

Chapter 12: Transportation Safety

Introduction

Safety can be defined as the ability of a person to use the regional transportation system (any mode) to transport themselves, passengers, or goods in a way that does not endanger others using the system, the population or the environment. Ensuring the current and proposed regional transportation infrastructure is safe for all users and reducing the risk of transportation related crashes or incidents is an important element of the planning process and development of the Bend Metropolitan Transportation Plan.

The passage of the Safe Accountable Fair Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) has brought increased attention to addressing the safety and security of the transportation system. SAFETEA-LU requires regional plans to consider how to best increase the safety of the transportation system for motorized and non-motorized users.

This chapter presents the transportation safety element. The purpose of this chapter is to identify safety issues for all travel modes on the regional transportation network, develop and document projects, strategies and concepts to address existing and future safety deficiencies and guide future planning efforts to ensure that the regional transportation system operates in a safe manner through the planning horizon year of 2030 and beyond.

Safety Background Information

The purpose of this section is to provide background research and analysis to guide the role of the MTP in enhancing regional transportation safety. The evaluation of safety from a regional perspective and for all modes of travel, as well as methods for monitoring safety in the Bend Metropolitan planning area contributes to the development of recommended changes to regional policy for the MTP.

Trends affecting the regional transportation system and current regional transportation planning policies and regulatory requirements have been outlined to lay out the framework for policy gaps within the Bend Metropolitan planning area. National trends, as well as federal, state and local policies are also included in this section to outline the components that impact the regional transportation system. This information is used to develop recommended changes to regional policy for the MTP.

Policy and Regulatory Framework

Several agencies, at the federal, state and regional level have developed plans and corresponding strategies that address the safety of their transportation facilities. These plans stress the importance of building, maintaining and operating a transportation system that is safe for all users, for all modes and provide information that will ultimately impact what elements will be incorporated into the Bend MTP.

Federal

In 2005, Congress enacted SAFETEA-LU. That legislation was developed to address the many challenges facing the transportation system today, such as improving safety, reducing traffic congestion, improving efficiency in freight movement, increasing intermodal connectivity, and protecting the environment. SAFETEA-LU promotes safety and security as factors to be included in metropolitan planning and establishes a new core Highway Safety Improvement Program that is structured and funded to make significant progress in reducing highway fatalities. It creates a positive agenda for increased safety on our highways by almost doubling the funds for infrastructure safety and requiring strategic highway safety planning, focusing on results. Other programs that target specific areas of concern, such as work zones, older drivers, and pedestrians, further reflect SAFETEA-LU's focus on safety.

State

Transportation Planning Rule (TPR)

In 1991, the Land Conservation and Development Commission adopted the Oregon Transportation Planning Rule (TPR). The TPR implements State Land Use Planning Goal 12, Transportation, which was adopted by the Oregon Legislature in 1974. The TPR requires most cities and counties and the state's Metropolitan Planning Organizations to adopt transportation system plans that consider all modes of transportation, encourage a safe environment and avoid principal reliance on any one mode to meet transportation needs. By state law, local plans in MPO areas must be consistent with the regional transportation plan (RTP). Likewise, the regional TSP must be consistent with the Oregon Transportation Plan and TPR. Recent updates to the TPR do not affect the requirements for safety planning.

Oregon Transportation Plan (OTP)

The Oregon Transportation Plan, amended in September 2006 by the Oregon Transportation Commission (OTC), includes Goal 5 which addresses safety and security and details related policy and strategies. The OTP safety goal and policy is outlined below. Several key strategies were also identified in the plan to help attain the desired outcome of a safe transportation system.

Goal 5 – SAFETY AND SECURITY

To plan, build, operate and maintain the transportation system so that it is safe and secure.

Policy 5.1 – Safety

It is the policy of the State of Oregon to continually improve the safety and security of all modes and transportation facilities for system users including operators, passengers, pedestrians, recipients of goods and services, and property owners.

Transportation Safety Action Plan (TSAP) and Amendment 1

ODOT's Transportation Safety Action Plan and Amendment 1, adopted in 2004 and

2006, respectively, identifies 69 actions with nine key actions for ODOT to strive for in making their road network safer, and in particular, working toward reducing the number of crashes on the state's roads. The key actions identify areas to address beyond the implementation of traditional transportation infrastructure projects (e.g. education of drivers and training of judges and traffic police). The remaining 60 actions address facility design, construction and maintenance, as well as developing a comprehensive database of incident information to assist in developing strategies and projects to address locations with a high number of incidents. The strategies outlined with the action plan provide guidance to potential safety investments within the Bend Metropolitan planning area.

Several different data sources are available for transportation accident data. Federal, statewide and local agencies maintain databases and/or GIS mapping of accident details and locations. Although data is collected continuously, agencies may publish or make results available only on a yearly basis and complete data sets may not be available for the recent time period due to the maintenance of collecting and organizing the data. Timely, accessible, and accurate crash data is critical to improving traffic, bicycle, and pedestrian safety.

Table 12-1 outlines the most recent available data for national transportation fatalities by mode, as compiled by the Bureau of Transportation Statistics (US DOT).

Table 12-1: Nationwide Transportation Fatalities by Mode-2003 and 2004

Mode	2003	% of Total	2004	% of Total
Air	698	1.57%	636	1.4%
Highway	42,884	94.2%	42,836	94.4%
Pipeline	12	0.03%	23	0.05%
Railroad	868	1.9%	897	1.9%
Transit	234	0.5%	248	0.54%
Waterborne	830	1.8%	769	1.71%
Total Fatalities	45,526	100%	45,386	100%

Source: Bureau of Transportation Statistics

Nationwide, highway fatalities (which include pedestrians, motor vehicles, heavy vehicles and motorcycles) comprise the largest percentage of total fatalities. The number of annual roadway fatalities has remained unchanged (40,000-42,000) for the past ten years, but is now showing an upward trend¹. The impact of fatalities on the transportation system is significant.

In Oregon, the rate of fatalities per 100 million vehicle miles traveled declined from 1.76 in 1992 to 1.46 in 2003². While the trend is encouraging, the numbers are still high. In

¹ FHWA-Road Safety Fact Sheet. Accessed online: http://safety.fhwa.dot.gov/facts/road_factsheet.htm

² Oregon Transportation Plan, Oregon Department of Transportation. Adopted September 2006

2003, there were 512 fatalities and 28,256 injuries involving motor vehicles alone in the state of Oregon.

Speeding is a complex safety problem that involves numerous factors like public attitudes, driver behavior, vehicle performance, roadway design, posted speed limits and enforcement strategies. Speeding has also been estimated to be a contributing factor in approximately one third of all fatal crashes, representing a cost of more than \$40 billion³.

BMPO Safety Goals and Policies

In addition to the goals outlined in the new federal legislation, the Bend MPO has set goals and policies that emphasize the importance of building, maintaining and operating a regional transportation system (regardless of mode) that is safe for all users. The goals and policies of the Bend MTP were developed based on a review of the existing goals outlined in other regional and local plans (e.g. Oregon Highway Plan, Deschutes County TSP, and City of Bend TSP) and are outlined in Chapter 2. The goals related to safety were created and adopted to help guide the future development of the roadway network, address safety concerns in a range of areas, and select specific projects for construction. Stemming from the goals and policies, a series of evaluation criteria have been developed to rank potential projects for the regional transportation system. Evaluation criteria includes: the ability of a project to address existing safety deficiencies and the ability to support TSM/ITS strategies. Detailed crash data is available for ODOT and City of Bend facilities and can be used to identify high crash sites; projects that benefit these locations should be scored higher and given a higher priority for implementation.

BMPO Modal Safety Data

Motor Vehicle

The existing motor vehicle collision data is summarized in Chapter 3: Existing Conditions, for ODOT, City of Bend and Deschutes County study area facilities.

The Oregon Department of Transportation (ODOT) maintains a comprehensive, collision database for all accidents that are reported. The criterion for mandatory collision reporting was revised in December 2003; collisions must be reported if any of the following results occur as the result of a collision:

- Death
- Bodily Injury
- \$1,500 damage to a vehicle
- \$1,500 damage to anyone's property
- If any vehicle is towed from the scene due to damage

³ "Speed Management Strategic Initiative." USDOT. June 2005. p.1.

Prior to 2003, collision reporting was required for death, bodily injury, or \$1000 worth of damage to vehicle/property. This revision poses less stringent guiding principles for collision reporting which would attribute to an expected decrease in reported collisions. This is supported by 2004 ODOT collision records where collision rates decreased by 54-percent and 17-percent for urban city arterials and expressways respectively.

The City of Bend and Deschutes County also maintains GIS database files and maps for crash and incident data for intersections within the City and county. This information provides a baseline for comparison for the evaluation of safety-related projects that are recommended and implemented. The maps also provide a useful tool for examining region-wide collision trends over time.

Collision data for the previous five years (2001-2005) was obtained from ODOT for selected corridors within the study area⁴. Analysis focused on the identification of existing high collision segments by combining 2004 Average Daily Traffic (ADT) volumes conducted by the City of Bend and ODOT with the collision records and respective segment length. Equivalent collision rates per million vehicle miles traveled (MVMT) were then determined for each respective segment and used as the basis of identifying high collision segments within the study area. The use of MVMT reflects the level of exposure relevant to each roadway segment. These measured collision rates were compared to those of similar facilities as indicated in ODOT's 2004 Oregon State Highway Crash Rate Tables⁵. The basis of comparison for similar facilities is based on urban city arterials and urban city expressways which had respective collision rates of 2.04 and 0.76 per MVMT in 2004. Five collector/arterial roadway segments and seven highway/expressway segments analyzed have collision rates higher than similar state facilities; these segment details are summarized in Table 12-2.

⁴ Oregon Department of Transportation, Collision data provided for 2001-2005.

⁵ 2004 State Highway Crash Rate Tables, Oregon Department of Transportation, Transportation Data Section, August, 2005.

Table 12-2: City of Bend Roadway Segment Collision Rates (2000-2005)

Roadway Segment	Collision Type				Collision Severity			Total	Rate (per MVMT)	ODOT 2004 Rate (per MVMT) similar facilities
	Rear	Angle	Turn	Other	PDO	Injury	Fatal			
Reed Market Road										
Silver Lake Blvd. to American Ln.	37	27	46	10	70	50	0	120	3.24	2.04
American Ln. to SE 27th St.	43	2	11	19	40	34	0	74	2.14	2.04
27th Street										
Copperfield Ave. to Reed Market Rd.	8	1	5	1	2	13	0	15	2.09	2.04
Empire Avenue										
OB Riley Rd. to Boyd Acres Rd.	17	5	22	2	26	20	0	46	2.77	2.04
Business 97 (3rd Street)										
Greenwood Ave. to Brosterhous Rd.	82	31	89	27	128	100	1	229	2.84	2.04
Highway 97										
North MPO boundary to Nels Anderson Rd.	80	5	18	22	63	62	0	125	1.54	0.76
Reed Ln. to Hwy 97/3rd St. (south)	73	16	29	9	69	57	1	127	2.24	0.76
Hwy 97/3 rd St. (south) to south MPO boundary	2	7	5	2	5	11	0	16	0.92	0.76
Highway 20										
Railroad track to Greenwood Ave.	45	19	51	17	72	60	0	132	2.60	0.76
3rd St. to Pilot Butte Summit Dr.	38	17	59	22	79	57	0	136	3.59	0.76
Pilot Butte Summit Dr. to Purcell Blvd.	41	3	13	12	32	36	0	68	1.83	0.76
Purcell Blvd. to East MPO boundary	17	3	12	4	24	12	0	36	1.54	0.76
Notes:										
- Other types of collisions include backing, pedestrian, head-on, sideswipe, parking, fixed object, non-collision, and miscellaneous.										
- Injury includes A, B, and C type injuries										
- PDO = Property damage only										
- MVMT = Million vehicle miles traveled										

ODOT Safety Priority Index System (SPIS)

ODOT maintains a Safety Priority Index System (SPIS) that ranks high collision locations along state facilities. The system provides a weighted score based on the severity, frequency, and rate of collisions over the previous three years. Locations are aggregated into 0.10-mile segments. Only segments experiencing three or more collisions or one fatality over the three year analysis period are considered to be a SPIS site. The most recent ODOT SPIS data indicate that 21 segments along Highway 97 and Highway 20 made the SPIS list for the 2001-2003 analysis period⁶.

Deschutes County High Crash Locations

Deschutes County currently maintains a listing and GIS database of high crash locations within the county. The County has identified a total of 16 intersections that have been designated as high crash locations within the Bend Metropolitan Planning Area including:

- Highway 97/Cooley Road
- Highway 97/Robal Lane
- Highway 20/Empire Avenue
- Highway 20/Olney Avenue
- Highway 20 (3rd Street)/Greenwood Avenue
- 3rd Street/Franklin Avenue
- 3rd Street/Wilson Avenue
- Highway 20/Mt. Washington Drive
- Highway 97/Empire Avenue
- Highway 20/8th Street
- Highway 20/27th Street
- Butler Market Road/Purcell Boulevard
- 3rd Street/Reed Lane
- 3rd Street/Badger Road
- 3rd Street/Division Street
- 3rd Street/Reed Market Road

Pedestrian and Bicycle

The City of Bend maintains GIS data that includes mapping for pedestrian and bicycle collisions. The most recent data set includes pedestrian and bicycle collisions occurring within the City of Bend between 1995 and 2004. Over the 10-year span, there were 80 collisions reported involving pedestrians, yielding an average of 8 collisions per year. The majority of the pedestrian collisions occurred on arterial roadways, primarily in the downtown area where pedestrian and traffic volumes are typically highest. Fifty-six percent of the crashes involving pedestrians occurred at mid-block locations; the remaining crashes occurred at intersections. Twenty-three percent of the total crashes occurred on 5-lane roadway segments. One fatality occurred in 2002.

Rail

Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) currently operate trains through the City of Bend. The Federal Railroad Association (FRA) maintains a current database of rail crash and incident information. The FRA requires reports to be filed for all rail crashes and incidents that occur:

- Between railroad on-track equipment and other vehicles or pedestrians;

⁶ ODOT, http://www.oregon.gov/ODOT/TD/TDATA/gis/odotmaps.shtml#SPIS_SIP_Maps

- At grade rail crossings; or
- From any event arising from railroad operations that result in death or injury.

Table 12-3 summarizes rail accident and incident information for the last 10 years in Deschutes County for the two rail lines that travel within the Bend Metropolitan Planning Area. Nationally, rail accidents and highway-rail incidents⁷ are decreasing; this can most likely be attributed to the decrease in total rail miles traveled.

Table 12-3: Rail Accidents (Deschutes County) January 1997 - January 2007

	Type			Severity	
	Train Accidents	Highway-Rail Incidents	Other Accidents/Incidents*	Fatal	Non-Fatal
Union Pacific Railroad	0	0	1	0	1
BNSF Railroad	0	2	1	0	3

Source: Federal Railroad Administration

Notes: *Other accidents/incidents are events other than train accidents or crossing incidents that cause physical harm to persons

Aviation

Two airport facilities serve the Bend Metropolitan Planning Area: Bend Municipal Airport (located within the study area) and Redmond Airport (located 16 miles north of Bend). Aviation safety is a highly regulated activity, managed by the Federal Aviation Administration. Aviation safety involves aircraft construction, repair, operations in flight, the airway system, airport design and airport operations. Federal regulations require operators to notify the National Transportation Safety Board immediately of aviation accidents and certain incidents. An *accident* is defined as an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. An *incident* is an occurrence other than an accident that affects or could affect the safety of operations. Major contributors to aviation accidents include factors beyond the design of the airport facility and runway, such as pilot error, equipment problems, and weather. Table 12-4 summarizes the aviation accidents that occurred in the last 5 years at the Bend Municipal Airport and Redmond Airport. The Bend Municipal Airport Planning Update⁸ and the Oregon Aviation Plan⁹ identify the key facility needs and airport layout improvements for the airport, including any safety improvements.

⁷ Bureau of Transportation Statistics

⁸ *Bend Municipal Airport Planning Update (2002-2021)*, Century West Engineering, December 2002

⁹ *Oregon Aviation Plan*, Oregon Department of Transportation, February 2000.

Table 12-4: Airport Accidents (January 2002 - January 2007)

	Accident Date	Event Severity	Aircraft Type
Bend Municipal Airport			
Bend, OR	12/2/2006	Fatal (2)	Holloway RV6A
Bend, OR	9/18/2005	Nonfatal	Eiland RAF-200 Gyro
Bend, OR	4/8/2005	Nonfatal	Shannon Lancair Legacy 2000
Bend, OR	10/8/2004	Nonfatal	Maule MT-7-420
Bend, OR	6/16/2004	Nonfatal	Cessna 421B
Bend, OR	12/30/2003	Nonfatal	Bellanca 8KCAB
Bend, OR	8/27/2003	Nonfatal	Lancair LC41
Bend, OR	8/26/2003	Nonfatal	Beech C24R
Redmond Airport			
Redmond, OR	2/4/2005	Nonfatal	Cessna 182G
Redmond, OR	11/13/2004	Nonfatal	Luscombe 11A
Redmond, OR	8/1/2004	Nonfatal	Piper PA-24-260
Redmond, OR	4/20/2004	Nonfatal	Mooney M-20J
Redmond, OR	2/10/2004	Nonfatal	Lancair LC42-550FG

Source: Federal Aviation Administration

As outlined within the section, existing safety issues are present for each mode of travel. For the purpose of the MTP, the focus of safety improvements on the regional system is for those modes funded with public dollars. The rail and aviation industries are private industries and the safety improvements of this plan are generally focused where these modes interact with the highway system (i.e. at-grade railroad crossings). Key safety issues include the interaction between modes (pedestrian and car, car and train, etc.), road design and/or geometry issues on regional facilities, and the negative safety implications of bottlenecks and other congested locations.

Safety Strategies for Bend MPO

Strategies to address these existing safety deficiencies and guide the future of safety improvements for the Bend Metropolitan planning area include a variety of elements: engineering, education, enforcement, and policy development.

Engineering/Planning

Several opportunities for infrastructure and engineering improvements exist within the Bend Metropolitan planning area to enhance the safety of the regional transportation system:

- Road safety design features (e.g. rumble strips, guardrail, retroreflective signs)
- Intersection safety design feature (e.g. traffic signal timing, exclusive turn lanes)
- Pedestrian safety design features (e.g. pedestrian signals, improved lighting, refuge islands on a median)

Roundabout construction and traffic signal installation can reduce the potential for

collision and incidents; roadway widening projects also provide better channelization of traffic movements. Other capacity improvements reduce congested conditions and can contribute to increased safety. Smaller scale improvements, such as re-timing of traffic signals and left-turn pockets have also been shown to be effective at reducing total crashes and the severity of injury crashes¹⁰. The results of these projects will need to be tracked over time to determine whether they have been successful in addressing safety issues. The preferred alternative project list includes a list of projects that contribute to mitigating existing safety issues, and include ITS solutions as well as infrastructure improvements.

Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) apply advanced and emerging technologies in information processing, communications, control, and electronics to surface transportation needs. ITS safety projects, such as traveler information systems aim to give drivers necessary information to avoid hazardous conditions and prevent accidents. Similarly, improvements to traffic control devices (e.g. traffic signal coordination) seek to minimize the frequency and severity of crashes. The Deschutes County Intelligent Transportation System Plan identified a number of projects that address safety issues. Projects identified in that plan focus on providing connections between the traffic operation centers and emergency responders. Other projects include cameras at key locations to identify incidents and observe the system, dynamic message signs and advisory radio systems to inform travelers of bottlenecks, diversions and other hazards. Relevant projects are discussed in the TSM/ITS Chapter and have been incorporated into the Preferred Alternative Project List in the Motor Vehicle chapter of this report.

Education

Public awareness and other educational campaigns on the negative impacts of alcohol and drugs, aggressive driving behavior, railroad safety initiatives and pedestrian/bicycle safety can be implemented on a region-wide level and may contribute to the reduction of crashes. Developing partnerships with public and private agencies is a key element to the successful implementation of such programs.

Enforcement

Two common infractions that have a significant impact on traffic crash rates and severity are red light running and speeding. These can be reduced through the consistent enforcement of safety related traffic laws.

Policy Issues

There are several opportunities for safety-related policy development within the Bend Metropolitan planning area. These opportunities include:

- Coordination with City of Bend, Deschutes County and ODOT for identifying and implementing safety improvement projects, with the primary focus being on

¹⁰ “Study: Better Signs reduce car crashes”, Washington, September 26, 2002.

highway and pedestrian safety improvements since those constitute the highest number of accidents.

- Working to examine the nature of highway crashes in the region and possible hazard and design-related mitigations
- Continuing Intelligent Transportation Systems planning and project programming, paying special attention to investments that will enhance safety
- Developing safety criteria for project scoring, selection and implementation
- Identifying additional transportation funding sources that are specifically targeted at safety projects to supplement the limited funds from conventional transportation sources
- Continuing to stay abreast of research on transportation safety developed by national and regional agencies around the country, seeking out best practices that can be applied within the Bend Metropolitan planning area

A number of projects have been identified and included in the Preferred Alternative Project List in Chapter 8 of this plan that address the underlying safety issues of critical locations within the Bend Metropolitan Planning Area. The purpose of these projects is to reduce the potential for collisions and incidents, using a variety of countermeasures (e.g. installing traffic signals, widening intersections to provide better channelization of traffic movements, and other capacity improvements that reduce congestion). With limited resources, focusing improvements on corridors has emerged as a way to manage the existing roadway system. Corridors are the focus of traffic safety projects that typically initiate a combination of roadway improvements, enforcement efforts, and public information and education programs. Corridor analysis can also be useful to examine trends in crashes over multiple years and to track whether or not improvements on a corridor contributed to a reduction in crashes.

Ensuring the Bend Metropolitan planning area has a transportation system that is safe to use is a complex task. Several strategies for implementation have been recommended that could potentially improve the safety for all modes of travel; however, additional data and analysis are required to better inform the decision making process where limited funds would provide the most return on investment. Future updates to the Plan will include additional data on where incidents have occurred and how successful the proposed solutions have been in addressing the underlying issues.