

# Pierce County Transportation Plan Transportation Safety Discussion

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Public Works and Utilities

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## **Introduction**

While the purpose of transportation is to provide mobility, doing so safely is the utmost concern for all forms of transportation - planes, trains, ferries, automobiles, and pedestrians and bicyclists. This document will focus on transportation that is the responsibility of Pierce County, including county roads and ferries and all of the users and uses of these transportation systems including automobiles, trucks, buses, pedestrians and bicyclists. This paper will not include information about railroad, airport, or recreational water safety.

The purpose of this paper is:

1. To review and understand the road and ferry safety data to identify trends.
2. To reach conclusions about the significance and acceptability of aspects of these systems that are still experiencing crashes that result in loss of life and cost to society.
3. To identify strategies and responses to these trends in order to reduce collisions and the economic losses that result.
4. To estimate the cost-effectiveness of these strategies and therefore prioritize our safety investments.

## **Setting Safety Goals Requires Financial Trade-offs**

It is important in developing this analysis to discuss safety policies and goals and engage in a conversation about the acceptable level of transportation safety in Pierce County. To spark this policy discussion, this paper proposes that the long-term transportation safety goals for an acceptable and affordable risk for County Roads and Ferries be as follows:

- **No fatal or disabling injuries occur on county roads;**
- **Non-disabling injuries should be minimized to reduce their cost on society but recognize that crashes do occur and such non-disabling injuries can be recovered from;**
- **Property damage only crashes will also be minimized with strategies to reduce or eliminate injury and fatal crashes, but also recognize that the cost of property damage losses will be addressed through insurance.**

While some will argue that eliminating fatal and disabling injury crashes is impossible, it is still important to set goals that show that the County considers transportation road safety a high priority. Certainly other forms of transportation industries (planes and trains) do not consider any loss of life acceptable and go to great lengths to investigate such crashes and implement strategies to eliminate future crashes.

## **Responsibilities for Road and Ferry Safety Are Shared**

Responsibility for programs and projects in the county road and ferry safety area is widely shared. Since the ferry system is already very safe and the majority of issues are on the road system, the following discussion will focus on roads and address the ferry system security and safety at the end of the paper. Transportation safety results from the condition and state of the road and from the behavior of the person operating a vehicle on

the road including the condition of the vehicle being operated. In Pierce County government, the condition of the roadway is the responsibility of the Department of Public Works and Utilities. This condition includes how the roads are maintained, operated, preserved, and improved. The enforcement of laws is the responsibility of the County Sheriff. Other public safety agencies, including local fire departments, have responsibility for swiftly responding to traffic incidents and increasing public safety awareness about traffic safety. Pierce County's DUI Task Force focuses on programs to ensure drivers are operating vehicles responsibly. There are many others who have programs to improve driving and promote safety on roads including school bus operators, transit operators, trucking associations, bicycle organizations, and many more. The efforts of this broad group of interested parties are generally categorized into the following areas:

- **Engineering**
- **Enforcement**
- **Education**
- **Emergency Services**

### **Safety is Affected by Roadway, Vehicles, and Drivers**

It is important to consider that vehicle crashes on roads are the result of a combination of factors including the condition of the roadway, the condition of the vehicle being operated on the roadway and the actions of the driver of the vehicle. It is widely accepted that the majority of crashes are a result of driver error and that driver behavior is of critically important to address to reach the goals outlined above of improved traffic safety. Also, the vehicle can play a significant role in enhancing the safety of traffic on roadways. Vehicle safety standards are largely a federal government responsibility, but there is some role for local enforcement of vehicle safety standards. Although looking at data and trends for all three of these aspects that affect traffic safety, this report is focused mostly on roadway conditions and some on driver behavior to see what is causing crashes on Pierce County roads and proposing a plan of strategies to address these crash trends.

### **Safety Trends Based on Data**

The County Road safety trends and conclusions about the appropriate strategies to address these trends are based on crash data that is reported to the state when required by law. It is important to note that this is reported crashes that are filed with the Washington State Patrol and compiled by the Washington State Department of Transportation. This data is then given to cities and counties for such analysis as is shown on the following pages of this report. It is recognized that there are some crashes that may occur that are not reported. The County has no means to identify such unreported crashes so they are not used in this analysis.

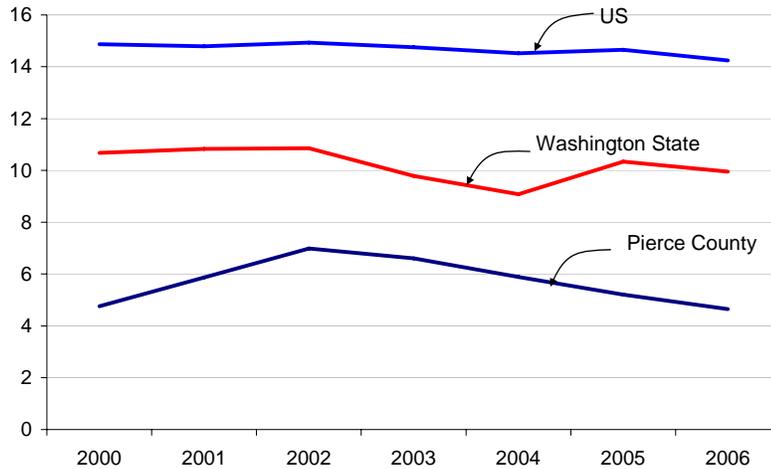
### **Fatality Rates on County Roads Have Held Steady**

The data shown below for fatalities on Pierce County roads indicates that the fatality rate per 100,000 population is well below the national average and comfortably below the statewide average since 2000. Nationally, there are about 15 fatalities per 100,000 population while Pierce County roads experience less than half of that at 5 to 6 fatalities

per 100,000 population. While this is good, the overall goal should be to reduce and ideally eliminate all fatal crashes each year. Maybe of more concern is that the data since 2000 does not show a trend that this number of fatal crashes is declining.

**2000 - 2005 Fatality Rate on Pierce County Roads Compared to US and State**

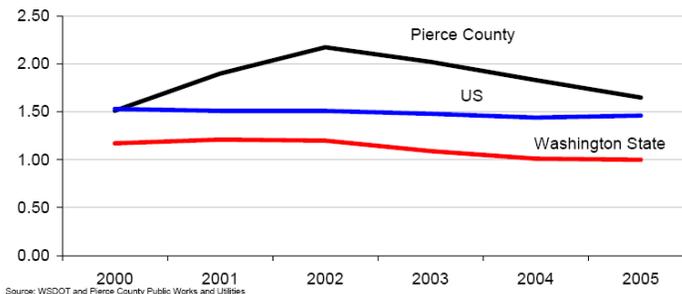
*per 100,000 Population*



Another common way of comparing fatality rates is to calculate the rate of fatalities per 100 million vehicle miles traveled. This is a more direct correlation of fatalities to the exposure of using the road system. (While statewide data shows a very strong correlation between population and vehicle miles traveled, the rate per vehicle miles traveled is more intuitively correct). Unlike the comparison above, the fatality rate per 100 Million Vehicle Miles Travel (VMT) in the graph below shows that Pierce County roads have a higher fatality rate than does the state as a whole or the national average.

**Fatality Rate on Pierce County Roads per 100 Million Vehicle Miles Travel**

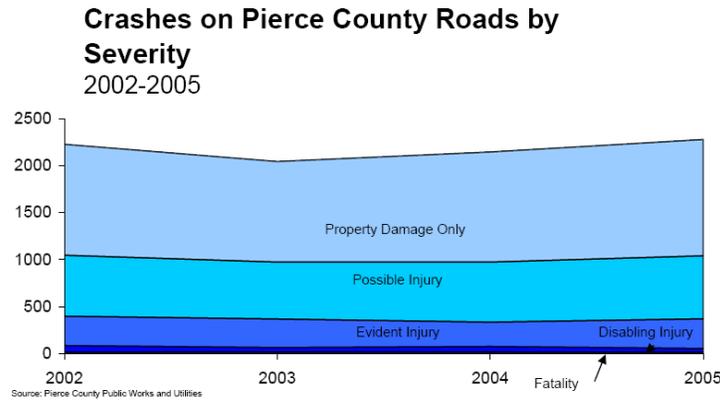
2000 - 2005



**Severity of Crashes**

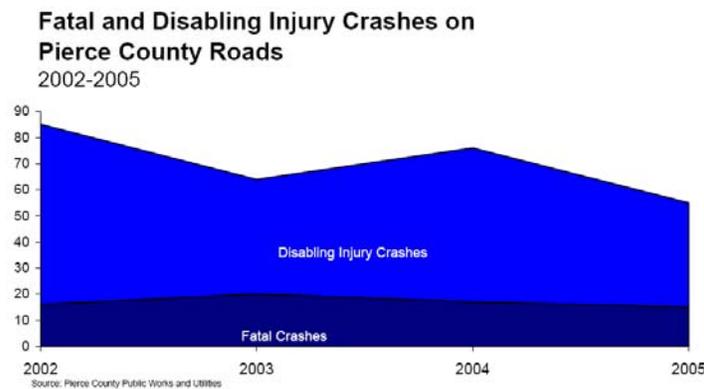
Adding to the fatal crash information above with data on disabling injury crashes, evident injury crashes, possible injury crashes, and property damage only crashes, it is evident that the most severe crashes (fatal and disabling injury) are a very small percentage of the total number of crashes. The trends below also show that the total number of crashes is

increasing, mostly due to increases in possible injury and property damage only crashes. This overall increase over the past few years is probably due to additional population traveling more and the fact that more of this travel is occurring on congested roads. Since 2002, the population of unincorporated Pierce County has increased from 329,124 to 345,940 which is a 5.1% increase. Over this same time frame the number of total crashes has increased, slightly more than population, by 5.4%.



The increase in the overall number of crashes is of not of significant concern because the increase is not in severe crashes.

The good news is that looking at the most severe crashes below, while fatal crashes are level, disabling injury crashes, (almost as severe as fatal crashes), are showing some decline over the past few years.

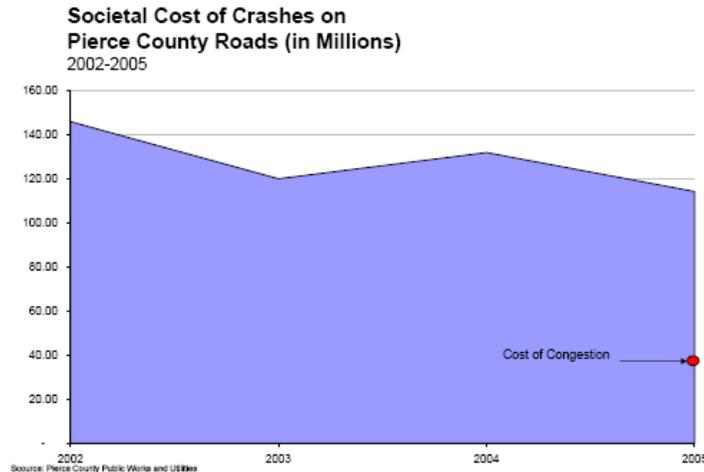


**Societal Cost of Crashes on County Roads**

While the total number of crashes is increasing, the cost to society for those crashes is decreasing. This is largely due to a reduction in the most severe crashes, which have the highest cost to society. The figures used to calculate this cost come from methodologies

suggested by the Federal Highway Administration and the Washington State Department of Transportation. They are as follows:

- \$6,500 for a property damage only crash
- \$35,000 for a possible injury crash
- \$70,000 for an evident injury crash
- \$1,100,000 for a disabling injury crash
- \$1,100,000 for a fatal crash

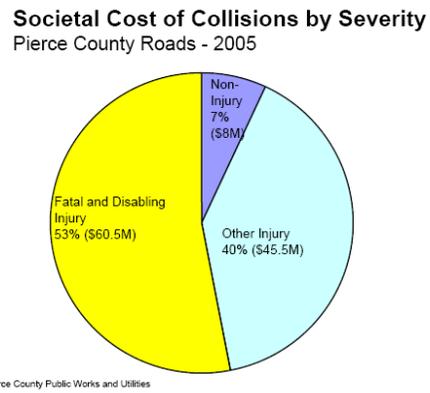
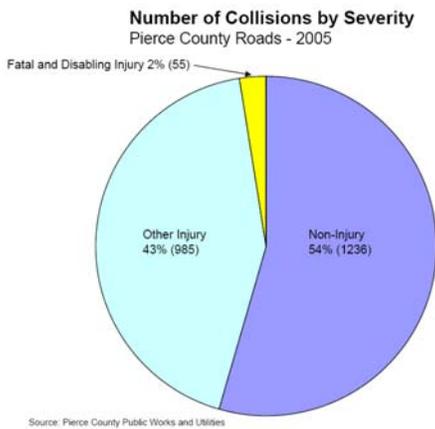


An important consideration in calculating the cost of these crashes to society is comparing this cost to the cost of congestion. Recent estimates of the cost to society for congestion on County roads are approximately \$35 million per year while the cost of crashes was \$114 million in 2005. The cost of crashes is more than three times the cost of congestion.

The cost of congestion was estimated from Pierce County Transportation Planning Models which estimate speeds and delay. Standard values for traffic delay were applied to the delay estimates to determine an estimated yearly cost of congestion.

### **Focusing on Fatal and Disabling Injury Crashes**

As discussed earlier, it would seem to be an appropriate goal to eliminate fatal and disabling injury crashes. This focus would also have some effect on the less severe injury crash and non-injury crashes. The data below also suggests that this focus on the most severe crashes, fatal and disabling injury crashes, would also be a prudent use of limited resources. The severe crashes account for only 2% of the total number of crashes in 2005, but the cost to society for these severe crashes account for 53% of the total cost. While trying to implement strategies to reduce over 2300 total crashes per year seems daunting, addressing the 64 fatal and disabling injury crashes in 2005 would seem much more possible.

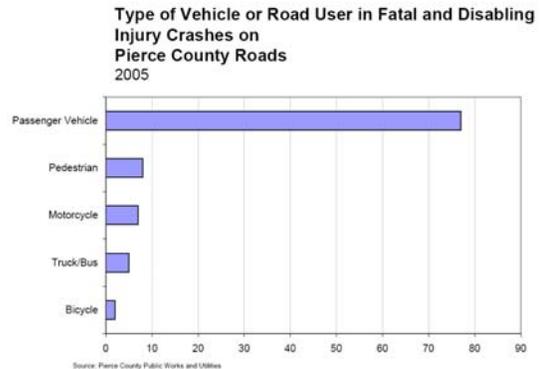
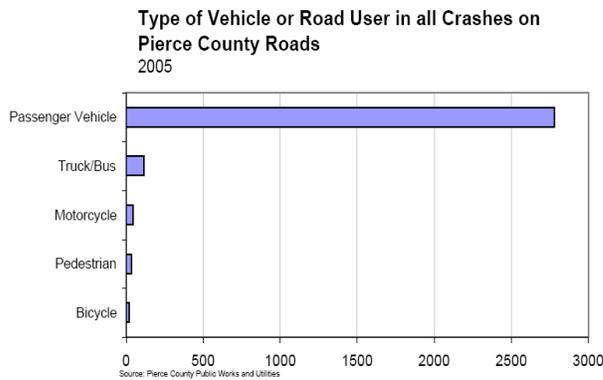


### Crashes by Road User

A key factor for deciding where to focus road safety resources is determining which road users experience the highest number and most severe crashes. The graphs below, comparing total number of crashes to fatal and disabling injury crashes by road user, clearly show that passenger vehicles not only make up the vast majority of total crashes but also the most severe crashes.

What is more notable to draw from the data is that while truck or bus crashes are the second highest total number of crashes, they are less than pedestrian and motorcycle crashes in the number of fatal and disabling injury crashes. Truck and bus drivers are typically professional drivers, which appears to contribute to the low severity of their crashes.

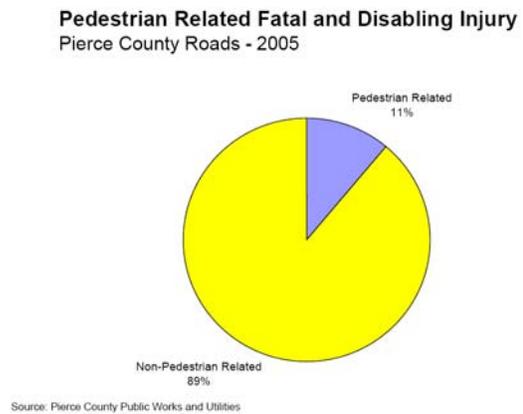
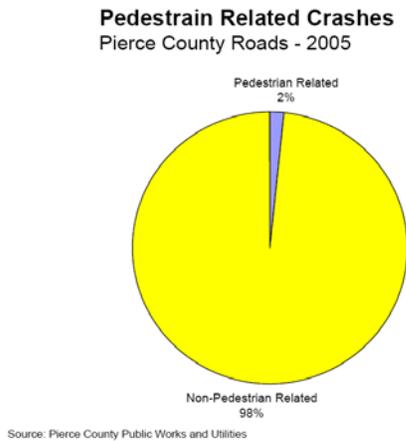
Of the 22 reported bicycle crashes in 2005, only 2 were severe. Given the low occurrence of severe bicycle crashes, a good thing, it seems prudent to focus on the other road users where there are large numbers of severe crashes. This analysis leads to a focus on passenger vehicle, pedestrian and motorcycle crashes as the opportunities for the most immediate improvement.



**Pedestrian Crashes**

Due to the number and severity of pedestrian crashes, it is prudent to dig deeper into understanding the circumstance and locations of these crashes so that possible solutions and investment can be focused most effectively. To do this, an analysis of each pedestrian crash was conducted for the years 2002-2005 to identify trends and circumstances that contribute to the majority of these crashes.

First, in looking at the severity of pedestrian crashes, the graphs below show how the total number of pedestrian crashes in 2005 is low at only 2% of total crashes. The number of severe crashes involving pedestrians is disproportionately higher, or “overrepresented” at 11% of total crashes.



This detailed analysis of pedestrian crashes for 2003 through 2005 looked at 82 crashes. The circumstances of these crashes are as follows:

**Pedestrian Crashes on Pierce County Roads**

**Injury and Fatal Crashes**

2003 – 2005

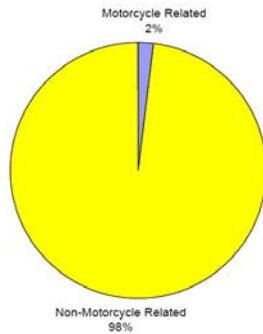
Pedestrian hit in roadway	55 (only 8 in crosswalk, 5 at intersections)
Pedestrian on side of road	24 (10 with parked or disabled vehicles)
Other	3

From the data, it is clear that the area of most concern is the pedestrians hit in the roadway not crossing at a crosswalk or at an intersection. This tells us that over half of the pedestrian crashes were pedestrian errors crossing in the wrong location. There were 14 instances where pedestrians were hit while on the side of the road or on a sidewalk which is also of concern.

**Motorcycle Crashes**

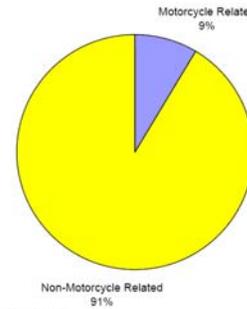
As with pedestrians, the number of severe motorcycle crashes is of concern. In 2005, the total number of motorcycle related crashes was only 2%, while the number of severe crashes was disproportionately higher at 9%.

**Motorcycle Related Crashes**  
Pierce County Roads - 2005



Source: Pierce County Public Works and Utilities

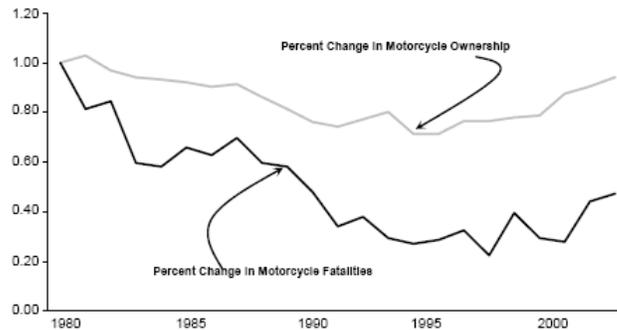
**Motorcycle Related Fatal and Disabling Injury Crashes**  
Pierce County Roads - 2005



Source: Pierce County Public Works and Utilities

This data for motorcycle related crashes in Pierce County follows a statewide trend. Motorcycle ownership is increasing in Washington since 1995 and while the total number of severe crashes for other road users is declining, the number of severe crashes for motorcycles is increasing.

**Percent Change in Motorcycle Ownership  
Compared to Percent Change in Motorcycle Fatalities**  
All Washington State Roads 1980 – 2002  
1980 = 1.0



Source of above charts: WSDOT Transportation Data Office

A detailed analysis of these motorcycle crashes was conducted and the following circumstances were identified:

**Motorcycle Crashes on Pierce County Roads  
Injury and Fatal Crashes  
2003 – 2005**

Motorcycle lost control or went off road	58
Motorcycle vehicle collision	59
Other	6

A look at this data indicates that serious motorcycle crashes are caused equally by motorcycles leaving the roadway and by motorcycles colliding with other vehicles. While some of the improvements for other motor vehicles to prevent run off the road crashes and angle crashes will also improve safety for motorcycles, single motorcycle crashes will continue to be severe if they continue to leave the roadway.

### **Types of Crashes**

When looking at the types of all crashes that occur on County roads, the data is categorized by:

- Angle crashes - are usually vehicles colliding at intersections and driveways where a vehicle was entering or exiting the road and struck another vehicle. These can be mostly viewed as crashes at intersections.
- Rear End crashes - are usually vehicles running into the back of another vehicle. Again, these are mostly intersection related when a vehicle is waiting at an intersection.
- Run Off Road crashes - are usually vehicles leaving the roadway and striking something. These are usually single vehicle crashes.
- Head On crashes - are usually vehicles crossing the centerline and striking another vehicle.
- Pedestrian crashes - are vehicles colliding with a pedestrian.
- Bicycle crashes - are normally vehicles colliding with a bicyclist.
- Animal crashes - are vehicles colliding with a domestic or wild animal in the roadway.

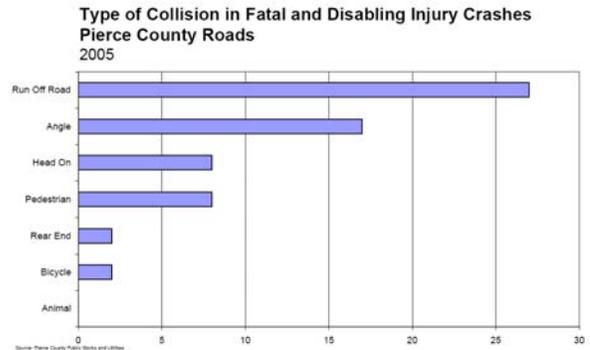
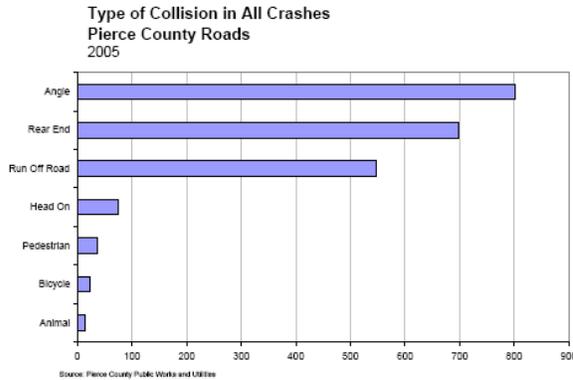
The graphs below again compare total crashes to the fatal and disabling injury crashes by these types of crashes. Of significant concern is that while run off the road crashes rank third in total number, they are the highest in severity of crashes. This is a statewide and even national concern since these single vehicle run off the road crashes are severe and predominantly occur on rural roads and rural state highways. Rural roads often do not have protective features like guardrail and contain objects such as trees that can be hit by an errant vehicle.

Head on crashes are also of concern given the fairly low total number of crashes but the high severity of such crashes.

In contrast, while rear end crashes are the second highest total number of crashes in 2005, they have very low severity. These crashes are most often occurring at intersections and on congested roads, at low speeds, and are less severe.

Angle, or intersection crashes are of concern given the total number and the severity of these crashes. Pedestrian crashes, as mentioned before, are also of concern given the low number but higher severity.

Crashes involving animals, wild or domestic, are not significant either in number or severity. While there is equestrian use of the County road system, there is not safety concerns associated with this use.



This data and analysis suggests that the types of crashes to focus on are:

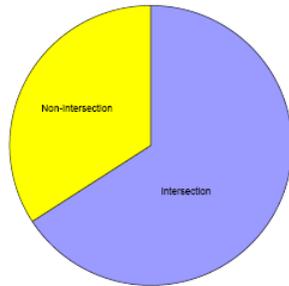
- Run Off Road,
- Angle,
- Head On, and
- Pedestrian

To further refine the analysis of the types of crashes and where they occur, the graphs below separate this data into those crashes that occurred at intersections, (or were intersection related), and those that did not occur at intersections, (or were not intersection related). This is an important distinction since most run off road crashes and many head on crashes do not occur at intersections, while angle crashes do occur at intersections.

The 2005 data indicates that while 66% of the total number of crashes occurred at intersections and 34% did not occur at intersections, 50% of the severe crashes did not occur at intersections.

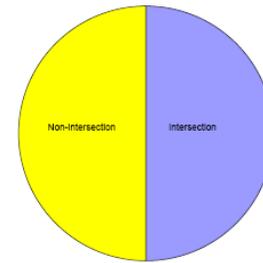
This analysis supports the need to generally focus on non-intersection related crashes; such as run off the road and head on crashes as well as intersections.

Intersection vs. Non-Intersection in All Crashes  
Pierce County Roads - 2005



Source: Pierce County Public Works and Utilities

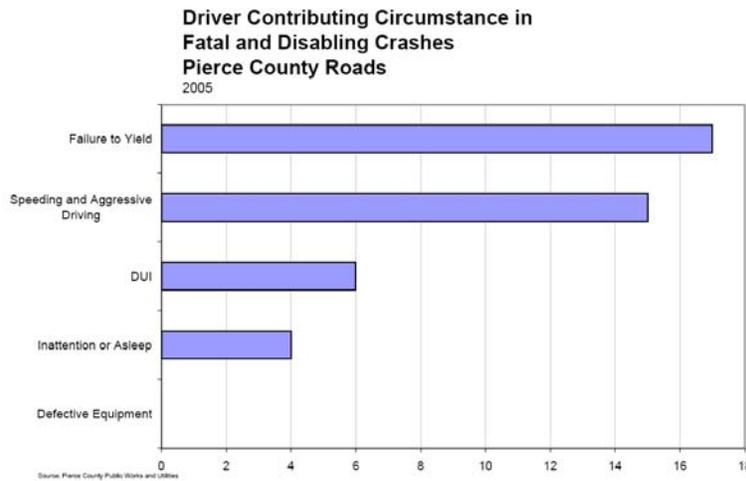
Intersection vs. Non-Intersection in Fatal and Disabling Injury Crashes  
Pierce County Roads - 2005



Source: Pierce County Public Works and Utilities

### What Driver Behavior Contributes to Motor Vehicle Collisions?

As discussed at the beginning of this paper, the safety on County roads is a result of the road condition, the vehicle condition, and the driver behavior. National information suggests that the overwhelming aspect of roadway safety is the driver behavior. Some calculations suggest that 80% of crashes occur due to driver error. In looking at crashes in 2005, the graph below indicates that driver failing to yield and speeding and aggressive driving are the biggest primary contributors to vehicle crashes.



Source: Pierce County Public Works and Utilities

That being said, in 2005 driving under the influence contributed only 9% of the total crashes, but 14% of the fatal and disabling injury crashes.

This data suggests that the areas of focus on driver behavior that could result in the biggest reduction in severe crashes are speeding and aggressive driving, failure to yield, and driving under the influence.

Seat belt use is not easily drawn from this data but statewide and national information shows that the use of seat belts contributes significantly to reducing the severity of

vehicle crashes. According to the Washington Traffic Safety Commission, the seat belt use for Pierce County is at about 94%. While the sample of data collected in Pierce County is intended to be only statistically valid for the statewide analysis and is not statistically valid for a county analysis, it is an indicator of the use in the county. That is well above the national average of 82% and close to the statewide average of 96%. There is ample data to suggest that keeping seat belt use rates high is a worthy endeavor and will support the suggested goal of reducing the most severe crashes since the use of a seat belt may easily reduce the severity of a fatal crash down to a crash that a person can recover from.

### Other Contributing Circumstances

Some analysis was also done to look at other contributing circumstances that are considered in vehicle crashes.

### Roadway Lighting

The first of these is lighting conditions on County roads. The table below indicates that the severity of crashes without roadway lighting is higher than those areas with roadway lighting. This was further refined to see if this was more of a phenomenon on urban roadways or rural roadways.

Lighting Conditions for Crashes  
On Pierce County Roads  
2005

	Total Crashes	Fatal and Disabling Injury Crashes
daylight	1603 (68%)	34 (54%)
lighted	313 (13%)	5 (8%)
dark	460 (19%)	24 (38%)

### Driver Age

Another contributing factor to roadway crashes is the age, and presumably, experience of drivers. The table below calculates the percentage of total crashes and severe crashes by different age categories. This data does not indicate that any age group is over represented in severe crashes.

Age of Drivers in Crashes  
2005 Pierce County Roads

Age	Total Crashes	Fatal and Disabling Injury Crashes
16 and 17	251 (7%)	6 (7%)
18-20	508 (14%)	13 (15%)
21-30	889 (24%)	21 (25%)
31-40	634 (17%)	10 (12%)
41-50	669 (18%)	18 (21%)
51-60	408 (11%)	9 (11%)
61-70	182 (5%)	3 (4%)
71-80	116 (3%)	4 (5%)
80+	17 (0%)	1 (1%)

### Weather Conditions

It would seem intuitive that unfavorable weather conditions would tend to result in more severe crashes, but that is not the case as shown in the table below. Rain or snow and ice crashes have essentially the same percentage of total crashes and severe crashes meaning such adverse weather conditions do not make a severe crash more likely.

Weather Conditions in Crashes  
2005 Pierce County Roads

Weather Conditions	Total Crashes	Fatal and Disabling Injury Crashes
Dry	1544 (65%)	40 (63%)
Rain	742 (31%)	20 (32%)
Snow and Ice	83 (4%)	3 (5%)

### Proposed Solutions for County Road Safety

Proposed solution should be effective at reducing fatal and disabling injury crashes. These solutions will likely reduce the number and severity of other injury crashes and reduce the overall cost of all crashes. Solutions should also be focused on passenger vehicles, pedestrians and motorcycles.

### Roadways

In **urban areas** the solutions most likely to improve the areas of focus above are:

Intersection improvements - this would include intersection channelization, adding turn lanes, and intersection signalization. The County intersections needing signalization will be improved under the Traffic Impact Fee Program. This program for intersection safety improvements should be prioritize intersections using both safety data and congestion data, although solving congestion obviously has a safety benefit. Such intersection improvements are estimated at \$20 million for the next 20 years.

Pedestrian improvements - focuses on improving the pedestrian's ability to cross arterials and walk along arterials. These improvements are as follows:

Pedestrian Education and Enforcement – Most pedestrian collisions on Pierce County roads occur when pedestrians cross the road at a random location with no crosswalk and not at an intersection. Many of the injured pedestrians are under driving age and probably do not have the ability to effectively judge when it is safe to cross or do not look before crossing. Education for children could be an effective strategy to address these types of collisions along with targeted enforcement activities mentioned before. The cost of this educational effort is estimated at \$200,000 and would likely be funded by state traffic safety grants. The County also should support and participate when possible in efforts by state agencies, including Washington Traffic Safety Commission and Department of Health, to improve driver training curriculum to provide pedestrian safety awareness.

Roadway Lighting for Pedestrian Safety – Roadway lighting at key locations where there is significant pedestrian activity and pedestrian safety is affected

by the lack of roadway lighting should be considered by traffic engineers when evaluating pedestrian safety concerns. It is estimated that such lighting improvements will cost \$1 million over the next 20 year period.

Pedestrian Refuge Islands and Traffic Control – A new strategy that is being tested for locations on multi-lane arterials with large pedestrian crossing volumes, such as cross-county trails, is the use of pedestrian refuge islands. When such a crossing would meet warrants for a traffic control signal, such a signal is a strategy that may be evaluated. It is estimated that such improvements will cost \$5 million over the next 20 years.

Sidewalks and Walkways – Sidewalks and walkways can improve safety for pedestrians walking along roadways. The County Transportation Plan can support land-use goals present in many community plans to provide connectivity for pedestrians between land uses such as housing and schools. When roadway improvements projects occur by the County or development, improvements for pedestrians on new or improved facilities should be considered. Often these improvements in urban areas include curb, gutter, and sidewalks to make these roadways friendlier to pedestrians. Where trail systems are identified in the non-motorized transportation portion of the Transportation Plan, higher level pedestrian improvements would be appropriate such as separated paths. The cost for these additional pedestrian improvements, above normal roadway improvement costs, is estimated to be \$5 million over the next 20 years.

Roadway Lighting for Vehicle Safety - will create illumination on urban, multilane arterials. A recently adopted Council policy directs resources toward improving arterials with lighting. The corridor projects in the Traffic Impact Fee program or other improvement projects will include this lighting as part of the project cost.

In **rural areas** the solutions most likely to improve severe crashes are:

Prevent run off road crashes - this will involve improving roads with most frequent crashes of this type by:

- Widening or constructing shoulders,
- Protecting slopes with guardrail, and/or
- Installing rumble strips.

Roadside improvements - which will reduce the likelihood of hitting an obstacle if a vehicle leaves the roadway by:

- Improving slopes, and/or
- Removing roadside obstacles.

The cost to address the roadways with the highest opportunity for such improvements is estimated at \$10 million over the next 20 years.

**Vehicle and Driver**

Improving driver behavior through a coordinated effort of enforcement and education has been shown to significantly reduce the number of severe crashes where driver behavior contributes to the crash. Investments should focus on the following programs and campaigns:

Graduated drivers licenses - a statewide effort to reduce the severity of crashes by younger inexperienced drivers is showing great success. Supporting this effort in Pierce County should be continued.

Driving under the influence - enforcement coupled with education has been shown to reduce the number of such crashes and is an important part of the continued effort to change driver behavior in this area.

Seat belt use - a statewide effort focused on improving seat belt use has succeeded to make Washington close to the top seat belt use state in the country. Continuing education and enforcement efforts to keep this seat belt use rate high is an important part of road safety.

Speeding and aggressive driving – a coordinated effort between enforcement and education has been shown to reduce the number of speeding and aggressive driving incidents on county roads. This is currently a focus of enforcement through the Sheriff’s patrols.

Motorcycle training – Again, a statewide effort is underway to improve motorcycle safety through rider training. Supporting this effort in Pierce County should be a part of a comprehensive safety program of education.

These education and enforcement efforts are a shared responsibility as discussed at the beginning of this paper. Currently \$1.3 million per year is invested from county road funds in traffic enforcement through the Sheriff’s office. This investment should focus on the areas of enforcement and education as recommended above.

**Proposed Solutions for Driver Behavior Issues**

The proposal is to continue the investments and coordination efforts between enforcement and education in the county. This begins with support of the Pierce County DUI Task Force that meets monthly and 14 law enforcement agencies as well as representation from the Liquor Control Board and the Pierce County Victim’s Panel.

To aid traffic enforcement a specific proposal to increase the number of officers with radar speed instruments would be funded as part of the existing County Road Funds invested in traffic enforcement activities.

The cost to address the enforcement activities is estimated at \$26 million over the next 20 years from the County Road Fund and additional resources in the Sheriff’s budget.

### Summary of Proposed Improvements

The table below summarizes the proposed cost of improving road safety over the 20 year life of the Plan.

Safety Improvement Area	Strategies	20 Year Costs
Roadways	Intersection improvements	\$20,000,000
	Pedestrian improvements	\$11,200,000
	Roadway lighting	Included in TIF projects
	Rural roadside improvements	\$10,000,000
Vehicle & Driver Behavior	Enforcement and Education	\$26,000,000
Total		\$43,800,000

### Proposed Policies

The following policies are proposed for the Update of the Transportation Plan to address transportation safety:

- Roadway safety for the traveling public and those working on the roadways should be held as the top priority for maintaining, operating, preserving, or improving the roadway.
- Roadway improvement projects should include safety benefits in the calculation of the overall project benefits used to justify the project.
- Include facilities to accommodate pedestrians and bicyclists in new and reconstructed arterials or new development when such facilities are identified as a non-motorized project recommendation in the County Transportation Plan, unless critical areas or other environmental or physical constraints preclude such improvements.

### Key Performance Measures

While it is not always easy to measure the direct effect of a particular solution on roadway safety due to the interaction of different factors and contributing circumstances, it is easier to measure the outcome of most interest, i.e., the number and rate of severe crashes. The other outcome of interest is the societal cost of crashes. It is proposed to annually measure:

- The number of fatal and disabling injury crashes,
- The rate of fatal and disabling injury crashes per 100 million vehicle miles traveled, and
- The societal cost of crashes.

### Safety Impacts of Maintenance, Operations, and Preservation

Safety on roads is also influenced by how the road is maintained and operated. Effective snow and ice control influences safety during such inclement weather. How effectively a traffic signal is timed can protect the “dilemma zone” for motorists. All aspects of road maintenance and operations are conducted with safety being held as the highest priority. The cost of this effort to maintain and operate roads to accomplish safety is not included in this portion of the transportation plan but rather is included as part of the costs of maintaining and operating the roadways.

How well a road is preserved also affects the safety of the road. The result of not adequately refurbishing, replacing, or rehabilitating an element of the roadway could be a catastrophic failure of that element. If a bridge is not preserved, it could fall into disrepair to the point that heavy loads would need to be prohibited on the bridge to avoid a collapse of the bridge. It is a clear relationship between preserving the roadway and overall roadway safety and it is important to keep that in mind when setting priorities of what to fund with limited resources. The cost of safety initiatives in this paper does not include the cost of preserving the roadway.

For county ferries, the maintenance, operation, and preservation of the ferry vessels have an obvious implication on the safety of the service. These areas are closely regulated by the Coast Guard. Federal maintenance, operations, and preservation standards that are required to keep the vessel's "certificate of inspection" ensure that safety is the top priority. As with roads, the cost of maintaining, operating, and preserving ferries are covered in those other portions of the plan.

### **County Ferry Safety and Security**

The safety aspects of the County's ferry service are strongly regulated by the Coast Guard. The ferry service has a long record of excellent safety with no recorded fatal or disabling injury crashes. For a system that carries 400,000 passengers and 108,000 vehicles each year, this safety record is remarkable although expected.

The bigger area of concern for the ferry is system security. There is a well defined security plan in place for the ferry system as required by the Coast Guard. Funding is identified in the ferry maintenance and operations plan for this security plan.