

Oregon Department of Transportation



Project Safety Management System (PSMS)

Biennial Report 2004



OREGON DEPARTMENT of TRANSPORTATION
TECHNICAL SERVICES
TRAFFIC ENGINEERING & OPERATIONS SECTION
<http://www.odot.state.or.us/tstrafmgtpublic>

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1 INTRODUCTION

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) mandated that states develop and maintain six transportation management systems, one of which was a Safety Management System (SMS). As defined by the Federal Highway Administration (FHWA) a SMS is "a systematic process which increases the likelihood of reaching safety goals by ensuring that all opportunities to improve highway safety are identified, considered, implemented as appropriate, and evaluated in all phases of highway planning, design, construction, maintenance, and operations"

In response to the mandate, Oregon Department of Transportation (ODOT) began to develop a SMS. The National Highway Designation Act of 1995 made development of these management systems optional, but ODOT recognized the benefits and has continued to develop a Safety Management System, comprised of the *Project Safety Management System (PSMS)*.

This biennial report on the progress of the PSMS fulfils the requirement in the *Safety Management System Agreement*, dated February 24, 2000 between the Oregon Department of Transportation and the Federal Highway Administration (FHWA). Below in tables are summaries of the accomplishments for different categories of activities. Each of the items is detailed in the corresponding sections of the report. A summary of ODOT's planned activities for the next biennium is available in the Project Safety Management System Business Plan for 2005 – 2007.

TABLE 1 SUMMARY OF PSMS ACTIVITIES

Accomplishments in 2004	
<ul style="list-style-type: none"> Developed Intergovernmental Agreement with PSU for Safety Research 	
<ul style="list-style-type: none"> Continued partnership between Traffic Engineering & Operations Section and Transportation Safety Division 	
<ul style="list-style-type: none"> Developed Draft Business plan for PSMS for review by HSEC 	
<ul style="list-style-type: none"> Approval for Formation of Highway Safety Engineering Committee (HSEC) 	
<ul style="list-style-type: none"> Crash Analysis Unit completed rewrite of Crash Database and links to associated tools 	

TABLE 2 HAZARD ELIMINATION PROGRAM

Accomplishments in 2004	
<ul style="list-style-type: none"> HSIP Report Completed detailing HEP Program 	

TABLE 3 SAFETY PRIORITY INDEX SYSTEM

Accomplishments in 2004	
<ul style="list-style-type: none"> Completed Project to maintain the Compatibility of SPIS after Crash rewrite 	
<ul style="list-style-type: none"> 2004 SPIS Reports published 	

TABLE 4 SAFETY INVESTMENT PROGRAM

Accomplishments in 2004	
• SIP 2004 – 2007 STIP	
• Research Crash Reduction Factors	
• Develop Crash Graphing Tool	
• Revision of OTMS Transviewer	
• Evaluate Safety Corridors	
• Training Provided	
• Development of TransGIS	

TABLE 5 OTHER SAFETY PROGRAMS

Accomplishments in 2004	
• Complete Lead State Initiative	
• Repeat Offender Transfer Provision- Section 164 Penalty Funds	
• Monitor Speeds	
• Complete Estimated Safety Expenditures	
• Develop Legislative Concepts	
• Perform Rumble Strip Experimentation	
• Conduct Interstate Speed Zone Study	

2 PROJECT SAFETY MANAGEMENT SYSTEM (PSMS)

The Oregon DOT's *Project Safety Management System* is a comprehensive data analysis and reporting system designed to improve the safety of Oregon's transportation system and reach all safety goals. The PSMS will help reduce the traffic fatality rate in Oregon from the 2003 rate of 1.36 fatalities per 100 million vehicle miles traveled, to the goal in our Oregon Transportation Plan of 0.99 by the year 2010. The PSMS and associated tools give highway project leaders and designers pertinent PC-based and internet based crash, safety, roadway and traffic mitigation information to perform safety analyses and make safety investments where they will count the most.

The PSMS currently consists of three major elements:

- Hazard Elimination Program (HEP)
- Safety Priority Index System (SPIS)
- Safety Investment Program (SIP).

2.1 Summary of Accomplishments

Intergovernmental Agreement with PSU

Due to ODOT's realignment, Traffic Engineering and Operations requested more staff for ODOT's Safety Program. The ODOT Strategic Alignment Committee denied the request and instructed management to utilize contracts as necessary to complete program work.

An Intergovernmental Agreement with Portland State University and ODOT was fully executed on December 15, 2004. This will assist ODOT's Traffic Engineering and Operation Section in research and completion of safety goals for the next three years.

Status: Ongoing

Partnership between Traffic Engineering and Operations and Transportation Safety

In March of 1999, a formal Safety Management System partnership between Traffic Engineering and Operations Section and Transportation Safety Division was established. This partnership has continued with regular communications including monthly meetings, joint committee work and ongoing coordination to provide engineering, education and enforcement solutions to transportation safety problems.

Status: Ongoing

Develop Business Plan for PSMS

This plan represents ODOT's 2005-07 biennium plan for improving and enhancing the Project Safety Management System. The plan outlines the goals, objectives and strategies for the upcoming biennium. This plan will outline the priorities as approved by ODOT's Highway Safety Engineering Committee.

Status: 80% complete

Formation of Highway Safety Engineering Committee (HSEC)

The formation of a HSEC was proposed in early 2004 for consideration by ODOT upper management. The HSEC was formed to address questions or issues that arise related to Highway Division safety engineering funding or programs.

The objectives of HSEC include:

- To reduce perceived confusion on which minimum safety features are to be incorporated on STIP projects.
- A visible committee with participation of key department players would help with information dissemination.
- To develop standard solicitation process for the Hazard Elimination Program (HEP) by Regions without reducing the flexibility of each Region.
- Provide centralized policy and procedure leadership modeled after other decision-making bodies in the agency such as the Statewide Pavement Committee.
- The *Highway Safety Engineering Committee* (HSEC) will provide operational decisions for the Project Safety Management System.
- The HSEC will make recommendations to Highway Division Executive Staff or the OTC regarding major policy matters.

The *Highway Safety Engineering Committee* will provide a leadership forum to strategize, coordinate, and direct the engineering-related highway safety activities for the Department.

Status: Approval December 2004, First Meeting February 2005.

Crash Database Rewrite

The ODOT Crash Analysis & Reporting Unit (CAR) began and completed a rewrite of ODOT's Crash Database in 2004. The database is restructured with better reporting capabilities and error checking. Seventeen years worth of crash data has been reformatted.

As a result crash data will be available to ODOT staff sooner. Each month's data will be available and validated within two months. The year end data will be finalized sooner, possibly by May of each year instead of July.

The new crash data was made available on ODOT Transviewer in January of 2005.

Status: Complete December 2004

3 HAZARD ELIMINATION PROGRAM (HEP)

The *Hazard Elimination Program (HEP)* is a federally funded program that mandates each state systematically survey of all highways to identify hazardous locations, segment and elements. The HEP is a component of the Highway Safety Improvement Program which also includes a rail crossing safety program.

The HEP has "the overall objective of reducing the number and severity of accidents and decreasing the potential for accidents on all highways."¹ Local, state, and city agencies may submit applications for project funding to the HEP program. Project applications must include a benefit-cost analysis or a risk narrative form. Projects are evaluated for HEP eligibility by the Traffic Engineering & Operations Section and programmed by Regions. Projects may be up to \$500,000 and require 10% matching funds.

3.1 Summary of Accomplishments

Highway Safety Improvement Program (HSIP) Report to Federal Highway Administration

This report details ODOT's accomplishments for the fiscal year 2004. The report summarizes the both the HEP and Rail Crossing Safety Programs activities for the previous year. The report documents the progress being made to implement safety improvements and the effectiveness of such projects.

Status: 70% complete

4 SAFETY PRIORITY INDEX SYSTEM (SPIS)

The *Safety Priority Index System (SPIS)* is a method developed in 1986 by the Oregon Department of Transportation (ODOT) for identifying potential safety problems on state highways. The development of SPIS complied with the federal Highway Safety Improvement Program (HSIP). When Oregon began developing its Safety Management System in response to the 1991 ISTEA, it identified SPIS as one of several essential building blocks. In 1996, based upon recommendations of Dr. Robert Layton at Oregon State University, changes were made in the weightings of indicator values (crash severity, crash frequency, crash rate) that make up the composite score.

SPIS is a tool used to identify crash history in 0.10 mile segments on state highways. SPIS scores are developed based upon crash frequency, severity, and rate. A prioritized list is

¹ Code of Federal Regulations, Subchapter J – Highway Safety, Part 924.5

created for each region (the top 10 percent of statewide SPIS sites) and is provided to regions annually for analysis and possible corrective action.

4.1 Summary of Accomplishments

Project to Maintain Compatibility of SPIS after Crash Data Rewrite

ODOT's annual SPIS reports were created by a Visual Basic program called *Manage SPIS*. The *Manage SPIS* program uses two primary data sources, the crash record system and the ITIS highway inventory files. Following the crash data rewrite project, the *Manage SPIS* program would not function as currently written since it references database extracts that no longer were available or were in different formats. This project rewrote *Manage SPIS* to allow the process to run again this year and was completed in December of 2004.

Status: 100% Complete

2004 SPIS Reports Published

The 2004 SPIS reports were distributed to Regions for investigations in January of 2005. There were total of 5,154 sites on this year's top 10% SPIS site list. Below is summary for the last five years.

Oregon Department of Transportation
2004 Safety Priority Index System
5 Year History Summary

Year	# Top 10% Sites	# Repeat Sites	# New Sites	Cutoff SPIS Value
2004	5,154	3,655	1,499 (29.08%)	44.49
2003	5,113	3,632	1,481 (28.97%)	45.03
2002	5,162	3,729	1,433 (27.76%)	45.45
2001	5,248	3,879	1,369 (26.09%)	46.24
2000	5,305	4,013	1,292 (24.35%)	48.02

Status: 100% Complete

5 SAFETY INVESTMENT PROGRAM (SIP)

The *Safety Investment Program* (SIP) is a process to selectively make safety investments on roadways with a history of fatal and serious injury crashes and perform minimal safety upgrades on roadway preservation projects with low fatality and severe injury crash history. The goal of SIP is to create a balance to meet the competing needs of two important transportation facility elements – safety and pavement preservation; and to provide the most cost effective means of reducing fatalities and severe injuries on safety projects.

Five mile sections of the state highway system are categorized by the number of fatal and severe crashes during a three period. The following is the stratification for SIP categories:

- Category 1: 0 (no) fatal or injury A (serious) crashes;
- Category 2: 1 to 2 fatal or injury A crashes;
- Category 3: 3 to 5 fatal or injury A crashes;
- Category 4: 6 to 9 fatal or injury A crashes;
- Category 5: 10 or more fatal or injury A crashes.

SIP tools include (1) an *ArcView Mapping* tool displaying SPIS sites and flagging 5-mile roadway segments with high fatality/crash frequency; and (2) an on-line intranet-based *Countermeasure Analysis Tool (CAT)* allowing designers to view the actual crash history on a roadway segment. Designers can use the CAT to select from a list of safety countermeasures that have been shown to be effective in providing engineering solutions for the most prevalent type(s) of crashes on the project.

5.1 Summary of Accomplishments

2004-2007 STIP

The Traffic Engineering and Operations Section reviews the STIP to monitor how safety set-aside dollars are being programmed in each of the Regions. As of February, 2005, \$83,981,000 safety dollars were programmed for construction of safety projects over the 4 year period 2004-2007. This total includes an average of \$18.2 million per year for SIP Safety projects and about \$2.4 million per year for HEP projects. This total does not include preliminary engineering, right-of-way, non-safety construction costs, Traffic Safety Grants, Rail Crossing projects or local safety projects. A summary is shown in Table 1 below for 2004 through 2007.

TABLE 1 2004-2007 SAFETY SUMMARY (SIP AND HEP)

Region	Safety Category Dollars Programmed				Totals
	2004	2005	2006	2007	
1	\$8,138,000	\$15,838,000	\$8,489,000	\$12,045,000	\$44,510,000
2	\$456,000	\$10,108,000	\$7,528,000	\$4,562,000	\$22,654,000
3	\$3,172,000	\$1,902,000	\$2,050,000	\$1,507,000	\$8,631,000
4	\$1,834,000	\$120,000	\$815,000	\$2,797,000	\$5,566,000
5	\$660,000	\$450,000	\$740,000	\$770,000	\$2,620,000
Total	\$14,260,000	\$28,418,000	\$19,622,000	\$21,681,000	\$83,981,000

Note: No preliminary engineering, right-of-way, or RR safety dollars included

During the review of the proposed STIP, particular attention is paid to the SIP category of each stand-alone safety projects. The intent of the SIP program is for category 5 sections to be addressed first, category 4 next and so on. The SIP program does allow for flexibility in programming these projects for other than engineering reasons.

Some of the reasons indicated by region staff for programming segments other than SIP categories 4 and 5 included: 1) commitments for safety improvements to local agencies or citizen concerns; 2) cost-effective solutions to SIP category 5 sections

were not always available: 3) some of the projects addressed SPIS sites rather than SIP sections. This last reason resulted in Traffic Engineering and Operations changing the guidelines for SIP investments from purely based on SIP category to using SPIS to identify standalone projects. Although the SIP categories are a good starting point it is believed that SPIS is the better tool for identifying sites for safety investments.

In addition, the spending split between stand-alone safety projects and mixed safety projects was determined. One of the concerns when the SIP program was implemented was that a majority of safety dollars would be incorporated into the mixed safety/preservation projects. In the 2004-2007 STIP a ratio of 4:1 standalone to mixed was calculated (\$17 million safety mixed in other projects as opposed to the total \$65 million in SIP). This compares to a spending ratio of 7:1 calculated for the 2002-2005 STIP and about 3:1 for 2000-2003 STIP.

Crash Reduction Factors Research

Accurate crash reduction factors (CRF) are critical to selecting the most cost-effective countermeasures for highway safety improvement projects. The CRF list is the primary resource used by engineers for safety project development and evaluation. Since the original development of Oregon DOT's CRF list, there have been significant improvements to evaluate the effectiveness of engineering countermeasures which has produced a wealth of new published research. There is a clear need to validate ODOT's crash reduction factors using this work and incorporate new countermeasures into the list.

The primary objective of this research is to provide an updated, comprehensive list of crash reduction factors for ODOT engineers. This will improve the chances of selecting the best safety improvement countermeasure and enhancing project development for the funding provided. A secondary objective is to document key aspects of the CRFs so engineers will be better informed when selecting the appropriate countermeasures. Research began in 2004 and is scheduled to be complete in 2005.

Status: 60% Complete

Crash Graphing tool

In 2003 Traffic Engineering and Operations developed an Excel Add-in program to assist traffic engineers and highway designers in identifying crash trends and characteristics. The tool was very popular among the region traffic offices. The Crash data rewrite project required this tool be rewritten to fit into the ODOT Transviewer format.

Status: 100% complete

Revision of OTMS Transviewer

The Oregon Transportation Management System (OTMS) Transviewer is an intranet program designed to manage and integrate pavement, bridge, safety, and congestion information for highways. Traffic Engineering and Operations supports development of the intranet tool for displaying data and information for use by highway and traffic engineers. The intranet tool contains easy access to volume data, crash data, highway inventory, digital images, safety data, etc. Additional elements, information and data are being developed by Oregon Transportation Management Systems (OTMS) group as an effort to integrate ODOT's management system information.

Status: Ongoing

Safety Corridors

The Traffic Engineering and Operations Section (TEOS) partners with the Transportation Safety Division to develop the guidelines and criteria for Oregon's Safety Corridors. TEOS develops and monitors the safety records of the Safety Corridors so that TSD can grant safety funds for educational, enforcement and minor improvements. In 2003 the Legislature passed a law allowing double fine signing in all safety corridors. ODOT funded new Double Fines signing for the corridors.

Training Provided

Salem-Keizer School Teachers – Safety General;
Keizer Senior Center – School Zones;
Oregon Transportation Safety Conference;
Three Flags Enforcement Conference;
ODOT Staff training - PSMS tools: SPIS, Countermeasure Analysis Tool, etc.

Development of TransGIS

Traffic Engineering and Operations supports the development and deployment of an easy to use and upgradeable mapping tool, TransGIS. The software is a simplified GIS in which users can generate maps of crash data, SPIS sites, SIP projects, pavement condition, ADT and other data. Additional tools and elements are being developed by ODOT GIS Group.

Status: Ongoing

6 OTHER SAFETY

Traffic Engineering and Operations supports other Safety Initiatives that don't fit well in the above categories.

This list is not exhaustive and does not include all engineering safety initiatives carried forth by other parts of ODOT, such as cable median guardrail for crossover crashes, upgrading guardrail/concrete barrier ends, upgrading roadside areas, corridor planning, pedestrian safety programs, bike safety programs, rail crossing safety programs and operations and modernization projects that improve safety.

6.1 Summary of Accomplishments

Lead State Initiative – Lane Departure Crashes

This initiative will examine the two elements, run-of-road (ROR) and head-on non-freeway crashes. It is to be noted that ROR crashes also includes opposing flow sideswipe crashes.

This report will analyze several aspects of the problem, identify problem areas (e.g. fixed object crashes), summarize major concerns, develop performance measures to use as a goal, and develop recommended actions/strategies for the department to

reduce the occurrence and severity of lane departure crashes. The objective is to reduce fatalities and serious injuries related to lane departure crashes.

Status: 75% complete

Repeat Offender Transfer Provision – Section 164 Penalty Funds

Oregon was assessed a penalty transfer of its federal construction funds as a result of failing to enact legislation covering all five points relating to Repeat DUII offenders. Penalty for non-compliance is currently 3.0 percent of the NHS Surface Transportation Program (STP) and Interstate Maintenance Funds annually. The funds are transferred to the state’s 402 Program, State and Community Highway Safety Grant Program. These funds are eligible for use to fund either impaired driving programs or be granted to the Section 152, Hazard Elimination Program (HEP). Since 2001 more than 80 percent of the funds have gone to HEP.

The program in Federal Fiscal Year 2004 amounted to a little over \$7 million worth of safety improvements. In 2005 initial estimates are 4.8 million for the first 8 months. Priority Safety Projects have been identified for funding, including most recently a project along I-84’s Burnt River Canyon for funding safety improvements including Intelligent Transportation solutions and possible other improvements in the corridor. See table below for summary of projects funded by 164 transfer funds.

Mt Hood Hwy @ Kelso Road	\$1,000,000
NE 223 rd Ave @ UPRR Undercrossing	\$2,000,000
US 26 Safety Feature	\$ 500,000
Tualatin – I-5 Cable Barrier	\$ 500,000
I-84 Region 5 Burnt Wood	\$3,500,000
Total Obligated 164 Funds	\$7,500,000

See also Planned Activities (under PSMS) for Strategy for Project Priorities for 164 funds for determining future uses of safety funding from 164 penalty funds and other funds as they come available.

Status: Ongoing

Speed Monitoring

The Traffic Engineering and Operations Section (TE&OS) monitors speeds on Oregon Highways through a series of speed monitoring stations. The 27 stations throughout the state are maintained by the Traffic Monitoring Unit of the Transportation Development Branch for collecting volumes and speeds. The speed data is analyzed and summarized by TE&OS quarterly during the year. Results are used for research, reports and informational requests.

Status: Ongoing

Estimated Safety Expenditures Report

The 70th Legislative Assembly passed Senate Bill 909 directing Oregon Department of Transportation to submit, as part of its recommended Governor's budget, a report

of how the Department plans to spend \$100 million to improve highway safety each biennium.

The Safety Expenditures report includes details of Highway Division construction contracts that have been awarded, or are planned to be awarded, that will result in expenditures for safety items during the 2005-2007 biennium. Also included in the report are Maintenance expenditures that will be made, or reasonably can be expected to be made during the 2005-2007 biennium.

The report indicates that highway construction contract payments over the 2005-2007 biennium will total approximately \$261 million for safety work and project safety features. Of the total amount, \$176 million is for permanent safety investments (permanent signing, guardrail upgrades, permanent striping, etc), and \$85 million is for temporary safety investments required during construction of the project (typically work zone traffic control).

Highway maintenance payments over the next biennium will total approximately \$74 million for safety work or activities (typically snow and ice removal, striping, guardrail repair, etc) that contribute to safety of the highway motorist.

Based on the above findings, the Department of Transportation will expend in the 2005-2007 biennium approximately \$335 million to enhance highway safety, both to the benefit of the highway user and to the benefit of the highway facility.

Status: Completed December 2004

Legislative Concepts

Traffic Engineering and Operations Section staff and Transportation Safety Division staff worked with other ODOT staff to propose several legislative concepts to the 2005 legislature, including such concepts as cleaning up the Oregon Speed laws, and changing and clarifying when motorists must stop for Pedestrians.

Status: Completed September 2004

Rumble Strip Experimentation

ODOT has been experimenting with different types of rumble strips for several years. As part of the Infrastructure Safety Investment Program (ISIP) the department installed variations of rumble strips, including centerline rumble strips in passing areas and rumble strips integral with the fog line. As part of highway projects ODOT has also been installing rumble strips in advance of stop signs on rural roads. ODOT has been monitoring the results and sharing results with other national efforts to summarize results of different rumble strip applications. As a result we have modified our rumble strip criteria in the ODOT Traffic Manual to incorporate findings and give further guidance on placement.

Status: Ongoing

Conduct Interstate Speed Zone Study

ODOT completed two studies required as the basis for recommending interstate speeds to the Oregon Transportation Commission (OTC). The engineering study was a complete analysis of speeds and traffic conditions on the Interstates with the Interstate system divided up into approximately 35+ study areas.

A second study researched the safety, environmental and societal impacts of changing interstate speeds. Called the Issues Report, ODOT contracted with Portland State University to investigate, examine and analyze all the relevant research. The report was completed in August 2004.

In September of 2004 the Oregon Transportation Commission acted on the recommendations and approved raising the speed on three sections of urban interstate. No sections of rural interstate speed were raised.

Status: Completed September 2004