Washington State
Department of Transportation

PRACTICAL PLANNING AND DESIGN LEADS TO LOW COST TRANSPORTATION SOLUTIONS

A REPORT TO THE GOVERNOR AND LEGISLATURE

JUNE 30, 2015

INTRODUCTION

The Legislature enacted a provision in the 2014 Transportation Supplemental Budget requiring the Washington State Department of Transportation to *"report to the Governor and the House of Representatives and Senate transportation committees on where practical design has been applied or is intended to be applied in the department and the cost savings resulting from the use of practical design.*" (ESSB Section 306 (23))

Planning and designing transportation construction projects and operating a vast multimodal system requires continuous efforts to seek low-cost solutions as public funding becomes more constrained and the needs of the state's traveling public and economy become more complex. Secretary of Transportation Lynn Peterson initiated a major reform in fall 2013 to implement a new approach to transportation project planning, design, construction and operations by applying principles of "practical solutions."

Practical solutions result from a planning and design process that involve data-driven, performance-based decision making; predictive safety analysis; demand management as an operational strategy; and other actions that lead to lower cost projects. This approach involves collaborating with communities and jurisdictions, and examining a potential solution's effect on the entire multimodal infrastructure. It also considers the broad implications of public health, environmental quality and economic development in order to find the lowest cost action that will adequately address the concern. This is a paradigm shift away from standards-based planning and design focus towards an approach that provides more options to deliver the right low cost solution that address the need.

This report describes where WSDOT has applied least cost planning and practical design to develop low-cost, practical solutions for Washington's transportation system. It also reports on the initial estimates of project savings where solutions have been applied. Finally, it describes where WSDOT intends to apply practical design in the future.

EVOLUTION TOWARDS PRACTICAL DESIGN

The use of practical design has evolved during the past two decades as transportation experts are challenged to meet the demands of transportation needs caused by population growth, changing land use, competitive economies, emerging technologies and a decline in traditional gas tax revenues. Engineers have developed new tools, innovations and best practices over the past several decades to continually improve the planning, construction and operation of the transportation system.

For the past 30 years federal transportation policy has driven the criteria for state roadway design, including requiring certain design speed; lane, shoulder and bridge width; structure strength; horizontal alignment; grade; stopping sight distance; and other factors that dictated how highway transportation projects were designed and constructed. In addition WSDOT's own policies required the state to bring some highway locations "up to standards" when a paving project was scheduled. This at times resulted in the scope of the project expanding to meet high levels of safety standards when there was little need for safety investments in that location. Subsequently other high-need safety improvements were deferred because of limited funding.

By the early 1990s, WSDOT changed its approach to reduce the number of design elements required to bring highway features "up to standards," based on the project type. The result was that improvements were made in spot locations, but that solution didn't always improve the overall performance of the rest of the transportation system. Additionally, planning and design standards focused on motor-vehicle performance as the priority and did not necessarily consider the entire context of the roadway, such as the adjacent land use.

A decade later, WSDOT issued guidance to designers to evaluate and mitigate design tradeoffs within a specific context or environment of a project. Designs that were different than the standards were considered deviations and required additional approvals. Also, most of the "flexibility" in design was a response to stakeholder issues, rather than becoming a general design practice. The Design Manual had become a "cookbook" representing a standards-based approach with limited ability to integrate land use factors, actual performance outcomes or modal integration investments. On the other hand, this standards-based approach allowed for consistent project scopes, predictable schedule, and reliable budgets—all key stewardship responsibilities for the state's transportation agency.

WSDOT LAUNCHES A PRACTICAL SOLUTIONS APPROACH

Led by Secretary Peterson's reforms, WSDOT undertook a comprehensive redesign of the project development process and policies based on the practical design approach. With this transformative effort, terminology and practices in planning, programming and design continue to develop and be implemented.

In the Results WSDOT Strategic Plan (2014-1017) the agency adopted the vision to "Be the best at providing a sustainable and integrated multimodal transportation system." Among other reforms, Reform V involved implementing practical design, which decreased the scope and cost of projects by increasing flexibility within WSDOT project development process. Practical design offers flexibility without sacrificing operations, performance, community livability, economic development and environmental stewardship.

Practical Solutions Work

To improve congestion on I-5 in the Joint Base Lewis-McChord corridor low cost solutions include reducing vehicle volumes with increased transit service, carpooling, bicycle and pedestrian improvements and expanding the capacities of local roads and streets.

Executive Order (E1090) was invoked to provide information and direction to WSDOT staff about the roles and responsibilities of a broad cross-section of offices within the organization to transform business practices by adopting least cost planning and practical design approaches. Another Executive Order (E1085) was enacted to direct the use of strategic safety policy and to encourage the engagement of communities and other public policy goals (e.g. public health) into project planning.

WSDOT also conducted numerous briefings with regional WSDOT staff, local agencies and organizations interested in the new approach to state transportation project development.
To achieve cost saving and innovative solutions, WSDOT reviewed and reformed the following planning and design policies and practices.

LEAST COST PLANNING

Least cost planning is an approach to making decisions after considering a range of strategies to achieve an efficient, sustainable, innovative, and generally, "low cost - high benefit" solution. Engaging with Washington's communities and public is a key to this approach. One of the first steps in the process is to set visions and goals for transportation projects that reflect a community's values and its support. In collaboration, a problem statement is developed that clearly defines the purpose and need for a transportation project. Performance measures, or indicators, for how the multimodal transportation system is supposed to perform are also developed so that the range of options can be considered. Some examples of performance indicators include, but are not limited to:

- Safety;
- Accidents;
- Operational performance;
- The community's sense of place, safety and public health;
- Economic development and revitalization;
- Environmental factors like air quality, open space, and greenhouse gas emissions;
- Opportunities for affordable housing and mixed-income communities;
- Land use and growth management plans by local jurisdictions;
- Transportation factors such as walkability, accessibility and transportation choices.

At a transportation corridor level, these types of performance indicators are used to evaluate various alternative actions. The next step is to engage stakeholder input on the effects of various options evaluated against the criteria. In the final step, a least cost methodology is employed to identify strategies or alternatives that provide the best value for the money in support of the investment decisions. Factors that might be considered include but are not limited to:

- Costs and benefits of any policy changes that are part of the strategy or alternative;
- Costs of potential environmental damage;
- Costs of collisions and traffic generated or reduced;
- Time and cost barriers and consequences for all modes and user groups;
- Population groups who bear the costs and who accrue the benefits;
- Energy efficiency and air emissions;
- Community characteristics.

WSDOT has conducted the least cost- planning process on a number of corridors such as US 2, US 95, US395, I-205 and I-5 JBLM. The result is an array of projects that are supported by the community, achieve the agreed upon purpose and need for a project and produce the best solution at the lowest cost.

FIRST PRACTICAL DESIGN REFORMS IN 2013-2014

The AASHTO Policy on Geometric Design of Highways and Streets is a nationally recognized policy on state highway design. In some cases WSDOT's Design Manual exceeded these standards so revisions were made to align the state standards with the national geometric standards. By reducing standards where appropriate, savings are realized in many facets of highway development including cost avoidance in: grading and paving, traffic control devices, rights-of-way acquisition, administrative and tortious costs of design deviations. Below are some examples of those design guidance changes.

- **Intersection Control Type Analysis**
  Engineers use this design policy to test the viability of several intersection types before committing to a specific treatment. In light of the underutilization of roundabouts, which have well-documented safety records, operational and sustainability performance were analyzed to compare them with the familiar signalized intersections. This policy change helps WSDOT apply the most appropriate intersection control type based on an analysis of conditions.
- **Intersection junction angles and lane alignment**
  These standards were revised to match AASHTO, providing engineers more flexibly in meeting project needs in constrained locations, saving expensive rebuild, traffic control, and rights-of-way costs.
- **Lengths, widths, and taper rates of deceleration and acceleration lanes at intersections**
  These standards have been updated to give engineers and local agencies more flexibility. Potential cost savings include fewer design deviations processed, ability to build within constrained urban locations where rights-of-way are a premium or simply not available, and reduced construction costs to meet project need.
- **Intersection Design Vehicle**
  This policy was revised to help the engineering and planning workforce understand and balance the need for accommodating large trucks without having to engineer broad corners or extra wide lanes. This helps WSDOT and local agencies accomplish their complete streets projects, where in urban and suburban places pedestrians, bicycles and vehicles can enjoy safer, shorter crossing distances and adequate turn radiuses in the available rights-of-way. Engineers verify the design vehicle can make the turn by using turn-simulation software instead of using outdated templates.
- **Highway sight distance**
  These requirements are revised to match AASHTO specifications. This change was accomplished by incorporating AASHTO's standard roadway-object height of 24 inches versus the previous 6-inch height WSDOT used. This revision results in fewer horizontal and vertical-crest curves being rebuilt just to meet an old standard. This saves on grading and excavation costs for new highway alignments, reduces project footprints and the need for additional rights-of-way, all of which are high-cost items.
- **Sustainable Highway Safety**
  This new Design Manual chapter guides project teams to safety strategies that are based on the AASHTO Highway Safety Manual and related diagnostics tools. The policy directs engineers to base project-level decisions on the safety analysis of specific locations and corridors. It encourages engineers to consider proven low-cost countermeasures. By focusing on proven, lower-cost, targeted countermeasures at specific locations, the return on investment of safety dollars is optimized. These lower-cost investments allow us to address additional identified locations.
- **Design and Maintenance Coordination**
  Highway maintenance and operations staff are unique stakeholders because they utilize, maintain, and operate the state transportation system facilities and assets. Given the nature and cost of maintenance work, as well as the exposure inherent in maintenance and operational activities, it is important for

designers to consider maintenance and operations staff as major stakeholders in every project. This new Design Manual chapter provides multiple options to help improve coordination with maintenance and operations staff during project design. These "best practices" are a culmination of responses from Design Manual user surveys, interviews with maintenance and operations superintendents, improved life-cycle-cost analysis and various regional practices that have demonstrated improved coordination between design and maintenance efforts and personnel.

- **NACTO Urban Streets Design Guide**
  WSDOT was the first state DOT to endorse this guide by the National Association of City Transportation Officials (NACTO). Prior to endorsement, and influenced primarily by AASHTO, WSDOT typically designed roadways to meet national design standards for high-speed highways; these standards are not always a good fit for the complexity of low-speed urban arterials. With the new guide, transportation engineers and planners will have access to information that provides more flexibility when planning and designing within urban environments and can better balance the livability, economic and mobility needs of a community.

- **New Main Streets Chapter**
  This chapter effectively adopts the endorsed NACTO guide, guidance from other innovative design resources, and assists with the implementation of complete streets. This chapter also introduces new concepts, supporting the practical design approach, such as target speed and the effect of modal environment on economic vitality performance. A more comprehensive phase of this effort will be published in 2015-16, diversifying the application of designing in a variety of urban and suburban environments.

2015 DESIGN MANUAL CHANGES

Major policy and guidance changes are being adopted into the WSDOT Design Manual in 2015. While these changes will bring challenges to our planning and engineering workforce, the goal is increased flexibility for designers based on procedures that will provide a more thorough understanding of project need. The guidance also provides for a renewed emphasis on context, modal performance, and community engagement. The highlights include:

- **Removing Design matrices** that are used to select design elements to be included in project construction and reconstruction, including their dimensions (such as super elevation, traffic lanes and shoulders). This approach has resulted in projects addressing elements that either didn't contribute to solving the problem or projects designed with standardized dimensions that may be excessive.

- **Adding performance-based decision making design policy** to replace the functions provided by design matrices and levels with a more flexible process. This policy change will provide for a more systematic implementation of practical design through project decisions that are more closely based on the expected performance of the project. Guidance is being developed for determining performance measures, targets and gaps, as well as procedures for using them in project decisions.

- **Creating Design Control** selection chapter. This is a primary component of implementing the practical design approach because context, all user types, access, and speed selection dramatically controls what amount of flexibility is possible in geometric design and interactions between the land use and transportation environments. This new chapter is an initial phase of the context classification system.

- **Developing a context classification system** to quantitatively analyze the characteristics of land use and transportation environments to determine design controls. WSDOT's completion of the quantitative tools and process will lead the nation in replacing decades-old systems currently in place. The outputs will be targeted speeds, modal compatibility and access control that will create more effective and aligned environments.
- **Adding a "Basis of Design" tool** as a means of documentation that supports the new guidance described for the 2015 Design Manual changes. The purpose of the Basis of Design is to document information and decisions related to design control and elements selection on a project. It can be thought of as incorporating at least three new concepts in the process:
    - Defining the problem in terms of specific "performance gaps" that describe the most basic need, evaluating alternatives through balancing the impact across a range of "performance categories" that will vary depending on the context and range of modal users.
    - Utilizing context sensitive solutions and performance analysis (wherever possible) to obtain greater flexibility than current design policy.
    - Selecting affected design elements and associated dimensions only after the preferred strategy and alternative is identified. Currently elements are selected before an alternative is identified, regardless of their direct influence to the actual problem being solved.

Practical Solutions Work

Intersection Active Warning Systems alert drivers of approaching or stopped vehicles and have reduced collisions and series injury accidents. These devices cost between $25-50 thousand compared to other traffic strategies such as more expensive roundabouts.

SUSTAINABLE HIGHWAY SAFETY AND RISKS

The purpose of WSDOT highway safety projects and programs is to save lives and reduce the potential for injury. The ultimate goal is to reduce the number of serious and fatal crashes. Sustainable safety is a combination of state-of the-art comprehensive processes and engineering tools that use quantitative data and scientific engineering methods to assess the safety performance of highway segments and intersections.

In many situations, safety performance analysis can determine changes in the risk of serious injury or fatal collisions for all modes. Engineers have new safety tools that support practical design when conducting safety performance analysis, and include potential countermeasures to obtain the desired performance. New tools used by WSDOT for sustainable safety include:

- **AASHTO Highway Safety Manual** introduces a science-based technical approach that removes anecdotal assessments of resulting safety performance. The manual gives practitioners the ability to quantify specific safety performance to crash type and severity. This allows them to strategically balance safety performance against other desired transportation performance measures, such as multimodal mobility operations, environmental impacts, economic vitality and construction costs. The HSM provides the following tools:

- Methods for developing an effective roadway safety management program and evaluating its effects.
- A predictive method to estimate crash types, frequency and severity.
- A catalog of crash modification factors for a variety of geometric and operational treatment types, backed by robust scientific evidence.

- **SafetyAnalyst** is a software tool used by state agencies for highway safety management. It incorporates state-of-the-art safety management approaches into computerized analytical tools for guiding the decision-making process. It helps engineers to identify safety improvement needs and develop a system-wide program of site-specific improvement projects to enhance highway safety by cost-effective means. WSDOT uses SafetyAnalyst for network screening and during scoping and design for gathering collision data for analysis.

- **Interactive Highway Safety Design Model (IHSDM)** is a suite of software analysis tools used to evaluate the safety and operational effects of geometric design decisions on highways. IHSDM is a decision-support tool. It provides estimates of a highway design's expected safety and operational performance and checks existing or proposed highway designs against relevant design policy values. Results of the IHSDM support decision making in the highway design process. WSDOT uses this tool to analyze the safety performance of freeway segments, speed change lanes, interchange ramps, ramp terminal intersections, and collector-distributer lanes.

- **Collision Analysis Data Report** is the basis for all collision analyses for all types of design documentation that need collision analyses (Design Manual Chapter section 321.04(1)).

- **Interchange Safety Analysis Tool enhanced (ISATe)** analyzes the safety performance of freeway segments, speed change lanes, interchange ramps, ramp terminal intersections, and collector-distributer lanes.

- **Highway Safety Manual Spreadsheets** are different spreadsheet options for Highway Safety Manual safety performance predictions. Each of these spreadsheet tools can predict the safety performance of highway segments and intersections for three types of highways: Rural Two-lane Two-way, Rural Multilane, and Urban-Suburban Arterial.

EXAMPLES OF VALUE AND SAVINGS FROM PRACTICAL SOLUTIONS

Practical design strategies are applied throughout the project development and delivery process. Where in the process the practical design refinements are identified will determine whether the savings are cost avoidance (i.e. an initial lower project estimate to be funded than otherwise anticipated) or a reduction to a project budget (i.e. project savings which occurred after the initial estimate was funded).

Practical design applications are considered even before the scoping and pre-design stage of project development in order to establish a project budget amount. After the initial project budget is established and design begins on that project, costs to deliver the project are tracked through change management systems in the Transportation Executive Information System (TEIS). Assuming no inflationary increases on the project over its delivery schedule, the reduced delivery cost will be reflected as project savings. However, it is important to note that some elements are more easily controlled, such as design decisions and others are completely out of the realm of predictability such as inflation.

It is important to recognize that greater savings are often generated from practical design during the earlier stages of project development. This has been documented, in part, in the 2010 JLARC report on WSDOT scoping and cost estimating for highway construction projects.

As part of Secretary Peterson's January 2015 "State of Transportation" address, she gave examples of some recent practical design applications conducted during the last half of 2014. Based on a sample of 10 projects in the scoping and pre-design stage of project development, the application of practical design resulted in project-estimate reductions ranging between 14 and 64 percent (excluding potential inflationary impacts). The average savings was 40 percent for the set of 10 projects, avoiding costs of nearly $215 million.

Practical Solutions Work

Congestion at the I-82 Valley Mall Boulevard was eliminated through a community process that identified two roundabouts as a low cost solution compared to a full scale diamond interchange which saved $24 million.

Project sizes ranged from $10 million to $73 million each, before applying practical design. The sample locations include: East Wenatchee corridor (SR 28), Medical Lake I/C (SR 902), Mount Vernon I/C (I-5), Spokane area (I-90), Lynden area (SR 539), Moses Lake I/C (SR 17), South of Anacortes (SR 20), Blewett Pass (SR 97), Omak (SR 155), and south Spokane (US 195).

Earlier efforts in 2013 and 2014 on many of the larger legislative-interest projects receiving practical design reviews resulted in significant dollar and percentage savings. In these examples, additional evaluations were performed on the current and near term needs rather than a 20+ year outlook. Refocusing the discussion on the essential needs allowed for some aspects of the projects to be removed from the initial scope of work. Examples include:

- **SR 167 Completion** This project was reduced last year from $1.5 billion to $790 million (-47%). This project constructs a new highway alignment between SR 509 in Tacoma and SR 512 in Puyallup, including completion of the facility between SR 509 and I-5 with a new interchange at I-5. The majority of the reduction came from reducing the full build out from two lanes in each direction to one lane in each direction between Valley Avenue and SR 512, and also modifying two interchanges on this segment. Remaining opportunity for practical design would likely be limited to reductions in lane and shoulder widths. WSDOT estimates this reduction would only result in 2 to 5 percent additional savings. The range of savings is determined by whether the original estimated cost ($824 M) for the project is used or whether the modified project budget ($790 M) is used to calculate the savings.

- **SR 509 Completion** This project was reduced last year from $1.3 billion to $750 million (-42%). This project connects SR 509 south from SeaTac to I-5, including one lane in each direction between S 188th and S 24th/28th avenues, two lanes in each direction between S 24th/28th avenues and I-5. The project includes interchanges at S 188th and S 24th, and improvements on I-5 in the vicinity of SR 516 to accommodate the SR 509 connections to I-5 and local routes. The majority of the reduction came from reducing the highway from two lanes in each direction to one lane in each direction between S. 188th and S. 24th/28th avenues. The remaining opportunity for practical design looks promising; and may achieve a 5 to 20 percent reduction. Without new revenue, WSDOT would need additional design money ($2 M+/-) to pursue these opportunities further.
- **US 395 North Spokane Corridor:** This project was reduced last year from $1.3 billion to $750 million (-42%). This reduced scope completes the corridor from Francis Avenue to an interim connection with I-90, including completing the corridor to the Trent Avenue Interchange. The majority of the practical design savings came from delivering the project scope differently than originally envisioned. Other ways to reduce dollars on this corridor are to only build out a portion of the project, which would include completing the BNSF rail realignment, Wellesley Ave Interchange, and extend the new corridor south from Francis Avenue to the Trent Interchange at SR 290 for $360 million.
- **I-405 Renton to Lynnwood corridor widening:** This project was reduced last year from $1.8 billion to $1.175 billion (-35%). This project continues the widening of the corridor between Renton and Bellevue, including the implementation of express toll lanes and rebuilding impacted interchanges. This project also builds the first segment of the I-405/SR 167 Interchange master plan by constructing a direct connector on northbound and southbound lanes between SR 167 HOT lanes and I-405 express toll lanes. This project completes a 40-mile corridor-wide express toll facility. A reduced design speed in the Renton to Bellevue segment of 60 mph, 11-foot lane widths and shoulder deviations are assumed in our current cost estimate. Because of these reductions, the region does not anticipate any remaining opportunity for practical design that would not significantly alter the scope or phasing of the project. Other opportunities to explore include such things as only building out one direction, conversion of HOV lanes to HOT lanes or changing the existing 2+HOV to 3+HOV lanes.
- **SR 520 Seattle Corridor Improvements – west end** The current design incorporates practical design efforts such as a reduced design speed on the Portage Bay Bridge, with 11 foot lanes and shoulder deviations. However, while there have been extensive efforts working collaboratively with the City of Seattle in developing a more

practical design for other remaining work elements, project inflation costs from changes in anticipated construction start dates, have eliminated the opportunity to reduce the overall budget from the current $1.4 billion.

- **I-5 JBLM corridor improvements:** This project was originally estimated at $820 million. There are several improvements which could be considered a cost savings because the features of the project are reduced or eliminated. One scenario under consideration is for design and construction of a $250 million to $350 million project investment (57% - 70% reduction). This investment scenario reconstructs the Thorne Lane and Berkeley Interchanges to widen the mainline and improve access; extend the current eight-lane configuration from the north, down to the Berkeley interchange; and provides additional shoulder width at locations between Mounts Road and Berkeley. Remaining opportunity for practical design would likely be limited to reductions in lane and shoulder widths. WSDOT estimates this reduction would only result in 2 to 5 percent of additional savings. However, local city and county representatives are not in favor of reduced investments and are requesting the full build at this time. Final project plans are still in progress.

Much of the savings from practical design has been identified on the above projects through the early stages of project development. While it remains possible that significant savings (up to 20%) may materialize on specific segments or pieces of the above projects, it would be more reasonable to assume that a range of 2 to 5 percent in additional savings might be realized from inflation since the original project estimates were established.

Practical design has been applied to projects over the past decade, generating savings, enhancing environmental benefits, and/or resulting in operational or maintenance savings over the life of the asset. Examples of projects with practical design savings or cost avoided solutions implemented between FY 2003-2014 are shown below.

PRACTICAL DESIGN SOLUTION REVISIONS TO MEET PERFORMANCE NEEDS

PROJECT	SAVINGS	DESCRIPTION
SR 243/Mattawa - Intersection Improvement	$4.0 M	Roundabout constructed - originally planned to be a grade separation.
I-205/Mill Plain Exit (112th connector) - Build Ramp (stage 1)	$1.4 M	Modified project staging to achieve efficiencies. Staged project for efficiencies.
I-205/Mill Plain Interchange to NE 18th St - Stage 2	$31.6 M	Eliminated the need to construct new overcrossing bridges by keeping design solutions (number of lanes) within the capacity of the existing bridge.

US 2/Bickford Avenue - Intersection Safety Improvements	$20.0 M	Eliminated the need for a full-diamond interchange using a modified interchange design.
SR 161/Clear Lake N to Tanwax Creek - Realign Roadway	$3.3 M	Significant redesign from a realignment of the highway to low cost enhancements (flashing beacons, delineation, illumination and upgrading guardrail).
SR 112/Hoko-Ozette Rd - Safety Improvement	$0.6 M	Used low cost enhancements (signing/deliniation) in lieu of capital project (curve straightening).
SR 4/Svensen's Curve - Realignment	$6.2 M	Used low cost enhancements (signing/delineation) in lieu of capital project (curve realignment).
US 2/Colbert Rd Intersection Improvements	$1.5 M	Used low cost enhancements (striping/signing) in lieu of capital project (signal or roundabout).
SR 150/No-see-em Rd Intersection Improvement	$6.0 M	Roundabout constructed - originally planned to realign the four-legged intersection with left and right turn lanes northwest of the existing intersection.
I-5/JBLM auxiliary lane	$0.3 M	Constructed auxiliary lane in lieu of hard shoulder running, eliminating the need for dynamic overhead signing.
US 395/North Spokane Corridor	$650.0 M	Modification to the NSC's elevation, alignment and width along with changes to the alignment of the relocated BNSF corridor and changes to the NSC / I-90 connection.
SR 285/W End of George Sellar Bridge - Intersection Improvements	$2.8 M	Redesigned solution resulting in lower right of way costs.
US 2/US 97 Peshastin - New Interchange	$11.4 M	Change in repair method following VE study resulted in lower cost solution.
US 2/N Glen-Elk Chattaroy Rd Intersection Improvements	$0.3 M	Improvements to minimize accidents caused by offset right-hand turn lane were constructed instead of a signal or roundabout.
SR 3/Jct US 101 to Mill Creek - Safety Improvement	$2.0 M	Local agency improvements have eliminated the need for many of the safety enhancements originally proposed by this project.
I-5/SR 532 NB Interchange Ramps - Add Turn Lanes	$1.0 M	Final design resulted in lower right of way costs

I-5/SB Viaduct, S Seattle vicinity - Bridge Repair	$2.7 M	Change in repair method following VE study resulted in lower cost solution.
I-5/Bakerview Rd to Nooksack River Br - Safety	$0.7 M	Used low-cost enhancement (rumble strips) in lieu of capital project (ramp modifications).
I-5/SR 432 Talley Way Interchange - Rebuild Interchange	$9.9 M	The project was re-evaluated and redesigned following geotechnical investigations that identified poor soil conditions.
SR 240/Beloit Rd to Kingsgate Way - widen roadway	$5.0 M	Identified alternative shoulder and clear zone improvements which resulted in a lower cost solution.
SR 241/Dry Creek Bridge Replacement	$1.4 M	Replaced the bridge with a pair of box culverts which resulted in a lower cost solution.
I-82/Valley Mall Blvd - Rebuild Interchange	$24.0 M	Constructed roundabout in lieu of signal.
TOTAL	**$786.1M**	

DESIGN SOLUTION REVISIONS GENERATING ENVIRONMENTAL BENEFITS

PROJECT	SAVINGS	DESCRIPTION
US 2/Tumwater Canyon - Bridge Replacements	$4.0 M	Realigning US 2 drastically reduced impacts to adjacent wetland, removed a fish barrier, provided a wetland mitigation site and allowed for efficient construction and reduced project costs.

EXAMPLES OF PROJECT SAVINGS THROUGH PROJECT DELIVERY (minimal design with re-defined basic safety)

PROJECT	SAVINGS	DESCRIPTION
SR 410/Enumclaw Golf Course Vicinity to National Park Gate	$0.5 M	Updated estimate base using minimal design approach and project delivery.
SR 9/Doran Rd to SR 542	$0.5 M	Updated estimate base using minimal design approach and project delivery.
I-82/US 12 to Valley Mall Blvd - Paving	$1.4 M	Updated estimate base using minimal design approach and project delivery.
US 2/Fairchild AFB to Jct I-90 - Paving	$1.9 M	Updated estimate base using minimal design approach and project delivery.
SR 27/32nd Ave to Jct SR 290 - Paving	$1.0 M	Updated estimate base using minimal design approach and project delivery.
TOTAL	**$5.3M**	

EXAMPLES OF DESIGN SOLLUTIONS TO GENERATE OPERATIONAL/MAINTENANCE SAVINGS OVER THE LIFE OF THE ASSET

PROJECT	SAVINGS	DESCRIPTION
SR 410/Enumclaw Golf Course Vicinity to National Park Gate	$0.5 M	Updated estimate base using minimal design approach and project delivery.
SR 9/Doran Rd to SR 542	$0.5 M	Updated estimate base using minimal design approach and project delivery.
I-82/US 12 to Valley Mall Blvd - Paving	$1.4 M	Updated estimate base using minimal design approach and project delivery.
US 2/Fairchild AFB to Jct I-90 - Paving	$1.9 M	Updated estimate base using minimal design approach and project delivery.
SR 27/32nd Ave to Jct SR 290 - Paving	$1.0 M	Updated estimate base using minimal design approach and project delivery.
TOTAL	**$45.5 M**	

MOVING FORWARD WITH PRACTICAL DESIGN

The citizens of Washington expect the delivery of transportation services, programs, and projects that are necessary, high quality, appropriately scoped, and delivered efficiently at the right time and in the right location. The department is expected to develop clear performance outcomes and predictable, consistent processes for planning, developing, and delivering projects to facilitate safety, mobility, and economic vitality, while promoting local business and jobs and providing for stewardship of the environment. The goal here is to maximize safety, decrease congestion, and encourage economic development at the lowest cost for as many communities as possible.

Practical Design will continue to be refined and expanded as part of the WSDOT way of business.

In the planning process, WSDOT uses least cost planning to plan transportation solutions to address the specified need for the least cost in consideration of social, environmental, and economic impacts. This requires a clear understanding of the performance outcomes necessary to achieve the objectives of the project from many diverse agency and community perspectives, including:

- Early interaction in plan and project development that allows for community engagement and dialogue before project scopes and budgets are set.
- Early interaction in plan and project development that allows for internal expert engagement and dialogue before project scopes and budgets are set.
- Planning, development, and delivery of projects that consider the needs of all the transportation modes, surrounding communities, and environmental context.
- All programs and projects will evaluate operational modifications, transportation demand management (TDM) options, modal options, and different phasing scenarios before increased capacity solutions (i.e., adding lanes) are considered.
- Development of solutions that are clearly

defined, understood, and agreed upon, to the extent practicable by the communities prior to committing to project planning and scoping.

- Recognition that by cost-effectively planning, scoping, developing, and delivering projects, WSDOT will be able to address more locations due to greater return on investment and cost savings.

Following planning and during project development, WSDOT will use practical design to develop and design transportation projects that are targeted to address the essential needs of a project, not every need. In doing so, designs are developed with criteria that achieve stated performance for the least cost. Multiple competing performance needs require optimization of tradeoffs. Solutions will consider mitigation strategies that address these tradeoffs for the least cost in achieving the desired performance.

- Designs will consider all modes and the context that these modes operate in. Design criteria will be chosen in a manner that recognizes different transportation and land use contexts.
- Design criteria will provide ranges for consideration. Designs are developed to achieve performance for the least costs.
- Designs choices will be documented to identify how context considerations are being incorporated and modal considerations are being addressed.
- Design considerations involving safety performance of selected design criteria will incorporate the Highway Safety Manual and associated tools.
- WSDOT will use practical design approaches in all projects including the development of environmental solutions.
- WSDOT will support our partners in the implementation of solutions that are beyond our management responsibilities.

15-06-0230

Washington State Department of Transportation