthetic aspects can be incorporated to make the project more visually appealing? If noise walls are required should they include aesthetic designs? Should bridges be designed for aesthetic appeal?

This is a small sample of the types of questions that project designers must answer to get to a final design. The following section on Practical Design explores how WSDOT approaches these design questions.

Practical Design

Practical Design is an emerging approach to transportation system design. The purpose is to meet a state's transportation needs at a reasonable cost by:

- Building good projects that together achieve the goal of building a great transportation system.
- Build projects to only those standards needed to meet state goals.

Practical Design is an overarching idea or theory about project approach and should not be confused with value engineering, which happens at 60-90% design. Each state that has begun to implement Practical Design has interpreted it independently to align with what their DOT values. In conversations with WSDOT project development staff, WSDOT has approached Practical Design as a holistic approach to project development and delivery.

PRACTICAL DESIGN IN OTHER STATES

According to a 2013 Transportation Research Board report, six DOTs have adopted Practical Design policies, including Utah and Oregon.

Given how recently Washington and other states have adopted Practical Design, the benefits of the approach are not likely evident in the historical data.

The TRB report highlights several case studies that illustrate potential cost savings.

Missouri adopted a formal Practical Design policy in 2005 and claims approximately $400M in saving for projects included in its 2005-2009 STIP that were invested in additional transportation projects.

Example: Missouri's I-64/I-70 Interchange project was originally designed as a $69M, three-level structure. The design team reduced complexity by lowering design speeds and shoulder widths, building two levels instead of three, and providing simpler access to local roads.
Total savings: $37 M (54%).

PRACTICAL DESIGN FRAMEWORK

The framework for Practical Design includes identifying:

- **A goal.** Appropriately allocate limited resources in order to maximize statewide improvements. The idea is to develop the broadest benefits by utilizing existing resources.
- **Project-specific purpose and need statement.** Focus on unambiguous and specific performance targets.
- **State-specific factors.** Factors each state deems important to a project.

About two years ago, WSDOT started to examine their approach to projects from a Practical Design standpoint to look for ways to be more efficient.

WSDOT's Approach to Practical Design

Due to the post-recession fiscal realities and changing priorities of WSDOT leadership, WSDOT has recently increased its focus on Practical Design implementation. Overall, WSDOT's approach to Practical Design is to look at project delivery more programmatically and more incrementally. They plan to make these changes in three ways.

Changing Frameworks for Design and Delivery. WSDOT is analyzing how the tenets of Practical Design could influence aspects of its project design and delivery. It is not an overhaul of the design system, but represents WSDOT's dedication to continuous improvement in all areas. Examples of how WSDOT is incorporating Practical Design to refine and improve its practices include:

- Identifying how and where to apply flexibility in design standards.
- Continuing to add nuance to its design standard road classifications to make sure the right standards apply to the right projects.
- Focusing on goals and outcomes from the project beginning and bringing designers into those conversations to understand those goals.

Combining Similar Projects. By approaching projects more programmatically, regardless of project location, WSDOT can group similar projects around the state to streamline its methods and learn from past experiences.

The Fish Passage Barrier program is an example. WSDOT has grouped all of its fish passage barrier projects under the responsibility of three teams. These three teams work together to identify best practices and potential economies of scale. WSDOT plans to continue efforts to strategically identify similar projects where combining efforts would create efficiencies or improve project delivery.

Designing Incremental Improvements with Long-term Benefit. WSDOT is also attempting a more incremental approach to improving and preserving roadways. For example, limiting the initial scope of a project in the short term (reducing costs) to achieve the same higher priority goals and make an incremental investment toward longer-term needs. The plan is to start with lower cost projects utilizing available money. The incremental projects can become part of a larger solution. For example, if WSDOT identifies an unsafe stretch of highway, instead of immediately widening the road to create a larger median or shoulder it will assess the cause of the problem and try targeted smaller improvements. If rumble strips are added and safety is improved, WSDOT will have achieved its goal and spent less money. If the problem still exists, WSDOT could move forward with widening and still gain the additional safety benefit from the rumble strips on a wider highway.

State-Specific Regulations

Sales & Use Tax

Sales tax paid on construction accounted for approximately 5% of 2003-2012 preservation and improvement project costs ($534 million). The sales tax, along with property and business and occupation taxes, is the foundation of Washington State's tax structure. The State relies on sales tax for 60% of its revenue, the highest in the nation.[1]

Policy Overview

Washington State has a sales and use tax of 6.5% and local option sales taxes that can bring the effective tax rate up to 9.5% in some areas. One of the more important components of the tax base is tax applied to construction labor and materials. This tax treatment extends to public and private construction activities including WSDOT. Revenues from the sales and use tax collected from construction contracts support the State General Fund and local government activities (see Appendix A for more detail on Sales & Use Tax in Washington).

In accordance with RCWs 82.08 Sales Tax and 82.12 Use Tax, Washington State retail sales and use tax is applied to contractors[2] working on WSDOT projects on state-owned highways in two ways:

1. **Contractor gross receipts**. Sales and use tax is applied to the contractor's total billing, including charges for labor, services, sub-contractor costs, and materials.
2. **Contractor-purchased materials consumed during construction.** When WSDOT contractors purchase materials that will be consumed by the contractor during construction (i.e. temporary striping, barricades), the contractor is charged sales tax. Materials installed as part of construction are not subject to sales tax when purchased by the contractor.

Since 1971, projects on state-owned highways have been taxed to a greater degree than projects on other publicly-owned roads and highways, including city, county, and federal facilities. In 1971, state-owned highways were removed from the Public Road Construction exemption in the sales tax statute that limits sales tax to materials, which are taxed at purchase by the contractor. Without this exemption, sales tax is charged based on the full contract price as with private construction activity. In addition, for materials that are consumed

KEY FINDINGS:
SALES & USE TAX

Sales & Use Tax accounted for 5% of project costs. Sales tax is a more significant cost in Washington than in other states.

Since 1971 projects on state-owned highways have been taxed to a greater degree than projects on other publicly-owned roads and highways including city, county and federal facilities. As a result of this differential treatment, the state sales tax cost is approximately 82% higher on these WSDOT projects than on local or federal projects.

Based on the analysis of the 10 years of sample contract data, changes to sales & use tax treatment of highway construction projects could have a high impact on cost savings.

[1] A 50-State Review of State Legislatures and Departments of Transportation. The National Conference of State Legislatures and the AASHTO Center for Excellence in Project Finance, 2011.

[2] Applicable to all contractors working in the state unless specifically exempted.

during construction there is a double tax with sales tax paid at the point of purchase and again when those costs are included in the total contract billing. The different treatment and cost implications of the higher tax burden for state-owned highways are presented in the table below.

State Tax	State-owned Highways	City, County, Political Subdivision, & Federal-owned Highways
Sales & Use Tax	• Applied to full contract price • Materials that become part of the structure not taxed at purchase • Materials used by contractor during construction (not part of structure) taxed at purchase	• Not applied to full contract price • All materials taxed at purchase
B&O Tax	• Retailing classification • Both prime and subcontractors: 0.00471	• Public road classification • Both prime and subcontractors: 0.00484
Example: State tax cost for $1 M contract	Sales tax: $71,100 Prime B&O tax: $4,710 **TOTAL: $75,810**	Sales tax: $39,000 Prime B&O tax: $4,840 **TOTAL: $43,840**
Notes	State sales tax rate of 6.5% only. Contract assumptions: 10% consumed materials, 40% installed materials; 50% other costs.	

As a result of this differential treatment, the state sales tax cost is roughly 82% higher for projects on state-owned highways than other public highway projects – estimated at $71,100 per $1 million of construction versus $39,000 per $1 million of construction. The actual budget impact of this higher tax burden is even greater since all of the local option sales taxes, which vary based on the location of the project, would also apply.

Comparison to Other States

Compared to other states, sales tax is a much more significant cost for highway projects in Washington. Thirty-nine states apply sales tax to some portion of highway construction costs. However, only four other states apply sales tax to the full contract amount. States with sales and use taxes[3] vary in how these taxes are applied to state highway construction labor services, gross receipts, and materials incorporated in the project or consumed during construction. Some states have special taxes that are applied to state highway construction and one state, West Virginia, returns state sales and use taxes collected on state highway project to the state highway fund. (See Appendix B for a summary of other states)

Policy Considerations

Impact on State General Fund. As noted earlier, Washington relies on sales and use taxes to fund government to a much greater degree than other states. Sales and use tax is deposited in the state General Fund. Any reduction in sales and use tax that benefits WSDOT construction costs would correspondingly reduce General Fund revenues.

Impact on Local Governments. A change in sales and use tax on construction services on state-owned highways would reduce local government revenues.

The Streamlined Sales and Use Tax Agreement (SSUTA), a multi-state agreement, governs the application of sales and use tax in the state. SSUTA Section 302 states that "the tax base for local jurisdictions shall be identical to the state tax base unless otherwise prohibited by federal law." This means that the state does not have the option to exempt construction services from only state sales and use tax and maintain the local option.

Potential Impact on Ability to Tax Federal Construction Contracts. Under the Supremacy Clause of the United States Constitution, the State cannot directly tax the federal government. On construction projects, the State imposes sales and use tax on the materials the federal contractors incorporate into projects.

The Department of Revenue (DOR) has expressed concern that creating new exemptions and deferrals for construction projects present "a significant legal risk that the federal government or federal contractors will seek to re-litigate Washington v. United States. Sales/use tax exemptions pose the greatest legal risk because they plainly treat the beneficiaries of the exemption more favorably than federal contractors."[4]

WASHINGTON V. UNITED STATES, 460 U.S. 536 (1983)

The US Supreme Court, in a 5-4 decision, upheld Washington's taxation of federal contractors in *Washington v. United States,* 460 U.S. 536 (1983).

According to the Supreme Court, "The important consideration is not whether the State differentiates in determining what entity shall bear the legal incidence of the tax, but whether the tax is discriminatory with regard to the economic burdens that result. The State does not discriminate against the Federal Government and those with whom it deals unless it treats someone else better than it treats them. Here, Washington has not singled out contractors who work for the United States for discriminatory treatment. It has merely accommodated for the fact that it may not impose a tax directly on the United States as the project owner."

[3] Some states have an excise tax which has the same cost affect as sales and use tax.

[4] Department of Revenue, Federal Contractor Concern, August 2013 p.1-2.

DOR also noted that including state-owned highways in the Public Road Construction exemption would likely NOT raise the risk of federal lawsuit, as this policy would treat state and federal contractors similarly. DOR has identified a potential impact at $89 million per fiscal year if the State could not impose sales and use tax on federal contractors.

Impact on Existing Tax Code. The DOR has expressed a reservation about eliminating the double taxation of materials that are consumed during construction, which are currently taxed at the point of purchase and again when included in the total contract billing. This would add complexity to the tax code by adding a third scenario under which contractors pay tax on materials (sales and use tax on contractors, public road construction exemption, and a new WSDOT project on state-owned roads exemption) each of which is different. "Providing this type of exemption only for state transportation projects would add significant complexity for administration and contractors buying materials on a project."[5]

Potential Cost Impacts

Based on the analysis of the ten years of contract data, changes to sales tax treatment of highway construction projects could have a high impact on cost savings. Looking backward, WSDOT could have saved the following if different policies were in place:

- Up to $227 M, if projects on state-owned land were taxed similarly to projects on local and federal land (Potential Action 2).
- Up to $336 M, if state sales & use tax was directed back to transportation funding (Potential Action 3).
- Up to $42 M, if contractors were exempt from paying sales tax on consumed materials for projects on state-owned land (Potential Action 4).

[5] Email to consultants on January 13, 2014 from Beau Perschbacher, Department of Revenue.

Prevailing Wage

WSDOT construction contractors are subject to RCW 39.12 - Washington State's Prevailing Wages on Public Works Act. Contractors working on projects that receive federal funding are also subject to the federal Davis-Bacon and Related Acts (DBRA) 40 USC section 3142.[6] State law requires the payment of prevailing wages for workers, laborers, and mechanics on public works. On WSDOT projects with federal aid, the State requires contractors to pay the state prevailing wage rate if it is higher than the federal rate. State law defines the prevailing wage as the hourly rate of wage, usual benefits, and overtime paid in a locality to the majority of workers, laborers, or mechanics, in the same trade or occupation. (RCW 39.12)

The purpose of state prevailing wage law is to "protect workers from substandard earnings and to preserve local wage standards" (Everett Concrete Products, Inc. v. Department of Labor and Industries. State Supreme Court, 1988). The law is administered by the Washington State Department of Labor and Industries (L&I). L&I's responsibilities are establishing prevailing wages, determining labor classifications and associated scopes of work, processing and certifying contractor intent to pay prevailing wage and affidavit forms, investigating complaints, and receiving and distributing certified payroll records.

- The prevailing wage rate is set via survey, based on the methodology in WAC 296-127-019. (See Appendix C for a sample survey)
- Surveys are completed by occupation. The goal is to update each occupation via survey every three years with a 15-25% response rate. In actuality, surveys are conducted much less frequently.
- If a survey shows that the majority of a wage is the same as a collective bargaining agreement (CBA), then it is a CBA-derived rate and biannual increases are based on the adopted CBA. If not, there are no increases until the occupation is re-surveyed.

State and federal prevailing wages are difficult to compare due to differences in job classifications and how prevailing wages are set. The prevailing wage is expressed as a total wage (which includes hourly wage and usual benefits), holiday, overtime, and special pay requirements. Given the diversity of industries that work on public works projects, there are between 300 - 500 separate wage rates in each of the 39 counties in the state.

KEY FINDINGS:
PREVAILING WAGE

Application of Rates

- State and federal prevailing wages are difficult to compare due to differences in job classifications and how prevailing wages are set.
- In the last 10 years, federal aid projects accounted for 82% of contracts awarded and would have paid the federal prevailing wage, even if there was no state prevailing wage.

Other States

- 18 states have no prevailing wage laws: 10 used to have laws that have since been repealed, while 8 never had prevailing wage laws.

Cost Impacts

- The prevailing wage law acts as a floor on wage rates and may increase costs in some circumstances, though market factors likely play a greater role.
- State law applies to a broader range of activities than federal law.
- On a programmatic level, it is not possible to estimate the impact from labor rate floor and broader base.
- Research studies are split on whether or not prevailing wage laws make projects more expensive.

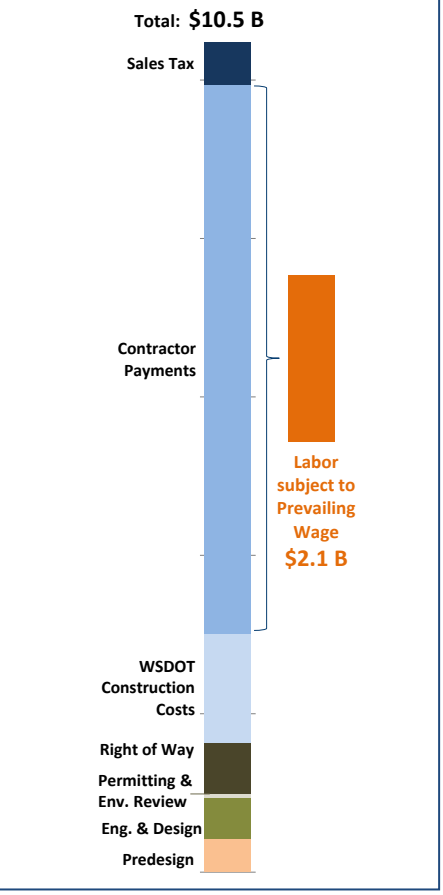
[6] "Many federal laws that authorize federal assistance for construction through grants, loans, loan guarantees, and insurance are Davis-Bacon "related Acts." The "related Acts" include provisions that require Davis-Bacon labor standards apply to most federally assisted construction. Examples of "related Acts" include the Federal-Aid Highway Acts." U.S. Department of Labor, Fact Sheet 6 The Davis-Bacon and Related Acts

LABOR COSTS SUBJECT TO PREVAILAING WAGE

Due to data limitations it was not possible in the course of this study to specifically identify the labor portion of the $10.5 B in project costs that was subject to prevailing wage. These challenges are described on page 50.

Based on discussions with contractors working with WSDOT, a "typical" contract may be composed of 30% labor subject to prevailing wage, 10% labor not subject to prevailing wage, 50% materials/equipment and 10% overhead and profit.

Using these metrics, labor subject to prevailing wage is estimated at $2.1 billion (or 20%) of the $10.5 B in project costs.



At the federal level, prevailing wages are set via the rules in DBRA. The wage is expressed as the hourly wage and usual benefits. Wages are set in four categories (residential, highway, heavy, building), within which there are multiple occupations and associated wages. In the last ten years, federal aid projects accounted for 82% of contracts and would have paid the federal prevailing wage, even if there was no state prevailing wage.

Prevailing Wage Administration

Contractors and subcontractors are required to submit the following to L&I to conform with prevailing wage requirements:

- Statement of Intent to Pay Prevailing Wage form
- Affidavit of wages paid
- Certified copy of accurate work and pay records upon request

The federal prevailing wage law has additional requirements:

- Certified payroll records – submitted weekly to project manager
- Employee interviews – allow for interviews during working hours

Prevailing Wage Cost Impacts

The state prevailing wage law does two things that could impact the labor costs of WSDOT projects. First, the law places a floor under labor rates to be paid on WSDOT projects. The floor is the state rate for state-funded projects and the higher of the state or federal rate for federal-aid projects. Second, the wording of the state law has led the courts to conclude that the application of the state law is broader than the application of the federal prevailing wage law.

We approached the question of whether prevailing wage increases costs through a literature review and a salary review. The research literature is split on whether or not prevailing wage laws make projects more expensive.

- A 1998 JLARC Highways Audit found that 0.44% of state highway program costs could be attributable to the requirement to pay the higher of the state rate or federal rate on federal-aid projects.
- There are no specific studies on the impact of prevailing wage vs. no prevailing wage for WSDOT projects.
- Nationally, studies vary on the impact of prevailing wage requirements on construction costs with no agreement as to whether these laws have an impact on overall wage levels in an area (See sidebar and Appendix D for a summary).
- Aspects of the state program add administrative burden, such as the use of a paper based survey and determining the higher of the two wages (federal or state).

- As a result of a series of court decisions, the state prevailing wage applies to a broader range of activities than the federal law. There have been nine rule changes since 1993, five of which amended scope of work definitions for specific work activities (See Appendix E for a summary).

To delve deeper into the relationship between overall construction wages and prevailing wages, two additional analyses were conducted: (1) a review of construction industry salaries across states using Bureau of Labor Statistics (BLS) data; and (2) analysis of detailed L&I affidavits.

Based on prevailing wage affidavits submitted to L&I, the average reported salary for all labor positions reported for WSDOT contracts was $64,400 per year. This is an estimate of wages only and is adjusted to 2013 dollars.

The L&I average is higher than the $53,688 average for the entire construction sector discussed in the cost analysis chapter. While this differential could be related to prevailing wage, there are also significant differences in types of labor employed in highway construction versus other construction sectors.

To better align the L&I data with a narrower industry sector, average wages were collected for the highway, street, and bridge construction sub-sector. The U.S. BLS tracks average annual salary by state by industry code.

- 2012 annual average wage for highway, street, and bridge construction in Washington State was $65,722, which is 2% higher than the wages included in the data from L&I for WSDOT construction.
- Washington's average wage is approximately 8.5% higher than the same average wage for the nation.
- By state, the average wage for highway, street, and bridge construction ranges from approximately $41,610 in Alabama to $85,966 in New York (excluding Alaska, which has the highest rates in the U.S.).

While this BLS industry average is still broader than WSDOT, it does primarily include public works transportation projects, of which state DOTs are a likely major contributor. Looking at averages and trends for the peer and neighbor states shows a similar pattern as the overall construction sector, though Washington is now higher than the national average.

PREVAILING WAGE STUDIES

Studies are mixed on whether prevailing wage adds to project costs: five of the studies reviewed found prevailing wage to be a benefit in terms of productivity that either balanced out additional cost or did not produce higher costs and five found that prevailing wage increased costs.

Pro Prevailing Wage Studies:

- The Adverse Economic Impact from Repeal of the Prevailing Wage Law in Missouri
- An Analysis of Davis-Bacon Prevailing Wage Requirements: Evidence from Highway Resurfacing Projects
- The Benefits of State Prevailing Wage Law
- Kentucky's Prevailing Wage Law: Its History, Purpose and Effect
- The Economic Development Benefits of Prevailing Wage

Con Prevailing Wage Studies:

- An Economic Examination of West Virginia's Prevailing Wage Law
- Prevailing Wage Laws: Public Interest of Special Interest Legislation
- Prevailing Wage Laws in NY State: The Impact on Project Cost and Competitiveness
- The Effects of the Exemption of School Construction Project from Ohio's Prevailing Wage Law
- Prevailing Wage Laws: Greed Disguised as Public Policy

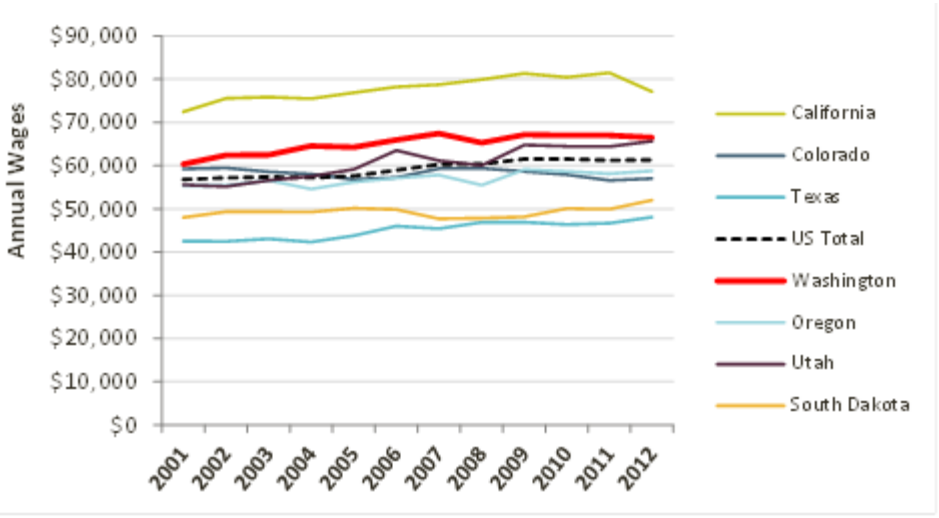
APPLICABLE INDUSTRIES

"**Public works**" labor is defined as all work, construction, alteration, repair or improvement, other than ordinary maintenance, executed at the cost of the state or any municipality or political subdivision of the state. Maintenance, when performed by contract, is considered public work that is subject to prevailing wage requirements. (RCW 39.04.0104)

State prevailing wage laws (RCW 39.12.020) prescribe the payment of prevailing wages "upon all public works": which applies to:

- **Offsite prefabrication**. Offsite fabrication of *nonstandard* items specifically produced for a public works project is considered public work for which prevailing wages are required. Offsite fabrication of *standard items* is not considered public work and is not subject to prevailing wage requirements.
- **Gravel and asphalt production and delivery**. Workers involved in the production and delivery of gravel, concrete, asphalt, or similar materials, unless delivering to a stockpile, are subject to prevailing wage rules. (WAC 296-127-010(5)(b) and WAC 296-127-018)
- **Employees other than workers, laborers, or mechanics**. The prevailing wage requirements do not apply to employees whose work is clerical, executive, administrative or professional in nature.

Exhibit 25
National and State-specific Highway, Streets and Bridges Construction Wages, 2001-2012 (2013 $)



Source: US Bureau of Labor Statistics, 2013; and BERK, 2013.

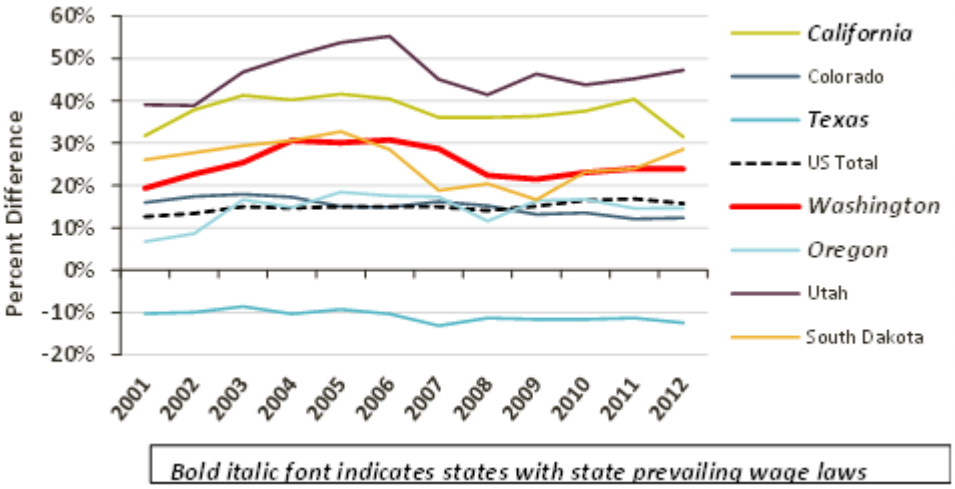
The previous analysis suggests that the overall average wage paid to the portion of labor on WSDOT contracts subject to the prevailing wage is closely aligned with overall statewide average wages for the highway, streets and bridges sub-sector.

Another noteworthy finding is that the average sub-sector wage was higher than the national average, while the overall construction average wage was much closer to the national average, suggesting that there is a relative premium in Washington for highway sector wages.

To explore this question further and to see to what degree this premium might be related to prevailing wage law, the wages in the highway sector were compared with the average wage for all construction sectors for the peer and neighbor states.

Exhibit 26 shows that all of the selected states except Texas show a similar pattern where highway sector wages are at a premium over the full sector average. Further, the premium varies widely among the selected states and can vary widely over time within each state. The overall national averages suggest an industry premium of between 10% and 15% and Washington fluctuating between 20% and 30%. The states with the greatest premium appear to be Utah followed by California.

Exhibit 26
Relationship of Highway/Bridge/Street Construction to All Construction Wages



Source: US Bureau of Labor Statistics, 2013; and BERK, 2013.

What is particularly noteworthy is that the highway construction wage premium does not seem to correlate with states that have a prevailing wage. For example California and Texas both have prevailing wage laws, while Utah, Colorado, and South Dakota do not. **This tends to support the overall conclusion from the review of other studies that it is unclear to what extent prevailing wage laws drive overall wage levels.**

Prevailing Wage in Other States

While 31 states, including Washington, set a state prevailing wage rate, 18 states have no prevailing wage laws, but use the federal prevailing wage on all federal aid projects.

Ten of these states once had laws that have since been repealed, while eight never had prevailing wage requirements. One state has a prevailing wage law, but does not set a prevailing wage rate. (See Appendix F for a summary of other states)

Prevailing Wage Data Challenges

L&I provided us with their prevailing wage affidavit database for the last 10 years. The goal was to quantify the wages subject to prevailing wage on WSDOT projects. However, through cleaning and analyzing the database, multiple significant data challenges arose that prevented a reliable calculation of this wage amount.

The first step was to match the affidavit database to the WSDOT project database. Given expected variation and errors in any dataset, it was important to match as many projects as possible so overall findings would be meaningful. However, the prevalence of multiple types of data errors led to a decision that this database could not produce reasonable numbers for this study. These data issues included:

- **Data Entry Errors**. Contractors must enter three numbers to enable calculation of total wages: an hourly salary rate, hourly fringe rate, and hours worked quantity. Many lines include data errors that significantly alter calculations, such as missing periods. For example, one project listed hours worked as 193291 instead of 1932.91. This resulted in total payments listed at $8.4 million instead of $84,000. While we found some of these errors and fixed them, there are hundreds in the dataset and no consistent way to screen for them.
- **Missing or Incorrect Contract Numbers**. The only way to match the affidavit database to the project database was through a Contract Number field on the affidavit form. This field was inconsistently filled out, especially for subcontractors, which meant we could not pull in all of the wages associated with a given project.

  For example, on the Tacoma Narrows Bridge, only four affidavits (one for the prime contractor and three for subcontractors) listed the correct contract numbers for the project. However, the project included the use of more than 90 subcontractors, so we know that these affidavits only represent a subset of all labor on the project. This issue came up for many projects, and without a systematic way to identify where these issues are and to find the associated affidavits, we were not able to include a large portion of wages in the analysis.

- **Prevailing Wages versus Actual Wages**. While affidavit instructions ask contractors to report actual wages paid, the certification statement that the contractor must sign at the end of the affidavit asks them to certify that. "…all workers I employed on this Public Works Project were paid no less than the Prevailing Wage Rate(s)…" This may result in the contractor listing the prevailing wage rates rather than actual rates for some positions, which would result in an understating of wages paid for some projects. Since the information provided becomes public, there are competitive reasons why some contractors may prefer to report the prevailing wage in lieu of actual wages paid, though it is not possible to know how frequently this might be done in practice.

Given these challenges, it was not possible in the course of this study to come to a meaningful conclusion about prevailing wage costs over the 10-year study period.

KEY FINDINGS: ENVIRONMENTAL REVIEW, PERMITTING, & MITIGATION

Environmental Review &Permitting. Environmental review is a small portion of overall project costs. Projects are subject to regulations from federal, state, and local agencies. For environmental review, NEPA and SEPA are the primary regulations that impact project design decisions.

The vast majority of WSDOT projects are excluded from NEPA and SEPA review. In 2011-13, 94% of projects had a NEPA Categorical Exclusion and 84% had a Categorical Exemption from SEPA.

Approximately 3% of WSDOT's projects underwent an Environmental Impact Statement (EIS) or Environmental Assessment (EA) due to NEPA, and about 1% included an EIS due to SEPA.

Mitigation. Mitigation costs cannot be easily split out within the 84% of costs that are construction. Analysis suggests the majority of mitigation is based on required elements, for example, stormwater and wetlands. WSDOT currently uses its design process to avoid and minimize impacts; however, it is not clear the degree to which WSDOT could programmatically reduce compensatory mitigation required by state and federal regulations.

Environmental Review, Permitting, & Mitigation

Costs associated with environmental review, permitting, and mitigation are frequently mentioned as a significant contributor to project costs. Our cost analysis identified relatively small shares of expenditures related to the environmental review and permitting process. That said, decisions made during these processes affect mitigation costs, which were found to be a significant share of project costs. The following were reviewed together because they are interrelated:

- **Environmental review** is a process which aids in understanding the potential impacts of a proposed project by evaluating alternatives and identifying impacts to be analyzed in an environmental document, in accordance with the State Environmental Policy Act (SEPA) and National Environmental Policy Act (NEPA) goals and policies.
- **Permitting** is a process that provides legal authority to proceed with a project subject to commitments to address any environmental impacts that need mitigation.
- **Mitigation** includes actions taken to avoid, minimize, or address environmental impacts.

Environmental Review & Permitting

WSDOT projects are subject to environmental review and permitting regulations from federal, state, and local agencies. For environmental review, NEPA and SEPA are the primary regulations that impact project design decisions.

The **National Environmental Policy Act (NEPA)** [42 U.S.C. 4321 et seq.] was signed into law on January 1, 1970. The Act establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals within the federal agencies. NEPA Review and documentation are required for all Federal agency "actions" that are not categorically excluded, including:

- Federal Projects
- Issuance of Federal Permits
- Projects with Federal Funding
- Projects on Federal Land

Seventeen states, including Washington, have implemented **state environmental policy acts (SEPA)**. In Washington, SEPA Review is required for all state or local agency "actions" that are not categorically exempt (WAC 197-11-704), including:

- **Project Actions**: Construction of roads, public buildings, utilities; private construction projects that require a state or local permit.

- **Non-project Actions**: Rules, ordinances or regulations; Comprehensive Plans or zoning codes; Road, street and highway plans.

Some transportation projects require approval from both federal agencies and state or local agencies requiring review under SEPA and NEPA. In this case, agencies are permitted (and encouraged) to prepare and issue combined documents that meet the requirements of both. NEPA and SEPA lead agencies can agree to be co-lead agencies and issue joint NEPA/SEPA documents. SEPA rules (WAC 197-11-610) allow the use of NEPA documents to meet SEPA requirements.

- A NEPA Environmental Assessment (EA) may be adopted to satisfy requirements of a SEPA DNS or an EIS.
- A NEPA Environmental Impact Statement (EIS) may be adopted as a substitute for a SEPA EIS.
- Federal documents may also be incorporated by reference as support for issuance of a SEPA document (WAC 97-11-635).

Generally, NEPA requirements are equal to or more stringent than SEPA and NEPA review is typically longer. Large, complex projects are likely to require an EA or EIS, which requires additional or expanded evaluations of:

- Environmental Justice
- Social, Economic, and Relocation
- Public Lands (Section 4(f), 6(f) and Forests)
- Farmland and Agriculture
- Historic, Cultural, and Archeological Resources

For smaller, routine projects, SEPA is more onerous than NEPA. The SEPA checklist is more time consuming than the documentation prepared for Federal Highway NEPA Categorical Exclusions (CE). NEPA CEs have been updated many times in the past few years, whereas SEPA has not. SEPA adds process requirements on projects that require SEPA checklists and Determinations of Non-Significance that do not exist with NEPA CE projects (e.g., public notice, circulation, and 14-day comment period).

WSDOT has three typical review scenarios:

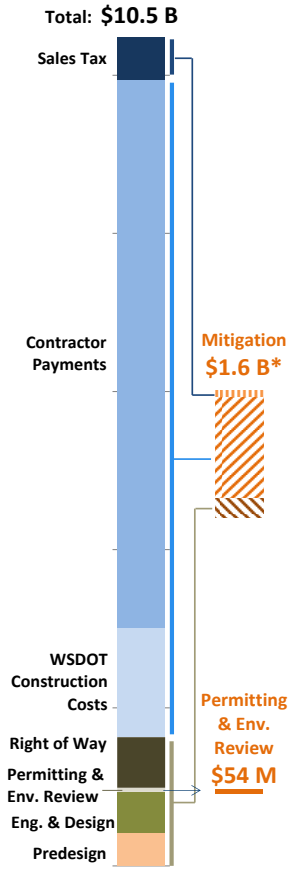
1. Large projects that use combined NEPA/SEPA documents. In this case, NEPA requirements are used by WSDOT;
2. Projects that are categorically exempt by SEPA and don't require any further SEPA review; and
3. Smaller projects that qualify for a NEPA categorical exclusion but not a SEPA categorical exemption. These require both NEPA categorical exclusion documentation and a SEPA checklist with comment period.

PREVIOUS ENVIRONMENTAL REVIEW PROCESS STUDIES *THE GRAY NOTEBOOK, EDITION 33,* MARCH 2009 (PAGE 59):

In 2005, JLARC completed two reviews of the environmental review process as it relates to transportation projects. This review concluded that the NEPA documentation process was not the cause of delay; the major contributing causes were funding uncertainties, design changes, lack of adequate federal and state resource agency staffing, and changes to or new regulation.

In 2008, the Washington division of FHWA reviewed WSDOT's performance on the simplest project-level environmental reviews. These projects are categorically exempt under NEPA when federal actions are involved, and excluded under SEPA when state actions are involved. Since 1999, Washington State has very effectively applied an administrative delegation of authority from FHWA that allows WSDOT to administer NEPA.

Upon examining 944 projects classified as categorical exclusions under NEPA during the 2005-2007 biennium, FHWA was pleased with WSDOT's performance. Of those 944, 566 were signed by FHWA and 388 were completed by WSDOT without FHWA signature under our joint agreement. Following their review, FHWA reiterated their support for the agreement that allows WSDOT to expedite NEPA approval for the simplest projects.



* We were not able to directly quantify mitigation costs using available data. The estimate of $1.6 billion is based on a sample set of case studies that found, on projects that included mitigation, mitigation-related costs averaged about 16% of total project costs. This factor was used to extrapolate to total program costs. WSDOT noted that not all projects require mitigation spending, and so this extrapolation may overstate total mitigation costs.

Frequency of Application. WSDOT provided the data shown in Exhibit 27 that summarize environmental review activity for 317 projects that were advertised for construction during the 2011-13 biennium.

Exhibit 27
Frequency of Environmental Review for 2011-12 Biennium Projects

NEPA				SEPA		
EIS	EA	CE	No NEPA	EIS	DNS	CE
4 (1%)	7 (2%)	297 (94%)	9 (3%)	4 (1%)	47 (15%)	266 (84%)

Notes
EIS – Environmental Impact Statement
EA – Environmental Assessment
NEPA CE – Categorical Exclusion
DNS – SEPA Checklist/Determination of Non-Significance
SEPA CE – Categorical Exemption

The vast majority of WSDOT projects are excluded from NEPA and SEPA review – in 2011-13, 94% of projects had a NEPA Categorical Exclusion and 84% had a Categorical Exemption from SEPA. Three percent of WSDOT's projects underwent an Environmental Impact Statement (EIS) or Environmental Assessment (EA) due to NEPA, and about 1% included an EIS due to SEPA.

The environmental review process can increase public acceptance and lead to improvements/efficiencies in overall project design. However, it is worth noting that views are mixed. There are those that perceive that environmental regulations are overly burdensome and those that believe SEPA is not stringent enough and that some impacts are not being mitigated under current law.

Many efforts to streamline the permitting process have been implemented over the past decade (see Appendix G).

Mitigation

Mitigation activities fall into the following categories:

Temporary. Temporary embankments, water quality monitoring, stream by-passes, dust prevention, erosion control, etc.

Stormwater. Conveyance to treatment facility, pipes, inlets, manholes, flow control structures, fencing, property acquisition, etc.

Wetland. Retaining walls, altered alignment, bridges, property acquisition, wetland construction, fencing.

Stream. Long bridge spans, retaining walls, riparian area enhancements, etc.

Noise. Property acquisition, concrete foundations and walls, other barriers, clearing and grubbing, wall aesthetic treatments.

Context Sensitive Solutions. Community gateways, concrete stamping and coloring, unique railing or fencing, special landscaping, shared-use paths.

Mitigation Type	% of Estimated Mitigation Cost	Required By	Administered Through	Technical Requirements
Stormwater Facilities	51.3%	Federal Clean Water Act (CWA)	Ecology NPDES Permit	HRM*, SMMWW^, SWMMEW+
Wetland Restoration	20.9%	CWA; GMA; Fed and State No Net Loss Policy	ACOE 404 permitting & Local CAOs	Wetland Mitigation in Washington State
Noise Walls	14.6%	Federal Rule 23 CFR 772; FHWA Guidance	WSDOT	WSDOT: Noise Policy and Procedures
Stream Protection	10.3%	CWA; GMA; ESA	ACOE 404 permitting & WDFW HPA	Washington Department of Fish & Wildlife (WDFW)
Context Sensitive Solutions	1.9%	NEPA, ISTEA, National Highway System Designation Act of 1995, and RCW 47.04.330	WSDOT in collaboration with local partners	
Temporary Mitigation	0.7%	NEPA, SEPA, local governments	Permit conditions from Ecology and local governments	WSDOT Best Management Practices (BMP)
Dust Control	0.3%	Federal Clean Air Act, National Ambient Air Quality Standards, Washington Ambient Air Quality Standards	Permit conditions from Ecology	WSDOT BMP

Stormwater

Stormwater mitigation makes up the largest share of mitigation costs. Costs come primarily from requirements for flow control and treatment facilities. WSDOT must comply with federal and state water quality laws for the 40,000 acres of impervious surfaces it operates and maintains. WSDOT follows the stormwater permit process, including the Highway Runoff Manual (HRM).

The HRM includes minimum requirements and best management practices equal to those found in the state Department of Ecology's Stormwater Management Manuals for Western and Eastern Washington. The two manuals reflect the significant differences in climate, hydrology, and geology in eastern Washington compared to western Washington.

Notes:
* WSDOT Highway Runoff Manual
^ Stormwater Management Manual for Western Washington
+ Stormwater Management Manual for Eastern Washington

WHY MITIGATION RATIOS?

Source: Wetland Mitigation in Washington State *Part 1: Agency Policies and Guidance* (2006)

Risk of Failure. Some wetland mitigation projects do not successfully compensate for wetland function loss and degradation.

Temporal Loss. It may take many years for a compensation site to achieve the "ecological equivalency" to replace lost wetland function.

Some Types of Compensation Result in a Net Loss. Some types of compensation result in a net loss of wetland acreage and/or function (e.g., enhancement or preservation). One way to minimize this loss is to require larger amounts of compensation.

Type of Wetlands and their Functions. Loss of a wetland with high functions carries a higher risk of failing to replace the functions.

The Location and Kind of Compensation. Out-of-Kind or distant replacement have a higher likelihood of degrading overall wetland functions.

Permanence or Degree of Impact or Alteration. In some cases a wetland may only be temporarily disturbed. Impacts that are relatively short in duration generally require lower mitigation ratios than permanent impacts.

Wetlands

Twenty-two projects (7% of projects) required wetland mitigation. **Our general finding is that we are doing what the federal government requires in terms of wetlands mitigation, similar to other states. Although our specific geography and climate may trigger the need for mitigation more frequently than in other locations (e.g., we have more wetlands than other states), the overall standards are not significantly different.**

The following policies and laws impact wetland mitigation activity.

US Army Corps of Engineers. Section 404 of the Federal Clean Water Act regulates discharge of dredge or fill materials to waters of the US. Waters of the US include lakes, rivers, streams, and wetlands.

Governor's Executive Order 98-10 states "Achieve no overall net loss in acreage and function of Washington's remaining wetlands base".

State Growth Management Act (GMA) requires that all cities and counties in the state designate and protect the functions and values of critical areas using best available science. Critical areas are defined as:

- Wetlands
- Areas with a critical recharging effect on aquifers used for potable water
- Fish and wildlife habitat conservation areas
- Frequently flooded areas, and
- Geologically hazardous areas

Critical Areas Ordinances (CAOs) require mitigation for impacts to critical area AND buffers (NEPA only requires critical areas). "The buffer for a wetland created, restored, or enhanced as compensation for approved wetland alterations shall be the same as the buffer required for the category of the created, restored, or enhanced wetland."[7]

- Mitigation ratios for buffers are typically 1:1[8]
- Mitigation ratios for wetlands are consistent with the Wetland Mitigation Manual in Washington State (2006)

[7] Department of Commerce: Example Code Provisions For Designating and Protecting Critical Areas.
[8] See for example, King County (21A.24.340) and Clark County (40.450.040.D.6 & Table 40.450.030-2)

Wetland Mitigation in Washington State. This manual provides compensatory mitigation guidelines and ratios. Joint guidance is provided by the Washington State Department of Ecology; U.S. Army Corps of Engineers Seattle District; and U.S. Environmental Protection Agency Region 10. This guidance helps insure that mitigation decisions are consistent across federal and state agency wetland mitigation requirements.

Mitigation type and cost are based on the size and function of the impacted wetland. In all cases, WSDOT takes the following steps in mitigation decisions:

1. **Avoid**. Adverse impacts to aquatic resources are to be avoided and no discharge shall be permitted if there is a practicable alternative with less adverse impact.
2. **Minimize**. If impacts cannot be avoided, appropriate and practicable steps to minimize adverse impacts must be taken.
3. **Compensate**. Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts which remain. The amount and quality of compensatory mitigation may not substitute for avoiding and minimizing impacts.

Compensatory mitigation only comes in after all impacts have been avoided and minimized to the greatest extent practicable. To determine the compensatory mitigation needed, the project applicants must answer the following questions to the satisfaction of the permitting agency:

- What are the types and extent of wetlands (area and function) affected by the project?
- How will proposed mitigation compensate for impacts (i.e., how will the project contribute to the goal of no net loss of wetland area, functions, or both)?
- Will the proposed mitigation be successful and sustainable?

In 2008, Ecology convened a multi-agency, multi-stakeholder forum to explore the state of mitigation and how to improve outcomes. The forum recommended use of mitigation banks and In Lieu Fee (ILF) programs. Instead of being responsible for monitoring the site for 10 years and managing the mitigation, the applicant purchases credits and is relieved of any further responsibilities for the mitigation. There are currently 13 mitigation banks and two ILF programs in operation that cover much of the Puget Sound area and I-5 corridor. WSDOT has three certified mitigation banks. Where these programs exist, they are often preferred over individual mitigation sites.

Ratios are a coarse tool based on area, wetland category, and work performed to determine anticipated gains in functions from the mitigation. Ratios are not hard line requirements but are used to provide predictability. Actual mitigation requirements are determined on a case by case basis.

Mitigation banking can be thought of as a type of "savings account" for mitigation. The bank owner creates, restores, enhances and preserves functioning wetlands prior to environmental impacts. These acres are then converted to "bank credits" that can be used later as compensation for unavoidable wetland impacts within the bank's specified service area.

In-Lieu Fee mitigation is an option where project proponents pay a third party to provide mitigation instead of building a project-specific mitigation site.

Oregon has a completely different system to regulate wetlands. Oregon has Statewide Removal-Fill Law, which requires a wetland fill permit separate from the federal Corps of Engineers permit.[9] Oregon compensatory mitigation ratios are as follows:

- Restored: 1:1
- Created: 1.5:1
- Enhanced 3:1

However, Oregon has a host of other requirements and policies including in-kind replacement generally being required; an allowance to increase ratio for temporal loses; and more established system of mitigation banks and fee-in-lieu options. Utah appears to have no regulatory role in wetlands protection relying solely on the Corps for permitting.

Noise

Noise walls accounted for 15% of the mitigation costs in the case studies. Federal rules require that state DOTs develop noise policies that are approved by FHWA. WSDOT's Noise Policy Procedures are based on the federal rule, and noise analysis occurs within the NEPA/SEPA process. Mitigation or abatement, which usually consists of noise walls, is required if:

- Feasible (sound level reductions, constructability)
- Reasonable (within allowable cost with design goal achieved)
- Acceptable to the public (eligible residents want abatement)

FHWA approves all final mitigation/abatement design.

Fish Passage

While we could not analyze the cost of fish passage barriers in the historical data used for this study, barrier correction is an emerging issue that could be a significant driver of future mitigation costs.

A U.S. District Court injunction (part of the U.S. v. WA culverts case) requires the state to correct 847 WSDOT culverts in western Washington by 2030. This case has been appealed to the Ninth Circuit. Statewide, WSDOT has 3,204 crossings on fish bearing streams, of which 1,519 have the potential for significant habitat gain – at least 200 linear meters of habitat without a natural barrier. Of these barriers, 1,013 are within the court case area, of which 847 have significant habitat gain and are subject to the court order. Up to 10% of the 847 culverts subject to the order can be deferred.

WSDOT NOISE POLICY PROCEDURES DEFINITIONS

Feasibility is a combination of acoustic and engineering considerations that asks - "Can abatement be constructed that achieves a meaningful reduction in sound levels?"

Reasonableness is evaluated after abatement is found to be feasible and assesses the practicality of the abatement based on a number of factors. Required factors are cost effectiveness, consideration of the viewpoints of the property owners and residents of benefited receptors, and noise abatement performance (noise reduction design goal).

Based on noise wall costs from 2007-2010, the current average costs for Washington State are:

- Type I Noise Walls: $51.61/ft^2
- Type II Noise Walls: $75.10/ft^2

[9] Environmental Law Institute, State Wetland Protection: Status, Trends & Models, March 2008.

Fish passage barrier corrections are funded in one of three ways:

- Stand-alone project
- Part of a larger highway project – barrier culverts that are within the geographic limits of the highway project
- Maintenance program – limited to cleaning out and not always a complete barrier correction

Funding for the 2013-15 biennium includes $36 million in stand-alone projects. Twenty-six are funded for construction: 16 of which are in regions subject to the court order while the other 10 are not.

WSDOT has estimated the costs to comply with the Court Order at $310 million per biennium or $2.4 billion from 2015-2030. This estimate assumes that all are constructed as stand-alone projects.

KEY FINDINGS:
RISK ASSIGNMENT

WSDOT is currently authorized to deliver projects using three project delivery methods:

- Design-Bid-Build Contracting
- Design-Build Contracting
- State Force Work

Other states use a method known as General Contractor/Construction Manger (GC/CM), which can provide additional risk sharing with contractors.

WSDOT should choose its delivery methods appropriately based on:

- Size and complexity of the project
- Project schedule and cost

The Legislature should consider allowing more flexibility for WSDOT to use Design-Build on more projects and to allow GC/CM contracting so project managers can choose the method most appropriate to their project needs.

Risk Assignment

One of our major analytic findings is that some of the biggest differences between construction contract award amounts and final contract payments are due to non-trivial errors on large projects. Design-Bid-Build contracting results in the highest owner risk assumption and is the method that WSDOT uses most often. Risk should be allocated to the party (WSDOT or contractor) best suited to manage the risk with the correct mix of core competencies. WSDOT should consider adjusting how it shares risk with its contractors to minimize unexpected expenditures in the future.

Should GC/CM contracting be authorized?

- 17 states authorize GC/CM contracting for transportation departments.

Could Design-Build contracting be used more to reduce WSDOT's share of project risk?

- 27 of 45 states using Design-Build have no threshold or limit on Design-Build projects. (State law limits Design-Build to projects over $10 M plus an additional five projects between $2 M and $10 M that have already been undertaken).

It is important to note that risk transfer opportunities do not come without cost. Since the design is much less developed when a Design-Build contract is procured, contractors must make judgments about the uncertainties at that stage and their ability to mitigate these potential risks. They account for these factors in their bids.

Project Delivery Methods

Project delivery is defined as the method for assigning responsibility to an organization or an individual for providing design and construction services. The decision to use a particular project delivery method is made during the pre-design phase and depends on:

- Size and complexity of the project
- Project schedule and cost
- Whether the delivery method is authorized

While no single project delivery method is right for every project, there are characteristics of the methods, in particular risk allocation, that should be considered. This section discusses four project delivery methods. The first three are used by WSDOT while the fourth is not, though it is used by other state DOTs.

- State force labor
- Design-Bid-Build
- Design-Build
- General Contractor/Construction Manager (GC/CM)

State Force Work

State Force Work is construction work conducted by WSDOT maintenance and traffic staff, contracted through the highway construction program. It does not include inspections, environmental work, or mitigation work. RCW 47.28.030 allows state force work where the labor costs are less than $60,000 or less than $100,000 if delaying the work would jeopardize a state highway or constitute a danger to the traveling public.

WSDOT Implementation. WSDOT used state force construction workers on approximately 42% of projects in the project database. Expenditures on state force construction work totaled $90.7 million over the ten-year period (when adjusted to 2012 dollars). Consistent with the statutory limitations on using state force work, the majority of effort was spread over very small projects and small tasks on larger projects, such as traffic control.

Design-Bid-Build

Design-Bid-Build is the most commonly used transportation contracting method with the least amount of risk allocated to the contractor. Under this method, the owner (WSDOT) is responsible for design of the project using their own staff or consultant services. Plans, specifications and estimates are prepared by the owner's engineer. The owner advertises the project and awards the contract to the lowest responsible bidder. A separate construction contract is issued based on the completed construction document. The owner is responsible for the design and warrants the quality of the construction documents to the contractor.

WSDOT Implementation. RCW 47.28 establishes Design-Bid-Build requirements. Currently, it appears that Design-Bid-Build is the default contracting method and Design-Build (or other methods) is treated as an exception, where a project manager needs to make a case for its use. Analysis of the project database (projects completed between 2003-12) showed that over the past ten years WSDOT completed 99% of its contracts using Design-Bid-Build, which comprised 76% of all contract dollars.

Design-Build (DB)

With Design-Build, the design and construction phases are combined into one contract and awarded to a contractor (or team of contractors). This method shifts more risk to the contractor as they are responsible for the design work. Hand-off from WSDOT to the contractor takes place at 20-30% design. Construction can begin immediately after designs are completed.

WSDOT Implementation. RCWs 47.20.780 and 47.20.785 authorize Design-Build for projects greater than $10 M and for five pilot projects greater than $2 M where Design-Build is critical to construction methodology; there is an opportunity for greater innovation and efficiencies between designer and builder; or there are likely to be significant savings in delivery time. Analysis of the project database

2006 FHWA DESIGN-BUILD EFFECTIVENESS STUDY

This study included results from other studies, including one from Washington and a survey on state Design-Build programs. High-level findings: 14% reduction in project schedule, 3% reduction in project cost compared to Design-Bid-Build no change in project quality:

Advantages

- Time savings: early involvement of contractor, overlapping design and construction, no separate contractor bidding
- Cost savings: communication efficiencies, few change orders, reduces inspections by DOT
- Quality improvement: focus on quality control and quality assurance, project innovations

Disadvantages

- Favors large national engineering and construction firms
- Reduces competition by excluding smaller firms
- Increases cost by eliminating low bid requirement for contracting
- Modifies traditional checks & balances between design and construction

CONSTRUCTION MANAGER AT RISK (aka GC/CM) PROJECT DELIVERY FOR HIGHWAY PROGRAMS

This Transportation Research Board study synthesizes several studies and original research on GC/CM. The four most frequently cited advantages and disadvantages were as follows:

Advantages

- Contractor input into design
- Ability to accelerate schedule
- Cost certainty at an earlier point than with Design-Bid-Build
- Ability to bid early work packages to mitigate risk of construction price volatility and accelerate schedule

Disadvantages

- Reconciling motivations of construction manager and designer – cost control versus conservative design to reduce design liability
- Owner must administer both a design and construction contract
- Final actual cost is unknown until the GMP is established

showed that over the past ten years, WSDOT completed only 1% of its contracts using Design-Build, which comprised 24% of all contract dollars. WSDOT has undertaken five projects between $2 M and $10 M, which means that its current authority is for projects over $10 M.

General Contractor/Construction Manager (GC/CM)

Description. A general contractor is selected during the design phase to increase collaboration between owner and contractor and provide more input into constructability, cost, and schedule. GC/CM involves two contracts with a contractor: one for preconstruction services with a provision for a guaranteed maximum price (GMP) and another for construction. The owner is not liable for costs in excess of the GMP unless the scope changes. However, the owner is responsible for design, which is typically done with consultant services.

WSDOT Implementation. The Alternative Public Works Contracting chapter of Washington State law (RCW 39.10) governs agency use of GC/CM via an oversight board called the Capital Projects Advisory Review Board (CPARB). While WSDOT is eligible to use this process the department has not done so. The CPARB process is most often used for vertical construction and not highway projects. Unlike for Design-Build and Design-Bid-Build, WSDOT is not separately specifically authorized to use GC/CM. CPARB evaluates projects using the following criteria:

- Project implementation involves complex scheduling, phasing, or coordination.
- The project involves construction at an occupied facility which must continue to operate during construction.
- Involvement of the GC/CM during the design stage is critical to the success of the project.
- Project encompasses a complex or technical work environment or the project requires specialized work on a building that has historic significance. (RCW 39.19.340).
- No threshold dollar amount for projects.
- Public bodies may seek a three-year GC/CM certification from CPARB, instead of project-by project approval. WSDOT would have to demonstrate successful management of at least one GC/CM project in the last five years, which means that they would have to have had at least one project approved by CPARB before seeking the three-year certification (RCW 39.10.270).

The CPARB process requires that sub-contracts be bid, which would reduce the time and cost savings of this approach for highway projects and is one of the primary reasons that the CPARB process is less suited to highway projects than to vertical construction projects. The CPARB statutes prohibit the GC/CM from

bidding on sub-contract work or on supplying materials and equipment (RCW 39.10.380-390).

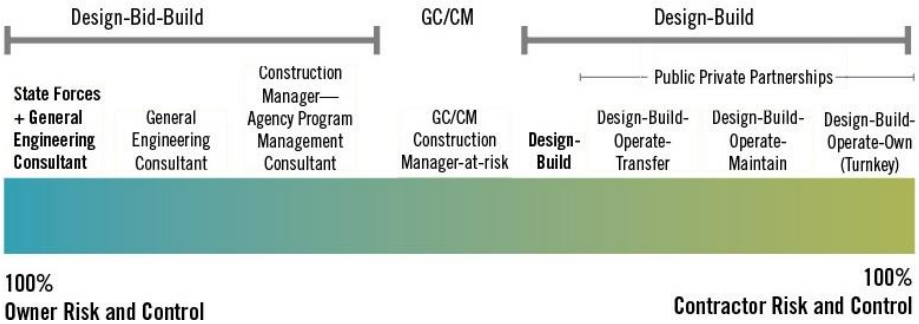
Other States: Seventeen other state legislatures have authorized GC/CM for state DOTs. Ten of the 17 have no threshold or limit on GC/CM projects while seven have set a threshold or limit. As noted in the textbox, FHWA encourages GC/CM and it is gaining wider acceptance among DOTs.

RISK ASSIGNMENT

The critical policy and program management question is how best to use contracting methods to align appetite for risk, owner core competencies, overall cost of project delivery, and budget certainty.

Exhibit 28 below shows the risk allocation and control between project owner and contractor across various project delivery methods.

Exhibit 28
Owner assumed risk varies with project delivery method



Source: BERK, 2013.

- **Design-Bid-Build.** Owner keeps the majority of the risk, accepts financial responsibility for project unknowns and potential errors. This may result in lower bids, but also greater budget uncertainty.
- **General Contractor/Construction Manager.** Owner keeps the majority of the risk and accepts financial responsibility for project unknowns. Mitigates some of that risk by introducing the contractor perspective into the design process, which may lower risk and/or reduce schedule.
- **Design-Build.** Owner passes greater share of risk to contractor, contractor accepts financial responsibility for more project unknowns; risk transfer will affect bids and may increase overall project costs, but should result in greater budget certainty.

DESIGN MILESTONES

- Project development at **30% design** = Basic information on design parameters, public concerns, and environmental impacts.
- **60% design** = Preliminary information in more detailed design plans and specifications such as pavement and drainage design. Beginning of permitting process.
- **90%** = Finalizing construction documents, right of way acquisition, construction plans, specifications, estimates, utility agreements and traffic management plans.
- **100%** = bid documents.

WSDOT PROJECT DELIVERY METHOD SELECTION

When selecting Design-Build as the delivery method, WSDOT relies on its *Design-Build Project Delivery Guidance Statement* (2006), which outlines procedures to follow when proposing Design-Build as the project delivery method. Recent studies have commented on project delivery method selection. The 2013 *Mega Project Assessment* included the following finding and recommendation:

At WSDOT, there appears to be less structure in terms of how decisions are made regarding delivery methods. Thoughtful consideration of the risk profile of specific mega projects will lead to a delivery method tailored to the project. We recommend that the highest-level executives within WSDOT consider all possible scenarios before selecting the contracting approach, and then consider how authority should be aligned for the specific projects. (pages 3-4)

In addition, the 2013 WSDOT *SR 520 Pontoon Construction Project, Internal Review Report* noted the following about use of Design-Build on this project[10]

Schedule was a driver:

"The group concluded that using a Design-Build contracting method was the only way to meet the schedule." (page 5)

"The schedule to deliver pontoons and to have the bridge open by 2014 drove decision-making in this project, and overshadowed effective balancing of other considerations such as risk and cost." (page 5)

Decision had risk implications:

b. WSDOT made the choice to use Design-Build contracting for a very good reason, had used it successfully before, but, in this case included the option for the Design-Builder to use a highly developed design by WSDOT for the major element of the contract (the pontoons). This decision put the responsibility for any and all design-related problems with the pontoons on WSDOT and caused confusion regarding the appropriate contract administration process. When that decision was made, there was then:

i. Limited follow through regarding documentation of that decision and its implications
ii. Limited consideration of the risks associated with that decision, their implication and a risk management strategy to avoid or minimize those risks (pages 9-10)

[10] : This project is not a typical Design-Build project as WSDOT provided a more complete design to the Design-Builder than the typical preliminary design used in this process.

OTHER CONSIDERATIONS

Pavement Warranties

A topic that came up during contractor interviews was the use of pavement warranty programs to reduce WSDOT staffing requirements for inspection and testing. Warranties shift the performance risk to the contractor and have been implemented in 24 states.[11]

According to a NCHRP Report on the topic, "The DOTs that have shifted greater responsibility for inspection and quality management to the contractor have reported significant savings in resources. This reallocation appears more likely to occur when warranties are used in conjunction with Design-Build or other alternative contracting systems that shift greater control to the contractor for design and construction."[12]

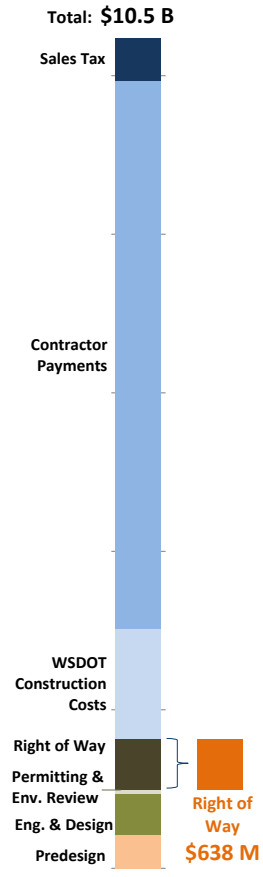
[11] NCHRP Report 699. Guidelines for the Use of Pavement Warranties on Highway Construction Projects, 2011, p. 5.

[12] Ibid., p 46.

KEY FINDINGS:
OTHER COST DRIVERS

With **Right of Way**, opportunities for saving money are likely around how much property needs to be purchased, rather than how much WSDOT is paying for specific pieces of land.

Based on CCI analysis from 1990 to 2012, WSDOT's **materials costs** have increased at approximately the same rate as national averages and as other states.



Other Cost Drivers

This section covers additional cost components that were analyzed but not determined to be Key Cost Drivers. It is important to understand the foundation of these components because they may account for a significant share of project costs. However, actions related to these areas likely would not result in significant or meaningful changes to efficiency or cost savings.

Right of Way

Right of Way processes for state DOTs are regulated by numerous federal and state laws. According to WSDOT's Right of Way Manual, the intent of right of way regulations is to assure "fair and equitable treatment of displaced persons, to encourage and expedite acquisitions by negotiations, and provide direction on properly managing properties once acquired by the department." To operationalize these laws and provide additional guidance around best practices, WSDOT publishes an annually updated Right of Way Manual.

A key component of Right of Way laws is regulating how much WSDOT pays for property. State laws provide strict guidance on appraisals and specifically on how fair market value should be determined. Fair Market Value is defined in the Right of Way Manual as the amount which a well-informed, voluntary buyer and a well-informed, voluntary seller would pay and accept for the property. WAC 468-100-102 outlines minimum appraisal standards that include approaches to appraisal, adequate property descriptions, and what can and cannot be included in determination of fair market value.

WSDOT's Real Estate Services division uses the Fair Market Value, as determined by the appraiser, to establish the just compensation for a property. When WSDOT's highway project plans necessitate that WSDOT acquire an entire ownership, just compensation is equal to the Fair Market Value of the property. If only partial acquisition is necessary, just compensation is set as the difference between Fair Market Value of the entire property and the Fair Market Value of any portion not required to be purchased.

While the Manual provides much more detail on how to specifically calculate values, benefits, damages, and relocation compensation, the price of parcel acquisition drives about 74% of WSDOT's right of way costs (or about 4.5% of project costs). Given the restrictions around independent appraisals and purchasing property for Fair Market Value, **opportunities for saving money when it comes to right of way likely lie around how much property needs to be purchased, rather than how much WSDOT is paying for specific pieces of land.**

Cost of Materials

Materials comprise approximately $3.5 billion over the study period (50% of construction contracts, or about 33% of project costs). The measure used to compare costs across states, the Construction Cost Index (CCI) has many limitations that make it an imperfect tool for comparison (see sidebar to right).

- **Based on CCI analysis from 1990 to 2012, WSDOT's materials costs have increased at approximately the same rate as national averages and as other states.**
- While materials are a large share of project costs, WSDOT does not have significant control over the price. Materials costs are set by the market, and potential savings from interstate purchases of materials to achieve lower prices are typically negated by transportation costs.

In some cases, particularly when purchasing fabricated materials created off-site, there may be enough of a cost advantage through the combination of cheaper materials and lower out-of-state wage rates that are not subject to state prevailing wage rates to offset transportation costs. For example, installed materials with a high labor component might be cheaper to source from out of state suppliers, particularly if the project is near the state border and transportation costs are not a significant differentiating factor.

CONSTRUCTION COST INDEX

The Construction Cost Index (CCI) tracks selected standard bid items over time. The CCI provides a point of comparison for construction cost growth across the nation, with the following limitations:

- In Washington, CCI bid items represent seven of potentially hundreds of bid items for a project. CCI bid items account for approximately 18% of contract costs.
- Each state's index includes a similar set of items, but specific definitions for items and methodologies for calculating the index vary by state.
- FHWA stopped creating a composite index after 2006 due to the limited use and value of the index and questions about reliability of the data.
- A 2007 FHWA reported that costs of commodities used in highway construction primarily varied across states due to the difference in the cost of transporting commodities.

POTENTIAL ACTIONS

What can be done to increase efficiency and reduce cost in WSDOT's construction program? For each of the cost elements described above, we identified potential actions to save costs. This section starts by summarizing the main findings that correspond to the 22 potential actions. These actions have been identified as alternatives for consideration by the Legislature.

PROJECT SCALE

Project Design (Potential Action 1)

The Practical Design experience of Missouri suggests the potential for significant costs savings through "good projects for a great system."

STATE-SPECIFIC REGULATIONS

Sales & Use Tax (Potential Actions 2 through 4)

Sales & Use Tax accounted for approximately 5% of project costs (or $534 million over ten years). Sales & use tax expenditures occur in the construction phase and are generated from sales tax paid by contractors.

As a result of differential treatment, the state sales tax cost is approximately 82% higher for projects on state-owned highways than other public highway projects – estimated to be $71,100 per $1 million of construction versus $39,000 per $1 million of construction.

In addition, for materials that are consumed during construction, there is a double tax with sales tax paid at the point of purchase and again when those costs are included in the total contract billing. A special exemption could be made for WSDOT only and would have saved $42 million over 10 years.

Prevailing Wage (Potential Actions 5 through 9)

As a result of a series of court decisions, the state prevailing wage applies to a broader range of activities than the federal law. While we could not find clear evidence that prevailing wage laws do or do not add to labor costs, they do provide a floor below which rates cannot be paid.

Prevailing wage rates do create some administrative burden as currently implemented due to determining the higher of the state or federal rate, completion of a paper survey, and different applications of the law between state and federal requirements.

Environmental Review & Permitting (Potential Actions 10 + 11)

Limitations in the data affected the extent to which we could single out expenditures on environmental review & permitting.

NEPA and SEPA compliance activities are the largest single expenditure category within environmental review, totaling about $19 million over ten years. For smaller, routine WSDOT projects, SEPA is more onerous than NEPA. The SEPA checklist is more time consuming than the documentation prepared for Federal Highway NEPA Categorical Exclusions (CE). NEPA CEs have been updated many times in the past few years, whereas SEPA has not.

RISK ASSIGNMENT

Project Delivery Methods (Potential Actions 12 through 19)

The greatest share of WSDOT project costs is contractor payments. Given this fact, the effectiveness of WSDOT's approach to contracting may be the most significant area in which to explore potential cost efficiencies.

Some of the biggest differences between construction contract award amounts and final contract payments are due to non-trivial errors on large projects. Design-Bid-Build contracting results in the highest owner risk assumption and is the method that WSDOT uses most often.

The current GC/CM process, including the Capital Projects Advisory Review Board, was designed primarily for vertical construction.

OTHER ACTIONS

Data (Potential Action 20)

As we conducted the in-depth analysis, limitations in the data affected the extent to which we could single out expenditures in certain areas, for example environmental review & permitting, mitigation, and change orders.

Federal Funding (Potential Action 21)

In the last ten years, federal aid projects accounted for 82% of contracts awarded. These projects are subject to additional requirements, such as federal prevailing wage laws and Buy American requirements.

Fish Passage Barrier Removals (Potential Action 22)

To comply with the court order, it has been estimated that fish passage barrier removal costs would be $2 billion for 2015-2030. This is clearly an emerging issue, but there is little information about the plan to address the court order or how the estimates were determined.

MAGNITUDE OF IMPACT

For each alternative, we attempted to calculate the magnitude of the potential cost savings. Our starting point was to estimate the dollars involved (to the extent possible with available data) and then assess the likely influence of the potential action to reduce that dollar amount.

For example, with sales tax, reinstating the public exemption would have reduced the tax paid by WSDOT over the 10 year period by $227 million. We deem this potential saving to be high because the dollars involved are high and the action would have a significant influence on potential savings.

With prevailing wage, while the dollars involved are significant (estimated at $2.1 billion) the potential actions outlined would not produce significant savings overall. A 1% reduction in cots would only equal about $21 million. Based on the JLARC study, a 1% reduction seems optimistic.

Potential Action	Administrative or Statutory	Potential Impact
PROJECT DESIGN		
1 Adopt Practical Design methods to guide project scoping and design decisions. • Incorporate Practical Design into project prioritization and selection process. • On projects greater than $10 million, include a Practical Design review to determine the cost effectiveness of the preliminary design and identify alternatives considered.	Administrative	High
SALES & USE TAX		
2 Reinstate Public Road Construction exemption on state-owned highways. • Exempt WSDOT projects on state-owned highways from tax on total contract amount. • Contractor would pay tax on all materials at point of purchase. • Lowers tax paid; no risk with respect to federal projects. • Reduces general fund and local government sales tax revenue.	Statutory	High
3 Direct receipts from state sales and use tax collected from contractors on state-owned highways to transportation fund. • Legislature could direct receipts to the Motor Vehicle or Multi-Model Account. • Tax paid is the same, but is returned to transportation. • Does not impact local government sales tax revenue. • Reduces state general fund revenue.	Statutory	High
4 Exempt WSDOT projects on state owned roads from the requirement for contractors to pay sales and use tax at the point of purchase on materials that are consumed during construction. • Legislature could create an exemption for WSDOT projects on state owned highways that would allow contractors to treat these purchases as re-sales that are not subject to sales and use tax at the point of purchase. • The effect would be to eliminate the double taxation of these purchases, which are currently taxed at the point of purchase and taxed again when included in the total contract billing.	Statutory	Medium

Potential Action	Administrative or Statutory	Potential Impact
PREVAILING WAGE		
5 Exempt WSDOT projects from the state prevailing wage act. • Retain the federal prevailing wage on federal-aid projects. • Potential wage savings; reduction in administrative burden related to determining the higher of the two wages; could lead WSDOT to program federal funds differently and use them on fewer projects.	Statutory	Low
6 Exempt WSDOT federal-aid projects from the state prevailing wage act. • Use federal wage rates only on federal-aid projects. • Potential wage savings; reduction in administrative burden related to determining the higher of the two wages; eliminate costs related to off-site construction where state prevailing wage applies but not federal prevailing wage - could lead WSDOT to program federal funds differently and use them on fewer projects.	Statutory	Low
7 Change Washington State Prevailing Wage language to match the Federal Prevailing Wage language "payment of prevailing wages to mechanics and laborers employed directly on the site of work." • Potential wage savings due to narrowing the range of activities covered by prevailing wage – would no longer apply to off-site activities.	Statutory	Low
8 Establish a threshold below which WSDOT projects are not subject to the prevailing wage act. • Potential wage savings; reduction in administrative burden; could produce more bids in some areas of the state if prevailing wage is a barrier.	Statutory	Low
9 Modify how Labor & Industries sets the state rate. • Options: (a) Use federal rate as state rate, (b) Use collective bargaining agreements as basis for state rate, or (c) Require annual survey. • Savings are in more efficient determination of prevailing wage; eliminate large jumps for those wages where the prevailing wage is not the same as the rate established by collective bargaining agreements. In these cases, the wage rate is not modified until a new survey is conducted. This means there can be very large jumps in the prevailing wage rate, which is disruptive.	Statutory and Administrative (L&I)	Low

	Potential Action	Administrative or Statutory	Potential Impact
ENVIRONMENTAL REVIEW & PERMITTING			
10	Allow smaller projects that qualify for a NEPA categorical exclusion (CE) but not a SEPA categorical exemption to submit NEPA documentation only (and not the SEPA checklist). • This would require a change to the SEPA rules. Currently, under SEPA WSDOT can only use NEPA Environmental Impact Statement (EIS) and environmental assessments. This would allow WSDOT so supply their documentation in support of a NEPA CE to satisfy SEPA checklist requirements. • This would affect smaller projects.	Administrative	Low
11	Expand SEPA exemptions to match the NEPA categorical exclusions. • NEPA categorical exclusions have been updated several times over recent years, whereas SEPA categorical exemptions have not. • This would allow small, routine transportation projects to be exempt from SEPA as they are currently under NEPA.	Statutory	Low
PROJECT DELIVERY METHODS			
12	Grant broad authority to WSDOT to determine project delivery methods. • Potential wage savings due to narrowing the range of activities covered by prevailing wage – would no longer apply to off-site activities.	Statutory	See note
13	For mega-projects, the highest-level executives within WSDOT should consider all possible scenarios before selecting the contracting approach, and then consider how authority should be aligned for the specific projects. (Mega-Project Assessment)	Administrative	See note
14	When selecting a contracting method, the Department should: perform a thorough risk analysis and quantify all project risks; consider the amount of risk that should be retained versus transferred to the contractor; on mega projects, the Chief Engineer should review and approve the delivery strategy. (Mega-Project Assessment)	Administrative	See note
15	Modify existing WSDOT authority for Design-Build. • Complete analysis of five pilot projects and potentially lower the threshold from $10M million to $2M. • Allow for projects of any size that meet the statutory criteria.	Statutory	See note
16	Specifically authorize GC/CM project delivery for WSDOT projects and authorize a separate review process from the Capital Projects Advisory Review Board. • Clarify process and availability of GC/CM for highway projects.	Statutory	See note

	Potential Action	Administrative or Statutory	Potential Impact
PROJECT DELIVERY METHODS			
17	Apply the same rigorous risk assessment process used in the original project delivery method selection to decisions about possible changes or modifications in the selection of a contracting method. • On complex projects with multiple components and contracts, any change in contracting method or contract modification should be reviewed using the same level of risk assessment as the original selection. Documentation should identify how a change in approach benefits the State.	Administrative	See note
18	Explore implementing a pavement warranty program and consider other opportunities to use contractor warranties (performance and/or materials and workmanship) in lieu of inspections.	Administrative	See note
19	Give Design-Build contractors additional design flexibility to support innovation and cost containment by not restricting them to the Design Manual.		
OTHER POTENTIAL ACTIONS			
20	Improve data collection to better inform management and policy choices. • Finding: There were many questions posed in this study that were difficult or not possible to reasonably address due to a lack of data or incomplete information. Some of these questions inform important policy and management issues. • This was particularly relevant to mitigation costs, change order documentation, right of way acquisition, environmental review and permitting and prevailing wage.	Statutory & Administrative	
21	Focus federal funds in fewer projects to limit the impact of federal aid conditions on WSDOT project costs. • Finding: WSDOT spreads its federal funds throughout its program which added federal aid project conditions to 82% of its projects completed in 2003-2012. • A major challenge for WSDOT in this regard is the general lack of flexibility to move funds between projects. For example, nickel funds are limited to nickel projects, so to consolidate federal funds on a nickel project likely requires switching money primarily among other nickel projects.	Legislature & WSDOT	
22	WSDOT should prepare a report to the legislature on fish passage barrier removals that outlines what the plan is, the methodology and amount of the cost estimates, and how performance on the fish passage barrier removals that were part of the court order will be tracked.	Legislature & WSDOT	

Contract Magnitude Notes

- Magnitude of Impact (12-17): Alternatives are related to shifting risk assignment and responsibility, which affects who pays for errors and cost overruns. While shifting risk does mean that it will be priced into contractor bids, it provides more budget certainty.
- Magnitude of Impact (18): Potential savings to contractors with respect to time and to WSDOT with respect to staff.
- Magnitude of Impact (19): Could potentially lead to more cost effective solutions based on current conditions in materials prices or state of the practice.