

Executive Summary

In 2003 the Washington State Department of Transportation performed project mitigation case studies on fourteen projects. The cross section of projects included a balance of small rural preservation projects to medium to large size mobility projects.



In early 2006 the data was supplement with a second volume by performing cases studies on seven additional medium to large mobility projects. All of the projects studied in 2006 were funded by the 2003 “nickel” gas tax increase.

Comparison between case studies performed in 2003 and 2006

2003 Case Studies	Total Project Cost in Millions	Total Mitigation Costs in Millions	% of Project Cost Spent on Mitigation
US 2/20/153 NC WA	\$0.28	\$0.06	20%
SR 20 Tonasket	\$4.32	\$0.28	6%
I-5 Lacey	\$7.96	\$0.29	4%
US 395 Tri-Cities	\$10.92	\$1.16	10%
I-5 Tumwater	\$11.22	\$1.66	15%
US 12 Walla Walla	\$10.20	\$3.03	30%
SR 510 Lacey	\$16.06	\$2.26	14%
I-90 Spokane	\$16.20	\$1.96	12%
SR 14 Vancouver	\$19.78	\$0.43	2%
I-90 Spokane East	\$36.12	\$3.54	10%
SR 18 Maple Valley	\$37.67	\$7.84	21%
SR 202 Redmond	\$61.83	\$15.17	24%
I-90 Issaquah	\$112.80	\$13.80	12%
SR 18 Hobart	\$82.08	\$27.93	34%
Totals	\$427.44	\$79.41	18.6%

In 2003, we performed case studies on fourteen projects with a total value of \$427.44 million; 18.6% of the total cost of the projects was spent on mitigation.

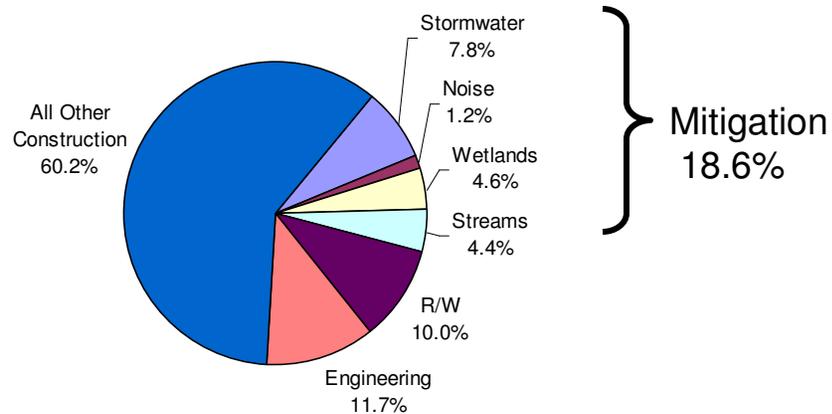
2006 Case Studies	Total Project Cost in millions	Total Mitigation Costs in Millions	% of Project Cost Spent on Mitigation
US 12 Walla Walla	\$10.3	\$0.2	1.0%
SR 270 Pullman	\$29.9	\$3.0	10.0%
I-5 HOV Tukwila	\$38.7	\$2.7	7.0%
SR 16 HOV	\$72.0	\$9.5	13.1%
I-5 HOV Tacoma	\$107.6	\$8.3	7.7%
I-405 Kirkland	\$163.7	\$34.9	21.0%
I-5 Everett HOV	\$219.2	\$53.5	24.4%
Totals	\$641.4	\$112.1	17.5%

In early 2006, we performed case studies on seven additional projects with a total value of \$641.4 million; 17.5% of the total cost of the projects was spent on mitigation.

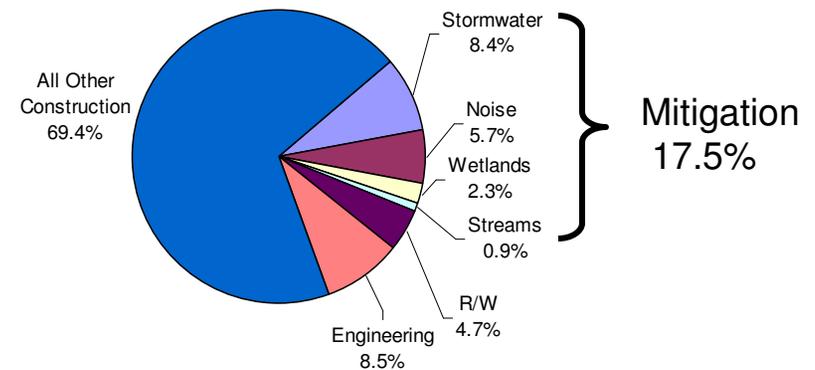
No clear pattern emerges for the scale of mitigation costs in relation to overall project size. The location and setting of a specific project in relation to neighborhoods, streams, and wetlands are much more critical factors. In general, the most expensive projects to mitigate are west of the Cascades, but not all west side projects fit that pattern.

Mitigation Breakdown

2003 cases studies;
balance of urban
and rural projects



2006 cases studies;
mostly urban
mobility projects

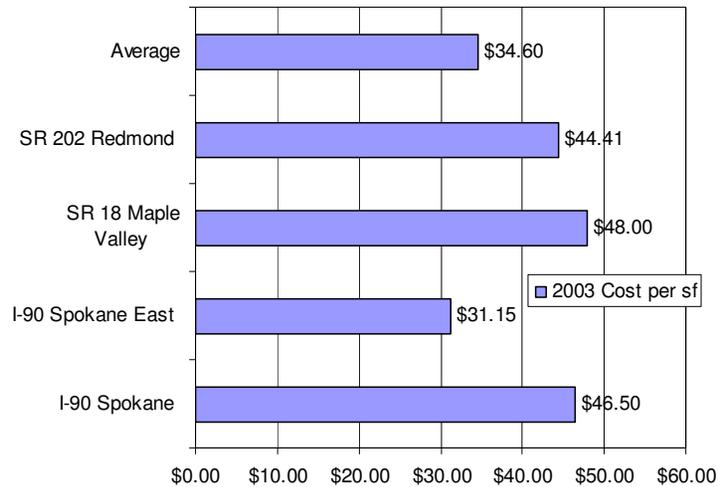


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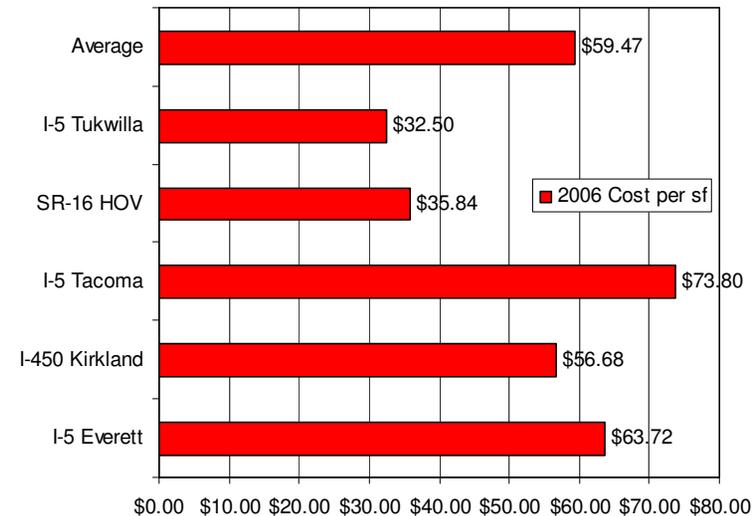
Noise

2003 Noise Wall Cost per sf



Four of the fourteen projects studied in 2003 included noise walls. The average cost per SF was \$34.60 per SF. The combined square footage in the 2003 studies was equivalent to 2.3 miles of ten foot tall noise wall.

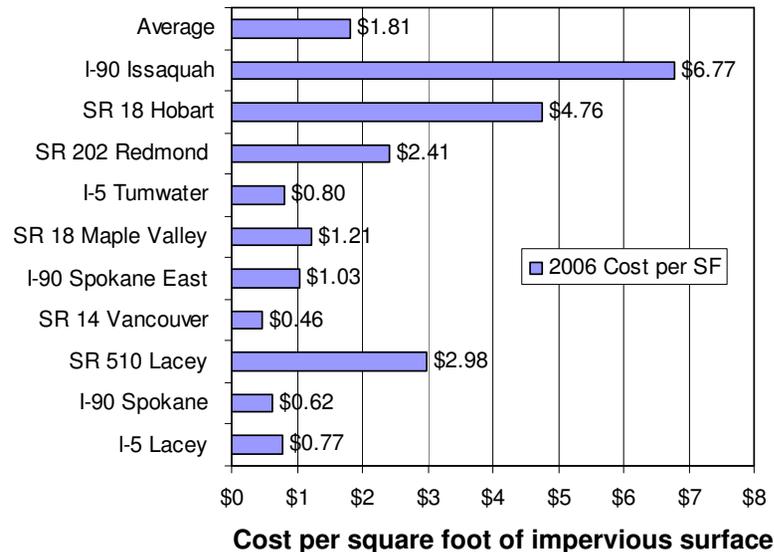
2006 Noise Wall Cost per sf



Five of the seven projects studied in 2006 included noise walls. The average cost per SF was \$59.47 per SF. The combined square footage in the 2006 studies was equivalent to 11.7 miles of ten foot tall noise wall. The increased average cost over the 2003 studies is mostly due to an increase in footing design for seismic and wind resistance and the inflation of construction material such as concrete and steel.

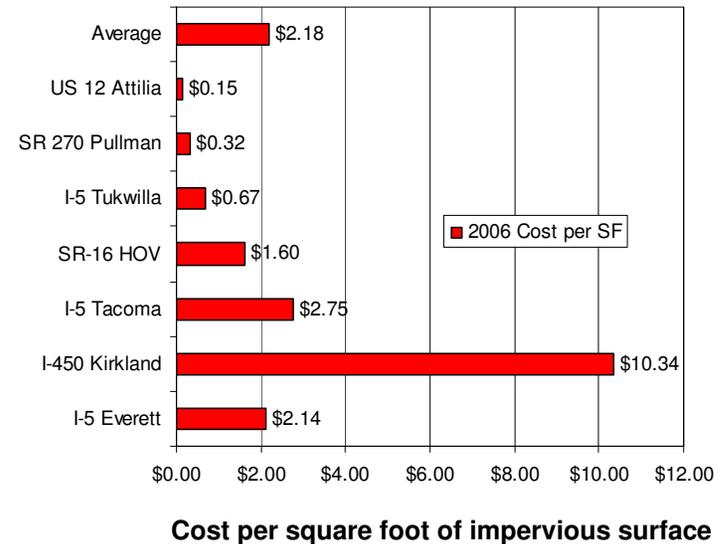
Stormwater Management

2003 Stormwater Management



From the case studies performed in 2003 the average cost to manage stormwater was \$1.81 per square foot of impervious surface. The large variation from project to project are mostly due to the need to purchase property for stormwater management facilities.

2006 Stormwater Management



From the case studies performed in 2006 the average cost to manage stormwater was \$2.18 per square foot of impervious surface. The large variation on the I-405 Kirkland project is the project is building facilities large enough to manage the stormwater for planned future expansion. By taking I-405 out of the equation the average cost to manage stormwater is \$1.63 per square foot of impervious surface. The guidance from the WSDOT's new Highway Runoff Manual is beginning contributing to the efficiencies in the design of stormwater management facilities.

I-5 Everett Freeway & HOV Expansion Project

Significant Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of Project Cost	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$26,043,000	11.9%	Addition of new impervious surface required detention, erosion control, conveyance pipes, and water quality treatment for stormwater.
Clean Water Act Section 404 Clean Water Act Section 401 State Hydraulic Code	Corps of Engineers Ecology WDFW	Wetlands Restoration	\$5,600,000	2.6%	Mitigation is needed for Stormwater Facility (Water Quality Site #1), which impacts existing wetlands. (Includes costs for stormwater facility, aqueduct, wetland mitigation and ROW costs.)
FHWA Noise Abatement Criteria	FHWA	Noise Walls	\$21,920,000	10.0%	344,000 SF of new noise walls per FHWA noise abatement criteria.
		Totals	\$53,563,000	24.4%	

*Cost estimates are based upon Engineer's Estimate including mark-ups.



The I-5 Everett Freeway & HOV Expansion Project, located in Everett, Washington, adds 1 additional lane northbound for 6 miles from the Boeing Freeway (SR 526) to the vicinity of Marine View Drive and 1 additional lane southbound for 4.6 miles. It also builds nearly one mile of new lanes in each direction from U.S. 2 to the Boeing Freeway (SR 526). The total project cost is \$219 million and began with a design-build contract on May 25th, 2005 with Atkinson-CH2M Hill, Joint Venture. Project completion is scheduled for June 2008 or earlier.

Mitigation for the I-5 Everett Freeway & HOV Expansion Project includes: 5 stormwater facilities to provide water quality treatment for all existing and new impervious surfaces (stormwater retrofit of the highway); one combined stormwater facility/wetland mitigation site totaling 13 acres; stream protection; and the construction of seven new noise walls. A professional archaeologist will monitor construction excavation activities that penetrate any undisturbed native soils on the project.

I-405 Kirkland Nickel Project - SR 520 to SR 522 Project

Significant Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of Project Cost	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$16,215,000	9.9%	Addition of new impervious surface required detention, erosion control and water quality treatment for stormwater. Includes \$1 Million in ROW costs.
Clean Water Act Section 404 Clean Water Act Section 401	Ecology WDFW	Wetlands Restoration	\$4,016,000	2.5%	Mitigation is needed for roadway widening impacting existing wetlands.
Clean Water Act Section 401 Clean Water Act Section 402 Hydraulic Project Approval	Ecology Ecology WDFW	Stream Protection	\$5,574,000	3.4%	Culvert upgraded to allow fish passage.
FHWA Noise Abatement Criteria	FHWA	Noise Walls	\$9,069,000	5.5%	160,000 SF of new noise walls per FHWA noise abatement criteria.
		Totals	\$34,874,000	21.0%	



The Kirkland Nickel Project, located in Kirkland, Washington, adds 1 additional lane northbound from NE 70th to NE 124th and southbound from SR 522 to SR 520. The total project cost for the Kirkland Nickel Project is \$163,700,000. This project constructs 10.5 lane miles of additional roadway capacity, and includes rebuilding and adding capacity to the NE 116th Street Interchange and connecting arterials. The project will be built in two stages. Stage 1 builds a lane in each direction from NE 85th to NE 124th with a design-build contract to begin in October 2005 with Kiewit Construction Company. Stage 2 begins construction in 2007. Environmental mitigation for the Kirkland Nickel Project includes: stormwater facilities to provide detention and water quality treatment; three wetland mitigation sites totaling 12.1 acres; stream protection and fish passage culvert replacement at Forbes Creek; construction of five new noise walls; and relocation of four existing noise walls.

I-5 South 48th Street to Pacific Avenue Nickel Project

Significant Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of Project Cost	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$3.84M	3.6%	Addition of new impervious surface required detention, erosion control, and water quality treatment for stormwater.
Clean Water Act Section 404 Clean Water Act Section 401 City of Tacoma Critical Areas Preservation Ordinance	Ecology WDFW City of Tacoma	Wetlands Mitigation	\$0.09M	0.1%	Mitigation is needed for roadway widening impacting a small number of existing wetlands.
FHWA Noise Abatement Criteria	FHWA	Noise Walls	\$3.47M	3.2%	47,047 sf of new noise walls per FHWA noise abatement criteria.
		Totals	\$7.40M	6.9%	



The I-5 South 48th to Pacific Avenue Nickel Project, located in Tacoma, builds multiple retaining walls and a northbound collector-distributor roadway in preparation for rebuilding the I-5 / SR 16 Interchange. The multilane C-D roadway will provide 7.4 new lane miles while improving connectivity with SR 16 ramps and removing a NB traffic weave from the mainline to the C-D. The total cost for this I-5 Nickel Project is \$107,637,000.

Environmental mitigation for the I-5 Tacoma Nickel Project includes: new stormwater management facilities to provide detention and water quality treatment; a monetary contribution to the City of Tacoma, in lieu of other forms of mitigation for minor wetland impacts, as well as additional drainage conveyance of city street runoff to the new stormwater management facilities; and construction of three new noise barrier walls.

SR 16 Union Avenue to Jackson Avenue – HOV Nickel Project

Significant Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of Project Cost	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$5.93M	8.2%	Addition of new impervious surface required detention, erosion control, and water quality treatment for stormwater.
Clean Water Act Section 404 Clean Water Act Section 401 City of Tacoma Critical Areas Preservation Ordinance	Ecology WDFW City of Tacoma	Wetlands Restoration	\$2.5M	3.5%	Mitigation is needed for roadway widening impacting existing wetlands.
FHWA Noise Abatement Criteria	FHWA	Noise Walls	\$1.04M	1.4%	29,116 SF of new noise walls per FHWA noise abatement criteria.
		Totals	\$9.47M	13.1%	



The SR 16 Union Avenue to Jackson Avenue HOV Nickel Project, located in Tacoma, Washington, builds and stripes new HOV lanes and provides major reconstruction within the corridor to meet modern engineering standards. The total cost for this SR 16 Nickel Project is \$72,040,610. This project provides approximately 23 new and reconstructed lane miles of roadway capacity, including the new Center Street Interchange, improved mainline curvature, multilane on-and off-ramps, new auxiliary lanes, and improvements to city streets accommodating local ramp connections.

Environmental mitigation for the SR 16 Nickel Project includes: new stormwater facilities to provide detention and water quality treatment; wetland mitigation, consisting of preservation, enhancement, and monitoring of 35.75 acres of wetlands acquired near the project, as well as improvements at Snake Lake; and construction of two new noise barrier systems.

I-5 HOV Pierce to Tukwila Stage 4

Significant Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of Project Cost	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$1.5M	42%	Addition of new impervious surface required detention, erosion control, and water quality treatment for stormwater.
FHWA Noise Abatement Criteria	FHWA	Noise Walls	\$1.24M	3%	37,226 SF of new noise walls per FHWA noise abatement criteria.
		Totals	\$2.7M	7%	



This project widens I-5 near Tacoma between South 320th Street and the Pierce County line by adding a high occupancy vehicle (HOV) lane to both directions of the freeway for carpools, vanpools, and buses.

The widening for the HOV lanes is performed in the existing median; the only additional property required to complete this project was for managing the stormwater. This project is currently under construction and is expected to be completed in 2007.

The total project cost is \$38.7M for 7.76 new lane miles.

SR 270 Pullman to Idaho State Line

Significant Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of Project Cost	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$0.8M	2.5%	Addition of new impervious surface required detention, erosion control, and water quality treatment for stormwater.
Clean Water Act Section 404 Clean Water Act Section 401 Hydraulic Project Approval	Ecology WDFW	Wetlands Restoration	\$2M	6.7%	Mitigation is needed for roadway widening impacting existing wetlands.
FHWA Noise Abatement Criteria	FHWA	Noise Walls	**	** 0%	** A noise study was performed and thresholds for noise walls were not met. This project is in a rural area.
		Totals	\$2.8M	9.2%	



WSDOT plans to improve capacity and safety by widening SR 270 from a two-lane roadway to a four-lane facility with a 14-foot wide median lane configuration. SR 270 is an important commute route between two university communities: Pullman (Washington State University) and Moscow (University of Idaho). Along with passenger vehicles, this route also carries a large number of heavy trucks. This project is scheduled to begin construction in 2006. Total project cost is \$29.9M.

Widening SR 270 will impact small wetlands north of the existing highway. To offset these losses, the project will construct three wetland mitigation sites along Paradise Creek, just south of SR 270. Project mitigation also includes stormwater mitigation through a combination of 11 small stormwater ponds, bioswales, and natural dispersion.

US 12 – Attalia Vicinity

Significant Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of Project Cost	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$0.21M	1%	Addition of new impervious surface required erosion control and water quality treatment for stormwater.
Clean Water Act Section 404 Clean Water Act Section 401	Ecology WDFW	Wetlands Restoration	*	* 0%	* Mitigation was completed during Phase 1 as advanced mitigation for the entire project corridor.
FHWA Noise Abatement Criteria	FHWA	Noise Walls	**	** 0%	** A Noise study was performed and thresholds for noise walls were not met. This project is in a rural area.
		Totals	\$0.21M	1%	



The US 12 – Attalia vicinity project is Phase 3 of 7 potential phases between Pasco and Walla Walla. Phases 1 and 2 have been completed. Phase 3 provides for the improvement of 3.20 miles of US 12 in Walla Walla County, from MP 301.79 to MP 304.99, in the vicinity of Attalia. It proposes to add lanes by grading, surfacing, and paving with Hot Mix Asphalt. The project also includes guardrail work, guideposts, pavement markings, illumination, permanent signing, and constructing a prestressed concrete girder bridge over Union Pacific and Burlington Northern Santa Fe rail lines.

This project mitigated stormwater impacts through the use of a relatively new Best Management Practice found in the *Highway Runoff Manual* of Compost Amended Vegetated Filter Strips (CAVFS). These linear facilities use existing right of way, compost, and native plants or grasses to treat stormwater. An agreement with the Boise Cascade paper pulp facility, shown in the photo, provided compost at a significant savings to the taxpayer. This agreement and BMP kept mitigation costs at 1% of project cost.