# Joint Transportation Committee

## Efficiencies in the Construction and Operation of State Transportation Projects

**Washington State Transportation Commission |January 21, 2014**

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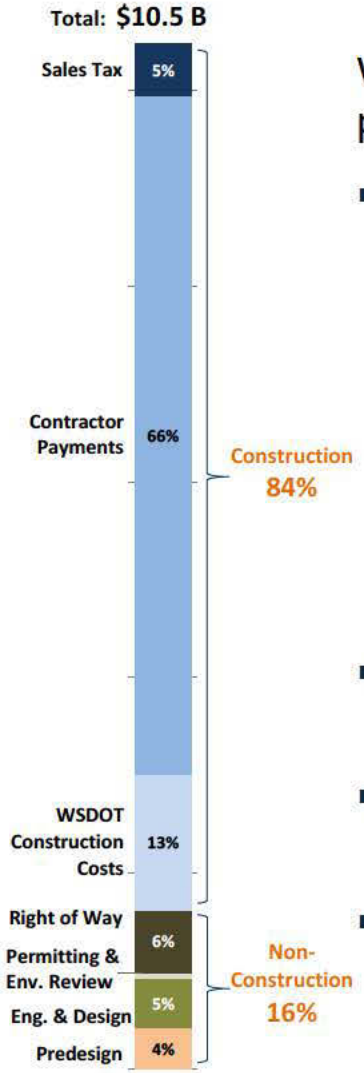
# JTC Study
# Objectives

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.

# WSDOT Project Expenditures (2003-12)

# What do we know?




WSDOT spent approximately $10.5 billion on highway and bridge construction projects that were completed between 2003 and 2012.

- **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) come 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%.

# Overall Findings
# Large projects drive costs

- Of the projects completed between 2003-2012:
  - 88% of the WSDOT projects in the database account for 20% of the expenditures
  - Projects over $25 M accounted for 3% of the projects and 59% of the 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 Cost Min | Project Cost Max | Number of Projects | Percent of Projects | Project Expenditures | Percent of Expenditures |
|---|---|---|---|---|---|
| Less than $1 M | | 1,308 | 57% | $ 522.2 M | 5% |
| $ 1.0 M | $ 5.0 M | 718 | 31% | $ 1,594.3 M | 15% |
| $ 5.0 M | $ 25.0 M | 198 | 9% | $ 2,199.9 M | 21% |
| $ 25.0 M | $ 100.0 M | 53 | 2% | $ 2,597.3 M | 25% |
| $100 M or more | | 16 | 1% | $ 3,560.2 M | 34% |
| | **TOTAL** | **2,293** | **100%** | **$ 10,473.9 M** | **100%** |

Source: WSDOT, 2013.

# Overall Findings
# Mitigation Adds to Project Costs

- Mitigation costs can be a significant overall contributor to highway project costs and were identified as an area of interest by the legislature.
- On projects where mitigation costs are contained within the overall project, WSDOT does not track costs in a way that allows us to easily identify and summarize these mitigation-related costs.
- To better understand the role of mitigation on project costs, WSDOT conducted four in-depth mitigation case studies in 2003, 2006, 2009, and 2013.
- 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 ($326M), with a significant range among individual projects of between 2% and 45%.
    - The higher end of the range was generally represented by smaller projects where the mitigation component was a significant share of the total project cost.

# Overall Findings

# Mitigation Driven by Regulatory Needs

Stormwater facilities, wetland mitigation, and noise abatement comprise ~ 87% of mitigation costs for the case study projects.

[1] WSDOT Highway Runoff Manual
[2] Stormwater Management Manual for Western Washington
[3] Stormwater Management Manual for Eastern Washington

| 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[1], SMMWW[2], SMMEW[3]* |
| 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; FWHA Guidance | WSDOT | *WSDOT: Noise Policy and Procedures* |
| Stream Protection | 10.3% | CWA; GMA; ESA | ACOE 404 permitting & WDFW HPA | 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 | 0.7% | NEPA, SEPA, local governments | Permit conditions from Ecology and local gov. | WSDOT Best Management Practices (BMP) |
| Dust Control | 0.3% | Fed. Clean Air Act, National Ambient Air Quality Standards, Washington Ambient Air Quality Standards | Permit conditions from Ecology | WSDOT Best Management Practices (BMP) |

# Project Delivery
# Project Management

- Data on construction contract awards and payments helps illustrate how well WSDOT brings projects from design to completion.
- Within the sample set of projects, 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 $25 million, which accounted for nearly $369 million of payments above award amounts.
- Larger projects had payments higher than award amounts more frequently and by a larger percentage than smaller projects. *(Note: $189.5 M of this difference is from Hood Canal bridge)*

**Washington Department of Transportation (WSDOT) 10-Year Cost Summary**

| 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%** |

# Project Delivery
# Comparison to Other States

- Oregon and Utah DOTs both provided 10 years of contract history for us to compare. Utah provided estimate, award, and payment information. Oregon did not provide information on estimates.
  - 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 contract data includes 1,329 projects totaling $5.76 B in awards
- The following table summarizes key metrics across the three states

| 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%) |

- Overall, WSDOT's project delivery metrics related to estimates, awards, and payments do not differ significantly from information provided by the Utah and Oregon DOTs.

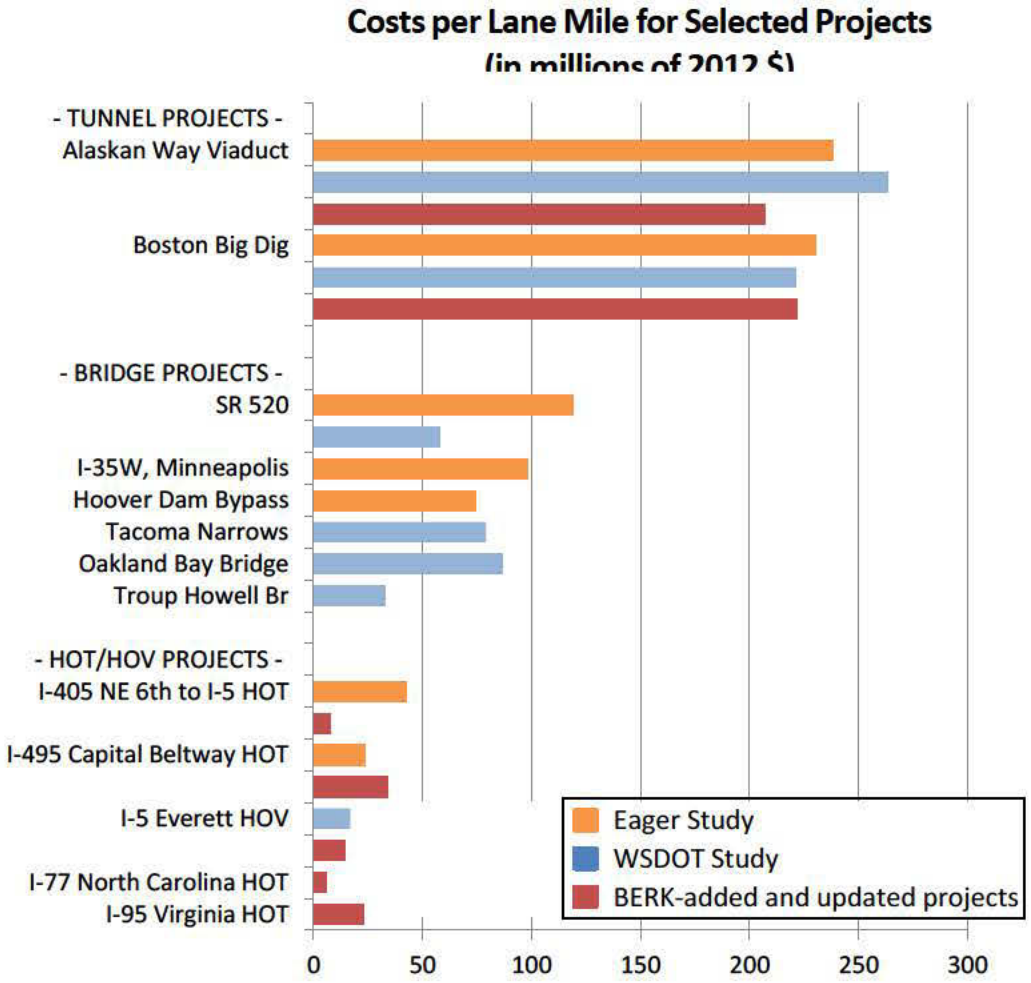
## Overall Findings

# Project-Level Cost Comparisons

- BERK reviewed two existing studies and conducted additional research on 7 projects to try to understand how project costs compare across states.
- The two studies had opposing high-level conclusions about how WSDOT's project costs compare to other states:
  - WSDOT Study: WSDOT is in the same range as other projects on a cost per-lane-mile basis.
  - Eager Study: WSDOT's costs are significantly higher than project costs in other states per-lane-mile.
- A review of the data behind the studies shows that the seemingly different conclusions are supported by similar project data
- Looking only at comparisons of specific projects, the results of the studies are in greater agreement that the overall conclusions would suggest.
- Both studies affirm that it's very hard to make determinative statements using these types of project to project comparisons.
- Comparing projects directly is challenging with many limitations: lack of exactly comparable projects, differences in bid competition over time, or basic differences between states.

# Cost Comparisons
# Project-level Comparison

- The chart shows the results of (1) updating all Eager and WSDOT study analysis to 2012 dollars and (2) researching 7 projects to find updated lane mile and budget information.
- After adjusting to 2012 dollars, the Boston Big Dig cost about 7% more per lane mile than the updated budget for the Alaskan Way Viaduct, which has changed since the completion of the Eager and WSDOT studies.
- The costs for selected HOV/HOT projects varies widely. The main reason for this variation is the proportion of new to converted lanes. All five HOT/HOV projects are a mix of both.
- The I-405 NE 6th to I-5 HOT cost per lane mile is significantly lower than the Eager Study estimated. Our researched cost is based on information currently available on the WSDOT website.



# 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:

- **Project Size**. Both required and optional decisions around project design impact *how much* WSDOT builds on an individual project.
- **State-specific Regulations.** WSDOT must comply with federal and state-specific regulations which can add costs to a project.
- **Labor Costs.** Labor comprises a significant portion of construction costs and accounts for the vast majority of other costs (engineering, design, construction management, etc.).
- **Cost of Materials.** Materials account for large share of construction costs, so variations in materials costs can have a substantial impact on costs.
- **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.

# POTENTIAL ACTIONS

# Potential Actions
# 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 savings to be high because the dollars involved are high and the action would have a significant influence on potential savings.
- With prevailing wage, the potential actions identified are unlikely to produce significant savings overall. Since none of the potential actions would completely eliminate prevailing wage for WSDOT projects, the potential impact was judged to be low.

# Project Scale
# Project Design

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

| Potential Action | Administrative or Statutory | Potential Impact |
|---|---|---|
| 1. Adopt Practical Design methods to guide project scoping and design decisions.<br>• Incorporate Practical Design into project prioritization and selection process.<br>• 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 |

# State-Specific Regulations
# Sales & Use Tax

**Key Findings Related to Potential Actions**

- 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.

# Potential Action
# Sales & Use Tax

| Potential Action | Administrative or Statutory | Potential Impact |
|---|---|---|
| 2. Reinstate Public Road Construction exemption on state-owned highways.<br>• Exempt WSDOT projects on state-owned highways from tax on total contract amount.<br>• Contractor would pay tax on all materials at point of purchase.<br>• Lowers tax paid; no risk with respect to federal projects.<br>• 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.<br>• Legislature could direct receipts to the Motor Vehicle or Multi-Model Account.<br>• Tax paid is the same, but is returned to transportation.<br>• Does not impact local government sales tax revenue.<br>• Reduces state general fund revenue. | Statutory | High |

# Potential Action
# Sales & Use Tax

| Potential Action | Administrative or Statutory | Potential Impact |
|---|---|---|
| 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.<br>• 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.<br>• 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 |

# State Specific Regulations
# Prevailing Wage

**Key Findings Related to Potential Actions**

- There is no consensus that prevailing wage laws increase costs at the program level.
- 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.
- The wide distribution of federal funding throughout the construction program in the last ten years (82% of contracts awarded included federal aid) suggests that limiting application of the state prevailing wage law would affect relatively few projects.

# Potential Action
# Prevailing Wage

| Alternatives | Cost Impact | Potential Impact |
|---|---|---|
| 5. Exempt WSDOT projects from the state prevailing wage act.<br>• Retain the federal prevailing wage on federal-aid projects.<br>• 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.<br>• Use federal wage rates only on federal-aid projects.<br>• 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."<br>• Potential wage savings due to narrowing the range of activities covered by prevailing wage – would no longer apply to off-site activities. | Statutory | Low |

# Potential Action
# Prevailing Wage

| Alternatives | Cost Impact | Magnitude of Impact |
|---|---|---|
| 8. Establish a threshold below which WSDOT projects are not subject to the prevailing wage act.<br>• 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.<br>• Options: (a) Use federal rate as state rate, (b) Use collective bargaining agreements as basis for state rate, or (c) Require annual survey.<br>• 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 |

# State Specific Regulations
# Environmental Review & Permitting

**Key Findings Related to Potential Actions**

- 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.
- 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.
- 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.

# Potential Action
# Environmental Review & Permitting

| Alternatives | Administrative or Statutory | Potential Impact |
|---|---|---|
| 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).<br>• 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 to supply their documentation in support of a NEPA CE to satisfy SEPA checklist requirements.<br>• This would affect smaller projects. | Administrative | Low |
| 11. Expand SEPA exemptions to match the NEPA categorical exclusions.<br>• NEPA categorical exclusions have been updated several times over recent years, whereas SEPA categorical exemptions have not.<br>• This would allow small, routine transportation projects to be exempt from SEPA as they are currently under NEPA. | Statutory | Low |

# Risk Assignment
# Project Delivery Methods

**Key Findings Related to Potential Actions**

- 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 for limiting excessive costs.
- 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.
- Project delivery methods offer the opportunity to have the parties best able to manage risk to assume that risk.
- Impacts to costs would come from limiting exposure to significant cost overruns which would also provide enhanced budget certainty.
- The current GC/CM process, including the Capital Projects Advisory Review Board, was designed primarily for vertical construction.

# Potential Action
# Potential Delivery Methods

| Alternatives | Administrative or Statutory | Potential Impact |
|---|---|---|
| 12. Grant broad authority to WSDOT to determine project delivery methods.<br>• 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.<br>• Complete analysis of five pilot projects and potentially lower the threshold from $10M million to $2M.<br>• Allow for projects of any size that meet the statutory criteria. | Statutory | See note |

# Potential Action
# Potential Delivery Methods

| Alternatives | Administrative or Statutory | Potential Impact |
|---|---|---|
| 16. Specifically authorize GC/CM project delivery for WSDOT projects and authorize a separate review process from the Capital Projects Advisory Review Board.<br>• Clarify process and availability of GC/CM for highway projects. | Statutory | See note |
| 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.<br>• 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. | Administrative | See note |

# 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.

# Other Actions
## Data

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.

| Alternatives | Administrative or Statutory | Potential Impact |
|---|---|---|
| 20. Improve data collection to better inform management and policy choices.<br>• 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.<br>• This was particularly relevant to mitigation costs, change order documentation, right of way acquisition, environmental review and permitting, and prevailing wage. | Statutory & Administrative | |

# Other Actions

## Federal Funding

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.

| Alternatives | Administrative or Statutory | Potential Impact |
|---|---|---|
| 21. Focus federal funds in fewer projects to limit the impact of federal aid conditions on WSDOT project costs.<br>• Finding: WSDOT spreads its federal funds throughout its program, which added federal aid project conditions to 82% of its projects completed in 2003-2012.<br>• 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 | |

# Other Actions

## Fish Passage Barrier Removals

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.

| Alternatives | Administrative or Statutory | Potential Impact |
|---|---|---|
| 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 | |