



Traffic Operations

2017–2019 Low Cost Enhancement Program

FINAL REPORT TO THE
WASHINGTON STATE
LEGISLATURE



STATEWIDE OVERVIEW

Low Cost Enhancement (LCE) projects are small, low cost – usually less than \$100,000 – projects that can be quickly implemented to reduce crashes, reduce the potential for crashes, or improve mobility. LCEs quickly address emerging crash trends and mobility issues. These projects bring near-term relief to operational deficiencies, and are often the first step in implementing incremental, long-term corridor strategies.

Because of their low cost and quick implementation, LCE projects are often very practical solutions to emerging needs. LCE projects may often postpone or lessen the need for larger capital projects.

LCE projects generally come in three sizes:

1. **Small.** Under \$5,000. When projects are under \$5,000, they are often bundled together under “Low Cost Actions,” but they can also stand alone.
2. **Medium.** \$5,000 – \$50,000.
3. **Large.** Over \$50,000.

LCE projects often originate with concerned citizens, elected officials, local agencies, or region staff. Additionally, priority programming and the Traffic Office’s Field Assessment Program identifies larger-scale opportunities for LCE through a system screening process.

Category	Definition
Intersection	Project addresses crash trends, contributing factors, or mobility issues at an intersection.
Lane Departure	Project addresses engineering countermeasures associated with a vehicle leaving the lane. These may include high friction surface treatment (HFST), rumble strips, guardrails, and other treatments particular to a location.
Pedestrian/Bicycle	Project addresses identified crash risks or mobility issues for bicyclists or pedestrians.
Mobility	Project addresses mobility on the system; includes Intelligent Transportation System (ITS) projects
Signs	Projects to implement Guide, Warning, Regulatory, or Low Clearance signs
Pavement Markings	Project involves striping.
ITS spending	ITS-related projects
Traffic Studies	Any research or traffic studies.
Project Design	Labor to design and scope projects.
Miscellaneous	Activities that don’t fit in another category. Examples include: WSP aerial markings, Test sites, Tort claim investigations, illumination
Low Cost Actions	Bundle of many small cost safety and mobility projects – usually \$5,000 or less – under one job number.

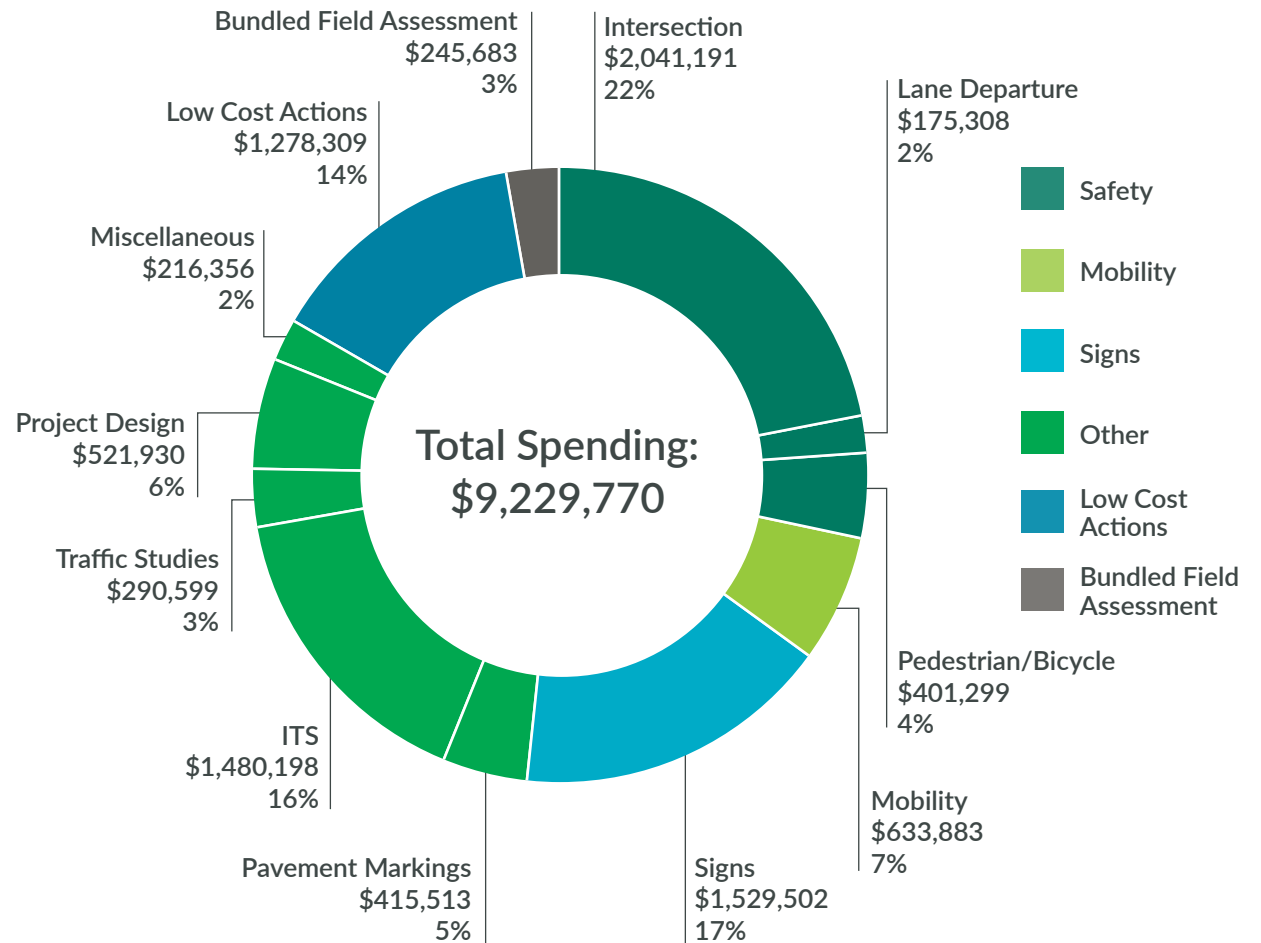


STATEWIDE OVERVIEW

In 2017-19, The Traffic Office delivered \$9.2 million in low-cost enhancement projects. This included over 260 projects, plus numerous low-cost actions and bundled signing projects.

Of the \$9.2 million, \$8.4 million went directly to implement on-the-ground projects. An additional \$291,000 went to traffic studies, and \$522,000 went to staff time to design projects.

Statewide Low Cost Enhancement Spending by Type of Project 2017-2019



Note: due to rounding, the percentages will not add up to 100%

SUCCESSSES & CHALLENGES IN 2017-2019

Successes

Higher Cost Projects

The LCE program continue to deliver quick-turnaround, lower-cost projects to address safety, mobility, and roadway management. The program also has supported an ongoing expansion to deliver higher-cost projects, 25 projects over \$50,000, compared to only 14 in the previous biennium. This highlights the Traffic Office's growing role in providing necessary mid-scale projects to address gaps in WSDOT's project delivery system.

Field Assessment

The program completed its fifth year, for one full cycle of the state. Traffic Office staff have surveyed 94% (6604 out of 7058 miles) of state roadways, and has completed 612 (66%) or the 931 total projects identified during the cycle. Staff are spending the sixth year of the program completing outstanding projects from the first five years, and preparing for the next five-year cycle of survey and project identification.

Challenges

Rising costs

The Traffic Office is facing increased costs, from the effect of inflation, and reduced spending power in a strong economy. The program is facing increased costs in the form of higher employee pay and higher bids for projects.

ITS preservation is 13.6% of all LCE spending for 2017-19

The ongoing preservation of ITS systems is a challenge for the LCE program. All regional offices performed some ITS preservation work during the 2017-19 biennium, for a total of \$1.25 million. Statewide, this is 75.8% of all LCE funds spent on ITS, and 13.6% of the overall LCE budget for the biennium. This compares to \$1,044,455 in the 15-17 biennium, which was 13.2% of that biennium's total LCE spending. Lack of preservation funding requires regions to use LCE funds to replace ITS devices.

NORTHWEST REGION

In the 2017-2019 biennium, NWR oversaw \$3.6 million in projects, approximately 40% of the total LCE spending for the state. NWR's major initiatives for the biennium included intersection improvements, Low Cost Actions, and ITS projects.

Intersection improvements accounted for 31% of the region's spending. This included partial costs for the *I-90 EB from Raging River Bridge to SR 18 - Active Warning Sign & Camera* project, which addresses queued traffic backing onto mainline I-90 at the interchange. The *Upgrade Maxtime Cards in Local controllers* project provided the upgrades necessary to optimize local signal control and central signal control. The *SR527 & SR96 - Loop Work For Adaptive Signal Control* project reconnected (aka mapped) existing roadway detection loops to the signal controller to facilitate updating the signal operating system to adaptive signal control. The updated mapping also allows collecting volume and turning movement counts from the signal rather than having to collect this traffic data separately.

Finally, the region installed multiple sign and signal enhancement projects at intersections. These included active warning systems for non-signalized intersections, *Intersection Safety Improvement Project (ISIP)* signs, and several flashing yellow arrow signal heads (see below for more information on flashing yellow arrows).

An additional 27% of the region's budget went to Low Cost Action projects. LCAs are small (less than \$5,000) signing and pavement marking actions implemented by WSDOT Maintenance staff.

The region supported WSDOT's Practical Solution Initiative, as well. NWR Traffic is improving connections with Program Development, project offices, and local jurisdictions in order to include low cost improvements as part of larger projects. Examples include, implementing pavement marking updates with a state paving project, and filling in a missing sidewalk segment (city funded) with a Connecting Washington project.

One major success for the biennium included the region's partnership with local jurisdictions on adaptive signal control projects. Adaptive control uses detection collected in real time to adjust signal timing, within parameters, to adapt accordingly. This is particularly beneficial for handling unplanned events, such as crashes. Typical traffic patterns are handled well with time of day plans and frequent monitoring, which the central signal system allows. These projects help with costs to get communication capability and camera coverage to intersections. Running fiber to intersections, whether underground or overhead, is expensive. NWR has partnered with the

cities of Mountlake Terrace, Lynnwood, Sammamish, and Federal Way, as well as Snohomish County, on these projects. Once communication is in place, signal operation improves because 1) cameras are available for remote monitoring 2) adaptive signal control is available for adjusting signal timing, and 3) signals can be connected to NW Region Central Signal System and operational adjustments made remotely. Remote adjustments can be much more frequent, since the engineer does not have to travel to and from the signal cabinet.

NWR experienced two key challenges in the 2017-19 biennium:

- Lack of availability of Maintenance staff to complete low cost enhancement work orders. Maintenance staff typically have a full load of Maintenance work, and must fit low cost enhancement work in as best they can. Traffic control costs in the Puget Sound region can be high, as work often must be performed when volumes are low, which is at night on overtime.
- Lack of funding to keep traffic signal, ITS, and maintenance equipment up to date and functioning optimally. This results in LCE funding being used for preservation purposes. Q2 funds are used to update controller equipment, cameras, VMS, emergency preempt, etc.

NORTHWEST REGION

Twenty percent of the region's funds went to ITS projects. Some of these ITS projects were new or represented necessary adjustments to a changing system, such as adding ramp meters and modifying meter configuration (such as converting an HOV bypass lane to a metered lane). However, of the \$743,998 that NWR spent on ITS projects, 17% was spent on ITS preservation: upgrading CCTV cameras, and replacing VMS equipment.

In 2019-21, NRW intends to pursue the following initiatives:

- Active Transportation Enhancements. Now that NWR has an Active Transportation Specialty team, they are better able to support region and local agency project development with regard to active transportation needs, and to develop and deliver active transportation related low cost enhancements. An example is improving signing and pavement marking for crossings at the I-5 at SR531 interchange.
- Flashing Yellow Arrows (FYAs). FYAs can improve roadway capacity and reduce driver frustration, as noted in the Design Manual. FYA is being used more by more jurisdictions to address these issues. In accordance with Design Manual guidelines, signal displays and operation are being converted to FYA where safety and mobility can be improved.
- Loop Mapping. As described above, loop mapping is updated so signal detection can be optimally mapped into the signal controller. This is necessary for collecting turning movement counts and for adaptive signal control operation. An additional benefit is leveraging signal equipment to get traffic count and turning movement data. NRW will focus on those intersections transitioning to adaptive signal control in the 2019-21 biennium, and eventually move focus to the highest volume corridors.

NORTHWEST REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
I-90 EB from Raging River Bridge to SR 18 - Active Warning Sign & Camera	415,301	Intersection	ITS spending
King Area Low Cost Actions	376,357	Low Cost Actions	
Mount Baker Area Low Cost Actions	319,783	Low Cost Actions	
Snohomish Area Low Cost Actions	282,803	Low Cost Actions	
Upgrade Maxtime Cards in Local Controllers	225,115	Intersection	
I-5 SB from NE 45th St to NE 130th St - Ramp Meters	171,704	ITS spending	
I-5 S from 188th St to NE 80th St - CCTV Installation	161,878	ITS spending	
SR 527 from I-405 to 164th - Signal Integration	127,928	Mobility	
SR 509 at Cloverdale St/1st Ave S - Signal Upgrade	120,914	Intersection	
SR 527 & SR 96 - Loop Work For Adaptive Signal Control	110,008	Intersection	
Curve Warning Signs from past biennia	87,482	Signs	
SR 202 at 218th - Active Warning Signs	62,886	Intersection	
Unstable Slope Signing - Regionwide	60,966	Signs	
Intersection Safety Improvement Program - Finish 15-17 Signs	60,813	Intersection	
I-5 SB at Mercer Street Exit - On Ramp Barrier	56,430	ITS spending	
I-5 at Ship Canal Bridge - VMS Replacement	53,318	ITS spending	
Environmental Investigation	44,090	Project Design	
SR 169 Safety Study - Enhancements to Signal & Signing	43,642	Intersection	
Camera Upgrades Phase 7	43,169	ITS spending	
Tort Claim Investigation	41,560	Project Design	
SR 527 & SR 96 - Update to Signal Preempt Feature	39,126	Intersection	
FAST Act Weight Limit Signs - Regionwide	37,780	Signs	
Camera Upgrades Phase 8	33,582	ITS spending	

NORTHWEST REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
Material Lab Investigation	31,693	Miscellaneous	
US 2 & SR 169 - Permanent Traffic Recorders	30,714	Traffic Studies	
I-5 SB from Lynnwood To Mountlake Terrace - Hard Shoulder Running	30,217	Mobility	
SR 96 from I-5 Interchange to SR 9 - Paving & ADA Compliance	30,070	Mobility	ITS spending
Northwest Region Advance Warning Signs	27,752	Intersection	
Lynnwood Sign Replacement	25,785	Signs	
SR 525 at 5th - Improvements to Holding Lane	24,387	Intersection	
I-5 in Bellingham - Tow Zone Signing	24,312	Signs	
I-90 EB at SR 18 - Active Warning Signs & Camera	23,255	ITS spending	
Low Clearance Bridge Signing	22,472	Signs	
Cabinet & Controller for Ramp Meter Firmware - Traffic Management Center	21,028	ITS spending	
SR 518 WB at Des Moines Memorial Dr. - Remove Bridge Signs	20,326	Signs	
SR 525 Alderwood Pkwy Signing	17,134	Signs	
I-5 NB & SB at Mercer Street Exit - Ramp Meters	15,955	ITS spending	
SR 526 in Mukilteo - Signing	15,414	Signs	
Software Development Tools	14,942	Miscellaneous	
US 2 from Fern Bluff Rd to 10th St.- Paving & Ada Compliance	14,830	Intersection	
I-405 at Interurban - Barrier Modifications	14,364	Lane Departure	
SR 522 - Signal Phase & Timing (SP&T) - Equipment Installation	14,344	ITS spending	
US 2 at SR 522 - Bike & Pedestrian Crossing Improvement	13,068	Pedestrian/Bicycle	
Signal Maintenance Investigation	12,136	Lane Departure	Project Design
SR 9 at 30th and 32nd - Flashing Yellow Arrows	11,863	Intersection	
SR 18 at Tiger Mountain - Curve Warning Signs	10,272	Signs	

NORTHWEST REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
Utility Investigation	10,159	Traffic Studies	Project Design
HOV Vehicle Occupancy Study	10,000	Traffic Studies	
I-5 at 44th Ave W 204th St SW Signal & Ped Heads Update	9,531	Intersection	Pedestrian/Bicycle
Spokane St/6th Ave S On Ramp to SB I-5 - Curve Warning Signs	9,061	Signs	
I-5 SB from NE 45th St to NE 130th - Pavement Markings For Meters	9,053	Pavement Markings	
SR 532 at 102nd - Flashing Yellow Arrow	8,860	Intersection	
I-90 WB at MP 24 - Curve Warning Sign	8,351	Signs	
SR 164 at SR 169 - Replace Signal Heads	8,252	Intersection	
SR 203 at 203rd/High Rock Rd - Loops For Active Warning System	7,601	Intersection	
SR 539 at Smith Rd - Flashing Yellow Arrow	7,336	Intersection	
I-5 At 44th - NB Ramp Signal & Pedestrian Countdown Timer Update	7,263	Intersection	Pedestrian/Bicycle
SR 543 at Intl Border - Detection Loops in NEXUS Lane	7,114	ITS spending	
SR 520 at Leary Way - Right Turn Blank Out Sign	7,029	Intersection	
SR 516 at 168th Pl SE - Flashing Yellow Arrow	6,736	Intersection	
I-405 at 124th - Camera Connection	6,475	ITS spending	
SR5 20 at NE 40th - Peak Hour Shoulder Running	6,261	Mobility	
SR 204 at Lundeen Pkwy - Flashing Yellow Arrow	6,139	Intersection	
SR 544 at Hannegan - Flashing Yellow Arrow	6,039	Intersection	
SR 164 at 244th Ave SE - Flashing Yellow Arrow	6,032	Intersection	
SR 539 at Birch Bay Lynden Rd & Kok Rd- Audible Pedestrian Signal	5,746	Pedestrian/Bicycle	
Mercer Street to SB I-5 in Seattle - Curve Sign Beacons	5,672	Lane Departure	
SR 516 at 172nd - Flashing Yellow Arrow	5,631	Intersection	
I-5 NB & SB at Kincaid St/SR 536- Signal Improvement	5,558	Intersection	

NORTHWEST REGION

All 2017–2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
SR 530 at Oso - Memorial Signs	5,181	Signs	
SR 532 at 88th Ave NW - Flashing Yellow Arrow	5,084	Intersection	
SR 524 at Damson Rd/North Rd - Flashing Yellow Arrow	4,754	Intersection	
Central Signal System Replacement	4,538	Intersection	
SR 169 in Maple Valley - Open House on Community Concerns	4,216	Miscellaneous	
US 2 at Fryelands - Video Detection	3,892	Intersection	
I-90 at W Lake Sammamish Pkwy - Correct Sign Placement	2,956	Signs	
SR 169 at 264th - Flashing Yellow Arrow	2,025	Intersection	
SR 92 at 127th - Active Warning Signs	1,649	Intersection	
I-5 NB from SR 531 to Stillaguamish River - Paving & ADA Compliance	1,447	ITS spending	
SR 18 WB at I-5 - Update Signing	1,160	Signs	
SR 542 from Cornell Creek Rd to Nooksack River - Guardrail Replacement	50	Lane Departure	



OLYMPIC REGION

OR's LCE program spent \$2.1M in the 2017-19 biennium. The region accomplished a diverse set of projects this biennium, with an emphasis on community partnerships and implementing practical solutions to address safety and mobility issues.

The region engaged in three notable partnerships in 2017-19. The first project, with Mason County, addressed speed and pedestrian safety along SR 3 in Belfair by installing radar speed signs, marked crosswalks, and pedestrian RRFBs. In the second project, OR implemented a practical solution by partnering with the I-5/SR 510 Interchange Reconstruction Project team to address recurring congestion exacerbated by a construction stage detour at the I-5 off-ramp to Martin Way E/Nisqually Cut Off Rd SE. This project added capacity at the ramp terminal intersection. OR also partnered with a project construction office to install a right turn lane on SR 305 to relieve congestion and address traffic risks at the location.

OR addressed several roadway departure crash locations through signs, pavement markings, and centerline and edge line rumble strips. OR also invested in restriping highways and intersections, providing more refuge areas for turning traffic, and providing additional vehicle queuing at intersections.

The program identified and tracked projects costing more than \$2,000 and grouped all other projects into Low Cost Actions, for a total of \$60,000

OR's Traffic Office faced a number of LCE project delivery challenges from both design and implementation perspectives. OR Traffic has found it helpful to coordinate some design work with Region Project Office staff, especially on projects that require minor pavement widening. OR Traffic is also working with Region Maintenance staff on flexible implementation schedules, to accommodate the existing heavy workload for the region's Maintenance staff. Olympic Region Traffic has also seen growth in requests from constituents and community groups for radar speed signs, rectangular rapid flashing beacons (RRFBs) is more conventional, and data collection devices.

Looking forward to the 2019-21 biennium, the region will continue to focus on safety, mobility, implementing practical solutions, collaboration with local and state governments and special interest groups, and reduction in maintenance costs with each future project. OR will also continue to identify projects through the Field Assessment Program. Currently-planned LCE projects include partnerships for pedestrian

improvements on SR 109 in Hoquiam, SR 105 along the coast, and US 101 in Hoodspport. OR also plans to fund mobility improvements such as ramp meters, a ferry holding lane, and ITS equipment to provide more efficient signal operations.

OLYMPIC REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category	Third Category
LCE Project Design & Support	1,105,910	Multiple		
SR 3 from Pickering Road to Allyn - Slow Vehicle Turn Outs - Phase 1	72,252	Mobility		
SR 3 at Belfair - Rectangular Rapid Flashing Beacons	65,992	Pedestrian/Bicycle	Signs	ITS spending
I-5 SR 512 to 56th St - Vehicle Detection & Comm. Upgrade	55,239	ITS spending		
US 101 at Happy Valley Road - Left Turn Channelization	50,291	Intersection	Mobility	Pavement Markings
SR 305 at SR 3 - Right Turn Lane	45,122	Multiple		
SR 307 at Foss-Pugh - Left Turn Channelization	40,540	Intersection	Signs	Pavement Markings
SR 7 at 175th - Left Turn Channelization	38,965	Intersection	Mobility	Pavement Markings
I-5 SB at 54th Ave E - Exit Only Signs & Pavement Markings	38,585	Multiple		
SR 3 from Pickering Road to Allyn - Slow Vehicle Turn Outs - Phase 2	35,553	Mobility	Signs	
Trafficcast International Renewal	30,600	ITS spending		
SR 16 at Kitsap County Line - Shoulder Rumble Strips	30,521	Lane Departure		
US 12 at Chehalis St - Install Left Turn Lane	30,398	Multiple		
SR 16 from Jackson to Olympic Dr - Camera Upgrade	27,390	ITS spending		
End School Zone Signs - Regionwide	22,841	Signs		
Data Stations Communication Upgrade - 2G to 4G	18,445	ITS spending		
SR 161 in South Hill - Mid-Block Crosswalk & Actuated Flashing Beacon	17,444	Pedestrian/Bicycle	Signs	Project Design
US 101 at Indian Creek - Structure-Weight Restrict	17,159	Signs		
SR 166 at Harrison Ave - Pedestrian Crossing Rapid Flashing Beacon	16,449	Multiple		
US 12 at SR 8 - Intersection Warning Signs	15,038	Signs		
SR 165 Carbon River to Gale Creek - LDS Panels	13,843	Lane Departure		
US 101 SB at SR 8 - Zipper Merge	13,113	Multiple		
SR162 at Military Road - Turning Vehicle Stop Signs	11,918	Pedestrian/Bicycle	Signs	

OLYMPIC REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category	Third Category
Thermoplastic and Raised Pavement Marker Purchases	11,680	Miscellaneous		
Rectangular Rapid Flashing Beacons and Vis-Z-Shields Purchases	11,040	Miscellaneous		
SR 3/SR 305 to SR 104 - Speed Zone Change	10,608	Multiple		
I-5 SB at Martin Way E/Nisqually Cut Off Rd SE - Off Ramp Restriping	10,337	Multiple		
SR 160 to SR 16 - On-Ramp Right Turn Lane	10,235	Mobility	Signs	Pavement Markings
SR 105/SR 101 to Newskan Creek - Linear Delineation System	9,702	Lane Departure		
Miovision Trafficlink Contract Renewal	9,000	ITS spending		
SR 105 at W Huntley St - Removed Signal - Updated Signing	8,612	Intersection	Signs	ITS spending
SR 410 between Bonney Lake and Bukley - Centerline Rumble Strip	8,556	Lane Departure		
SR 305 at Suquamish - Bicycle Detection Beacons	8,345	Pedestrian/Bicycle	Mobility	Signs
SR 305 Miovision	8,276	ITS spending		
SR 167 at 24th & 8th - On & Off Ramps - No Parking Signs	7,958	Mobility	Signs	Project Design
SR 109 Hoquiam to Moclips - Linear Delineation System	7,433	Lane Departure		
SR 160 at Converse Ave SE - Signing and Pavement Markings	6,999	Intersection	Pedestrian/Bicycle	Signs
SR 3 at SR 104 at Hood Canal Bridge - Yield Signs	6,886	Multiple		
SR 105 Twin Harbors State Park to Aberdeen - 8 Inch White Edge Line	6,697	Lane Departure	Pavement Markings	
US 101 Sequim to Blyn - Speed Study	6,097	Signs	Traffic Studies	
SR 101 at Humptulips - Speed Zone Change	6,082	Multiple		
SR 510 near Pacific Avenue & Martin Way - Speed Reduction Study & Signing	5,881	Signs	Traffic Studies	Project Design
Loxie Eagans Blvd at SR 3 Interchange - Signing	5,433	Intersection	Mobility	Signs
SR 507 at Vail Rd SE Mp - Warning Signs	5,379	Signs		
I-5/SR 512 Interchange to 56th St - ITS Devices Network Upgrade	5,315	ITS spending		

OLYMPIC REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category	Third Category
SR 116 MP 2.65 to MP 9.71 - Bike Signs	4,791	Pedestrian/Bicycle	Signs	
T-1 Line Switch Replacement	4,634	ITS spending		
SR 304 in Bremerton - HOV & Lane Reduction Arrows	4,328	Pavement Markings		
I-5 NB near Nisqually - Striping & Signing Adjustment	3,935	Signs	Pavement Markings	
SR 3 at Belfair Safeway - No Left Turn Sign & Pavement Markings	3,929	Signs	Pavement Markings	
US 12 at Linkshire Drive - Pylons	3,816	Intersection		
SR 16 at Sprague Ave - Ramp Meter	3,791	Mobility		
SR 7 at Garfield Street - Two Way Left Turn Lane	3,767	Mobility	Pavement Markings	
I-5 NB at 56th St - All Traffic Must Exit Sign	3,749	Signs		
SR 161 at Edgewood - Centerline Rumble Strip	3,747	Lane Departure		
SR 106 MP 8.10 - 8.50 - Centerline Rumblestrips	3,683	Lane Departure	Pavement Markings	
SR 165 at City Of Wilkeson Skate Park - Crosswalk	3,654	Pedestrian/Bicycle	Pavement Markings	
SR 12 at Forstrom Rd - Rumble Strips	3,612	Intersection	Miscellaneous	
US 101 at Port Angeles- Speed Reduction Signs	3,473	Signs	Traffic Studies	
SR 302 from County Line to 10.57 - Updated Street Name Signs	3,454	Signs		
SR 121 at 113th St - Intersection Warning Signs	3,197	Signs		
SR 162 near Alderton - Tractor Signs	3,192	Signs		
SR 167 near Tacoma - Edge Line Rumble Strips	3,089	Lane Departure		
SR 3 near Hood Canal Bridge - School Bus Stop Ahead Signs	3,075	Signs		
US 101 at Boulder Creek - Install Chevrons	3,065	Lane Departure	Signs	
SR 410 turn to Veterans Memorial Dr. - Added Yellow Dotted Extension Line	2,984	Pavement Markings		
SR 507 at Yelm Walmart - Private Entrance Striping/Signing	2,819	Intersection	Pavement Markings	
Communication Upgrade To Wireless Modem	2,789	ITS spending		

OLYMPIC REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category	Third Category
US-12 at Elma - WSP Aerial Markings	2,772	Pavement Markings		
US 101 in Olympia at Evergreen Off-Ramp - Pedestrian Signing & Crosswalk	2,624	Pedestrian/Bicycle	Signs	
SR 160 at Wilson Creek Road - Passing Zone Signs	2,619	Signs	Traffic Studies	
SR 302 at Gateway Park - Turning Traffic Signs	2,577	Signs		
SR 305 at High School Rd - Recessed Double Yellow Center Line	2,434	Pavement Markings		
SR 305 at Totten Rd - Install Dotted Extension Line	2,415	Lane Departure	Pavement Markings	
SR 166 at Rockwell Avenue - Remove Overhead Sign Poles & Relocate Pedestrian Sign	2,257	Miscellaneous		
Transportation Equipment Fund Commercial Driver License Training for Signing Maintenance Staff	2,172	Miscellaneous		
SR 165 Carbon River Bridge - Signing	2,137	Lane Departure	Signs	
Fiber Splice Boxes & Patch Cords	2,102	ITS spending		
I-5 Olympia Area - Microwave Technology Upgrade	1,973	Miscellaneous		
SR 121 at Beaver Creek Bridge - Emergency Vehicle Weight Sign	1,926	Signs		
SR 3 near Belfair - School Bus Stop Ahead Signs	1,907	Signs		
SR 507 at City of Rainier - Justin D Norton Memorial Signs	1,821	Signs		
SR 16 at Burnham Dr - Sign & Pavement Markings	1,644	Signs	Pavement Markings	
SR 20 at US 101 - Guide Sign	1,474	Signs		
I-5 at Dupont Steilacoom Rd - Do Not Stop on Tracks Signing	1,443	Signs		
I-5 at Maytown & Scatter Cr Rest - Commercial Vehicle 11hr Sign	1,419	Signs		
SR 115 in Ocean Shores - Replace Stop & Stop Ahead Signs	1,398	Signs		
SR 3 in Shelton - Driveways & Speed Zone Signing	1,291	Signs		
US 12 at Elderberry St - Pavement Markings Right Turn Lane	1,215	Mobility	Pavement Markings	

OLYMPIC REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category	Third Category
SR 20 at Fredricks St - Signing	1,213	Intersection		
US 101 at SB I-5 - Pavement Markings	1,119	Pavement Markings		
US 12 at Monte Brady Rd - Fire Truck Warning Signs	1,093	Signs		
SR 160 at Harper Church/Park & Ride Lot - Intersection Crosshatching	932	Pavement Markings		
I-5 SB Exit 105A -Vehicle Weight Restriction Signing	899	Signs		
SR 108 near Kamilche - Railroad Crossing Advisory Signing	871	Signs		
US 101 at Lynch Rd - Reinstall Raised Pavement Markers	864	Pavement Markings		
US 101 at Donkey Creek Rd - Warning Sign	732	Signs		
SR 101 at Sappho & Boyce-Deer Park - WSP Aerial Markings	579	Pavement Markings		
SR 104 at Teal Lake/Shine Rd - Left Turn Channelization Study	422	Miscellaneous		
SR 104 near Kingston - Kingston Transit Signing	339	Signs		

NORTH CENTRAL REGION

In the 2017-19 biennium, NCR again used LCE funding to accomplish a wide variety of improvements and enhancements to the regional transportation system. The region leveraged LCE funding in collaboration with other programs within WSDOT, and with local agencies. These partnerships resulted in sizable projects that enhance mobility and safety for freight, passenger vehicles, bicycles, and pedestrians. LCE funding is also a vital resource for many smaller projects in the region. System users frequently call with requests for a speed limit change, new signing, updated striping, or some other minor operational adjustment. LCE funding allows a quick, focused response to customer needs.

Near the end of the 2015-17 biennium, the region used LCE funds to purchase a new VMS for installation at the junction of US 2, US 97, and SR 28 north of East Wenatchee. The VMS was installed using LCE funds during the 2017-19 biennium. The VMS is an important addition that supplies accurate traveler information to drivers about road and weather conditions to the north or west. Other ITS investments in NCR are less visible, but highly important additions to the communications network that helps gather and transmit traveler information. For instance, LCE funding helped further enhance and expand communication infrastructure in the Columbia Basin. Along

with other ITS benefits, this enabled the installation of traffic cameras in the Moses Lake area and made their connection to the network possible.

The North Central Region began upgrading traffic signal controllers during the 15-17 biennium to Advanced Transportation Controller (ATC) specifications. ATC hardware and software enables flexibility in traffic signal timing to react to changing conditions and provide the most efficient operation. During the 2017-19 biennium NCR used LCE funds to purchase and deploy 25 new ATC-capable CPUs and ATC “Omni” software in existing traffic signal controllers.

NCR has continued its commitment to practical solutions through partnerships with cities, counties, and other agencies and organizations. NCR partnered with the City of Ephrata and Grant County to construct a roundabout on SR 282 at its intersection with Dodson Rd.

The enhancements enabled by LCE funding are low cost, but they provide big benefits. Because of the flexibility and quick response time possible with Low Cost Enhancements, NCR has been able to apply effective, innovative solutions and to economize by teaming up with other agencies and with WSDOT projects funded by other programs. One challenge that NCR faces is that anything added to the existing

transportation system must be maintained; this provides long-term benefits to users of the system. and protects the investment of State dollars. North Central Region is committed to finding new ways to address the gap between additions to the system and the personnel and funding to maintain it.

NORTH CENTRAL REGION

All 2017–2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
Area 1 Signs	112,376	Signs	
Scheduled Reviews of Traffic Signal Timing - Regionwide	74,495	Mobility	
SR 282 at Dodson Rd - Restriping for Roundabout	65,811	Mobility	Pavement Markings
US 97 in Brewster - Two-Way Left Turn Lane	65,502	Pavement Markings	
SR 155 in Nespelem - "Your Speed Is" Sign, Rectangular Rapid Flashing Beacons, & Warning Signs	55,789	Pedestrian/Bicycle	
I-90 - Four Gates For Ramp Closures	39,357	Miscellaneous	Signs
SR 28 north of East Wenatchee - Variable Message Signs	37,629	ITS spending	
US 2 from Leavenworth to Orondo - Field Assessment Projects	35,213	Bundled Field Assessment	
Regionwide Bike Detection at Signals - Radar Upgrades	34,400	Pedestrian/Bicycle	
SR 26 full route - Field Assessment Projects	33,338	Bundled Field Assessment	
SR 28 near Ephrata at Road E NW - Left Turn Lanes	32,202	Pavement Markings	
SR 24 from SR 243 to Othello - Field Assessment Projects	29,005	Bundled Field Assessment	
Regionwide Signal Controller Upgrades	27,859	Intersection	
US 97 from SR 970 to Canadian Border - Field Assessment Projects	27,380	Bundled Field Assessment	
SR 28 in Ephrata - Two-Way Turn Lane	26,136	Bundled Field Assessment	
US 2 from Nason Creek to Leavenworth - Field Assessment Projects	26,111	Bundled Field Assessment	
SR 243/SR 24 to SR 26 - Field Assessment Projects	25,046	Bundled Field Assessment	
SR 171 at Alder St - Access Control Curb	24,144	Intersection	
Area 2 Signs	22,864	Signs	
SR 17 at Dry Falls Rest Area - Restriping	18,608	Pavement Markings	
Area 4 Signs	16,033	Signs	
US 2 at Cascade Ave - Right Turn Extension	15,172	Mobility	

NORTH CENTRAL REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
SR 17 at Moses Lake - Cameras, Radios, & Connectivity	14,877	ITS spending	
Area 3 Signs	10,496	Signs	
US 97 Chelan County to Omak - Field Assessment Projects	10,008	Bundled Field Assessment	
ITS Communication Radios	9,603	ITS spending	
SR 20 Early Winters to Ferry County Line - Field Assessment Projects	9,400	Bundled Field Assessment	
US 2 in Leavenworth - Flashing Yellow Arrow	9,259	Intersection	
State Force Work	9,026	Miscellaneous	
Regionwide Minor Striping Changes	7,880	Pavement Markings	
Signal Interconnect - US 2 in Leavenworth & SR 28 in Ephrata	7,186	Mobility	
SR 155 at Coulee Dam - School Zone Signing	6,841	Pedestrian/Bicycle	
US 97 at Blewett Pass - Camera	6,391	ITS spending	
US 97 in Oroville - Crosswalk Installation	6,204	Pedestrian/Bicycle	
SR 97A from Entiat to Hugo Road - Field Assessment Projects	5,941	Bundled Field Assessment	
Regionwide Reduced Speed Sign Updates	5,873	Signs	
SR 28 from SR 2 to Ephrata - Field Assessment Projects	5,080	Bundled Field Assessment	
SR 20 Winthrop to Aeneas Valley Rd - Field Assessment Projects	5,032	Bundled Field Assessment	
Regionwide Minor WSP - Requested Enhancements	4,124	Signs	
SR 20 Flagg Mountain Radio Tower - Solar Panels	3,953	ITS spending	
SR 285 full route - Field Assessment Projects	3,591	Bundled Field Assessment	
US 2 at Easy St. - Signal Bike Detection	3,567	Pedestrian/Bicycle	
SR 171 at Ash St - Radar Detection	3,348	Mobility	
US 97 in Okanogan - Rectangular Rapid Flashing Beacons	1,713	Pedestrian/Bicycle	
SR 150 Manson to Howser Rd - Field Assessment Projects	1,448	Bundled Field Assessment	

NORTH CENTRAL REGION

All 2017–2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
SR 281 full route - Field Assessment Projects	1,344	Bundled Field Assessment	
SR 282 full route - Field Assessment Projects	1,306	Bundled Field Assessment	
SR 171 in Moses Lake - Striping Upgrades & Tubular Marker Installation at Pedestrian Crossing	743	Intersection	
Regionwide Motorcycle Safety Awareness Campaign	382	Miscellaneous	
SR 173 Bridgeport to Okanogan County Line - Field Assessment Projects	270	Bundled Field Assessment	
SR 20 from Skagit County to Early Winters - Field Assessment Projects	34	Bundled Field Assessment	

SOUTHWEST REGION

SWR implemented a wide variety of LCE projects in the 2017-19 biennium. 20% of the LCE funding allocation went to delivering seven larger-scale projects. The region placed an emphasis on taking a practical solutions approach to developing and prioritizing these projects.

Target Zero categories such as intersection, lane departure, and pedestrian/bicycle spending accounted for about 25% of the region's LCE spending. In support of WSDOT's growing emphasis on multi-modal transportation and increased community engagement, SWR continues to emphasize pedestrian and bicycle projects. The region completed 20 LCE-funded pedestrian and bicycle safety projects, accounting for about 7% of the region's LCE spending.

About 24% of SWR's LCE spending for the biennium went towards Intelligent Transportation System (ITS) equipment for signal and camera systems to assist in implementing low cost operational practical solutions. This work included Wavetronix and flashing yellow arrows tied to signals.

SWR spent 18% of its LCE funding on approximately 120 low-cost actions, small-scale projects under \$5,000 each. These projects can consist of improvements as simple as restriping eight inch edge lines to promote slower speeds, to adding tubular

markers, signing, and pavement markings to enhance pedestrian access.

16% of SWR's LCE funds went to cover funding gaps for other underfunded commitments. The region purchased update software/equipment for camera or signal systems, providing more effective communication and improving traffic flow. These are vital hubs for communicating to emergency, incident response, and Maintenance staff on a day-to-day basis, as well as enhancing coordination with WSP. The region used partnerships with the Maintenance Office to bring these regional assets up to present-day standards.

12% of SWR's LCE funds went towards implementing Field Assessment projects identified between 2014 and 2019. The Field Assessment program encourages partnerships with local agencies. Through this program, SWR staff and their partners successfully identified several very low cost safety improvements for construction projects that benefit the travelling public.

In the 2019-21 biennium, SWR is continuing efforts to actively manage its transportation system to address both recurring and non-recurring congestion. The region's goal is to limit the duration of congestion, reduce the number of incidents, clear incidents quickly, and prevent secondary crashes. One major

step towards these goals is the addition of nine proposed new ramp meters and an I-5 Active Traffic Management (ATM) system in early 2020.

SOUTHWEST REGION

All 2017–2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category	Third Category
Low Cost Actions	171,786	Low Cost Actions		
I-205 SB at Exit 30 - Striping Revision	77,906	Mobility	Pavement Markings	
SR 4 at Cathlamet Road - Speed Reduction/Traffic Calming/ Intersection Improvements	74,235	Multiple		
Wavetronix Data Station Replacements	55,872	Intersection		
US 12 at Mary's Corner - Truck Dilemma Zone Detection	43,520	Intersection	ITS spending	
4G Modems & Switches - Upgrade from 3G	41,453	ITS spending		
LCE Project Design & Support	38,753	Traffic Studies	Project Design	
SR 500 from 45th Ave to 54th Ave - Data Stations	35,633	ITS spending		
Mobile Cameras for Four Incident Response Trucks	32,247	ITS spending		
TMC/EOC Expenditures	31,235	ITS spending		
SR 503 at Goerig Rd - Intersection Improvements	25,761	Multiple		
SR 14 Slow Vehicle Turnout Signing	25,307	Signs		
A To D Camera Conversion - Digital Capability for 5 Cameras	24,708	ITS spending		
Traffic Studies	21,157	Traffic Studies	Miscellaneous	
US 101 at Duryea Street - Pedestrian Refuge Island	19,906	Pedestrian/Bicycle		
Traffic Cameras - Eleven New Cameras	18,585	ITS spending		
SR 105 Tokeland - Crosswalk, Signing, & Flashing Beacon	17,795	Pedestrian/Bicycle		
US 101 at SR 6 - Rapid Flashing Beacons for Pedestrians	17,143	Pedestrian/Bicycle		
2019 Advanced Traffic Management System Software	16,504	ITS spending		
Flashing Yellow Arrow Signal Upgrades	15,480	Intersection		
SR 141 at Trout Lake - Channelization, Signing, Speed Limit Revision	15,202	Intersection	Signs	

SOUTHWEST REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category	Third Category
I-5 NB at Exit 11/SR 502 - Curbing and Channelization	13,361	Intersection	Signs	Pavement Markings
SR 14 Tow Away Zone Signing	13,180	Signs		
US 12 Pass Closures Signing	12,955	Signs		
SR 14 Underwood Electronic Radar Speed Limit Sign	12,012	Signs		
CAL/CAC/IAL Development	11,749	Intersection	Project Design	
SR 503 at Gabriel Rd - Solar Powered LED Blinking Signs	11,562	Intersection		
I-5 & SR 14 - Vancouver Waterfront Signing	11,221	Signs		
I-205 Tow Away Zone Signing	9,468	Signs		
SR 4 Wahkiakum County Fairground Signing	9,273	Signs		
SR 505 at Toledo - Pedestrian Bulb Outs, Signing, & Striping	9,195	Pedestrian/Bicycle	Signs	Pavement Markings
Traffic Counting Equipment & Supplies	8,178	Miscellaneous		
Portable Camera Trailer	5,962	ITS spending		
I-5 at Exit 59 - Ramp Channelization	4,291	Pavement Markings		
SWR Ramp Updates for SRView	4,281	Miscellaneous		
SR 4 - Linear Delineation Panels on Curves	3,649	Lane Departure		
SR 500 at 99th Street - Right Turn Yield on U-Turn Signs	2,902	Intersection		
SR 503 at McBride Rd - Left Hand Turn Lane Design	2,901	Project Design		
SR 14 at Cape Horn - Signing/Delineation Improvements	2,812	Lane Departure	Signs	
SR 14 Tunnels 1-7 - Traffic Control for LIDAR	2,100	Miscellaneous		
SWR Curve Data Collection & Analysis	1,562	Lane Departure		
I-205 NB to SR 14 EB - Zipper Merge Signing	1,366	Signs		
I-205 NB On-ramp at Mill Plain - Restripe & Add Sign	1,339	Pavement Markings		

EASTERN REGION

Additional LCE funds allowed Eastern Region to accomplish more work in the 2017-19 biennium. However, even with the additional funding, the two largest projects could not have been accomplished without leveraging partnership opportunities:

- ER combined LCE funds with \$97,000 in Spokane Tribe mitigation funds to construct the SR 902 at Craig Rd - Compact Roundabout, discussed in the 15-17 LCE report. (Page 52 of that report.)
- ER also combined LCE funds with \$200,000 of Regional Administrator Discretionary Funds to install raised channelization on *US 2 Hayford Rd To Deer Heights Rd Channelization* a location the region has been trying to address for several years.

ER Traffic staff has a long history of using the Practical Solutions process to identify and implement Transportation Systems Management & Operations (TSMO) projects. Many ER projects start from safety investigations or from contact with a constituent. Larger projects involve collaborating with one or more local agency

partners. The *US 2 Hayford Rd To Deer Heights Rd Channelization* project is an excellent example of a successful practical solutions process.

Despite the region's commitment to the Practical Solutions process, challenges continue in the effort to improve approaches to identifying and delivering transportation projects.

Looking forward to the 2019-21 biennium, ER is pursuing the following initiatives:

- Around 20% of the 2019-21 allocation is set aside to pay for additional raised channelization work on the *US 2 Hayford Road to Deer Heights Road Channelization* project, to connect with a developer-constructed roundabout.
- Completing work on several routes with curve warning sign upgrades to meet MUTCD implementation dates.
- Q funds will likely be used to cover occasional shortfalls in maintenance funding when ITS equipment fails.

ER is considering using LCE funds to contribute to several regional rumble strip projects.

EASTERN REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	First Category	Second Category
US 2 Hayford Rd to Deer Heights Rd Channelization	369,061	Intersection	Project Design
SR 902 at Craig Rd - Compact Roundabout	194,074	Intersection	
Field Assessment Signing Projects	63,752	Signs	
Maintenance Area 1 - Signing	38,654	Signs	
Maintenance Area 2 - Signing	37,705	Signs	Pavement Markings
SR 26 & SR 195 - Weather Station & Cameras	37,367	Project Design	
Low Clearance Bridge Signing - Regionwide	29,075	Signs	
Eastern Region I-90 Operations Study - Ramp Volumes	23,651	Traffic Studies	
National Operations Center of Excellence (NOCOE) Signal Phase & Timing (SP&T) Challenge	20,277	ITS spending	
Maintenance Area 3 - Signing	8,462	Signs	
SR 290 at Progress Road - Turn Restriction	8,437	Project Design	
SR 20 at Republic - Crosswalk Revisions	8,203	ITS spending	
RWIS/VMW Communications Upgrade	6,977	ITS spending	
Maintenance Area 4 - Signing	6,061	Signs	
SR 20 at Sherman Pass - Curve Warning Signs	5,763	Signs	
US 395 at Colville - CCTV Replacement	4,227	ITS spending	
SR 272 at MP 1.1 - Curve Signing Updates & Guidepost Installation	3,835	Signs	
US 2 at Garfield Road - Grant Application Preparation	3,003	Project Design	
SR 20 & US 395 - Highway Advisory Radio Flasher	2,954	ITS spending	
CCTV Systems Design	2,219	Project Design	

SOUTH CENTRAL REGION

South Central Region (SCR) spent \$581,000 on Low Cost Enhancement (LCE) projects in the 2017-19 biennium. The region's main focus remains traffic safety for those who travel on the highway system. Over the last few years, SCR has also initiated more LCE projects to benefit pedestrian and bicycle users.

To maximize the benefits of the LCE funding, the region works hard to build partnerships and collaborate on projects. SCR's most important partner from biennium to biennium

has been WSDOT's local Maintenance Offices. The region has also increasingly been working with smaller, local communities to address issues of local concern. LCE funding helps the region leverage local funding contributions to develop and implement projects.

In addition to partnerships and bike/pedestrian projects, SCR continues to focus on signing and ITS projects, which account for just over one third of the region's 2019-21 LCE funds. The signing efforts typically

are single installations to meet an emergent need to address safety or guidance.

ITS deployments continue to help the Transportation System Management and Operations (TSMO) efforts of the region. Unlike most of the regions in Washington, where ITS efforts are urban-centered, SCR's greatest ITS effort is based in a rural area, the popular I-90 Snoqualmie Pass corridor which allows travelers from Central Washington to access Seattle, and vice-versa.

All 2017–2019 Low Cost Enhancement Projects

Project	Cost	Category
SR 240 in Steptoe - Peak Hour Roundabout Meter	95,103	ITS spending
SR 240 at Hagen Rd - Truck Signal Priority	41,561	Intersection
Minor Field Assessment Work - Signs	37,206	Low Cost Actions
Minor Signing Modifications - Regionwide	33,941	Signs
US 12 at 16th Ave - Pedestrian Railing Height Increase	30,701	Pedestrian/Bicycle
Low Cost Actions	30,375	Low Cost Actions
I-90 at Snoqualmie Pass - Realtime Travel Time Notification Signs	30,000	ITS spending
I-90 from MP 33 to E Easton Rd - Signing Enhancements	24,814	Signs
SR 125 in College Place - Rumble Strips	24,063	Intersection
Clarkston Vicinity - Wireless Communications Tower	22,002	ITS spending
US 12 at Naches River - Barrier to Protect from River Bank Erosion	21,042	Miscellaneous
I-90 at Vantage Bridge - Lane Delineation	20,355	Pavement Markings
Tricities ITS Communication Upgrade - Radwin Radios	15,035	ITS spending
Low Cost Enhancement Design	14,365	Project Design
SR 397 in Ainsworth - Oregon Ave Island Removal	13,904	Intersection

SOUTH CENTRAL REGION

All 2017-2019 Low Cost Enhancement Projects

Project	Cost	Category
SR128 and SR 193 Intersection - Illumination	13,425	Miscellaneous
SR 225 in Benton City - School Warning Sign	13,185	Signs
I-90 - Portable Workzone System Modifications	10,537	ITS spending
I-82 in Manastash - Slow Vehicle Warning Sign	10,036	Signs
SR 125 at College Place - College Place City Center Signs	9,793	Signs
SR 903 in Ronald - "Your Speed Is" Sign	9,198	ITS spending
US 395 in Hildebrandt - "Be Prepared To Stop When Flashing" Sign	8,835	Miscellaneous
US 12 at 16th Ave Overpass - Green Pedestrian Path	7,934	Pedestrian/Bicycle
Project Design	6,518	Miscellaneous
TMC Software Upgrades	6,324	ITS spending
US 12 near Cortwright Creek - Passing Lane Conversion	5,966	Pavement Markings
US 12 in Pomeroy - "Your Speed Is" Sign	5,818	ITS spending
SR 22 in Toppenish - Rectangular Rapid Flashing Beacons	5,608	ITS spending
I-82 from Military Rd to Valley Mall Blvd - Signing Enhancements	4,969	Signs
I-90 in Cle Elum - "Your Speed Is" Sign	3,304	ITS spending
Union Gap Main St to US 97/I-82 Interchange - Route Shields	3,245	Pavement Markings
SR 240 from Twin Bridges To Jadwin - Speed Study	1,825	Traffic Studies
SR 240 at Van Giesen Rd. - Converted Add Lane Illumination to LED	1,550	Miscellaneous
US 97 from I-90 to Burke Rd - Signing Enhancements	1,544	Signs
SR 10 from SR 970 to SR 97 - Signing Enhancements	1,245	Signs
US 395 in Eltopia - Rumble Strips Modification	1,128	Intersection
Portable "Your Speed Is" Sign	415	ITS spending
I-90 at Easton Hill - Signing Enhancements	232	Signs
TMC/ITS Communications & Signal Ops	95	Miscellaneous

HEADQUARTERS

All 2017–2019 Low Cost Enhancement Projects

Project	Cost	First Category
Victim Memorial Signs	13,100	Signs
Memorial Sign Overage Charges	5,949	Signs
State Work Force	1,644	Project Design