Washington State Department of Transportation

WASHINGTON STATE PATROL

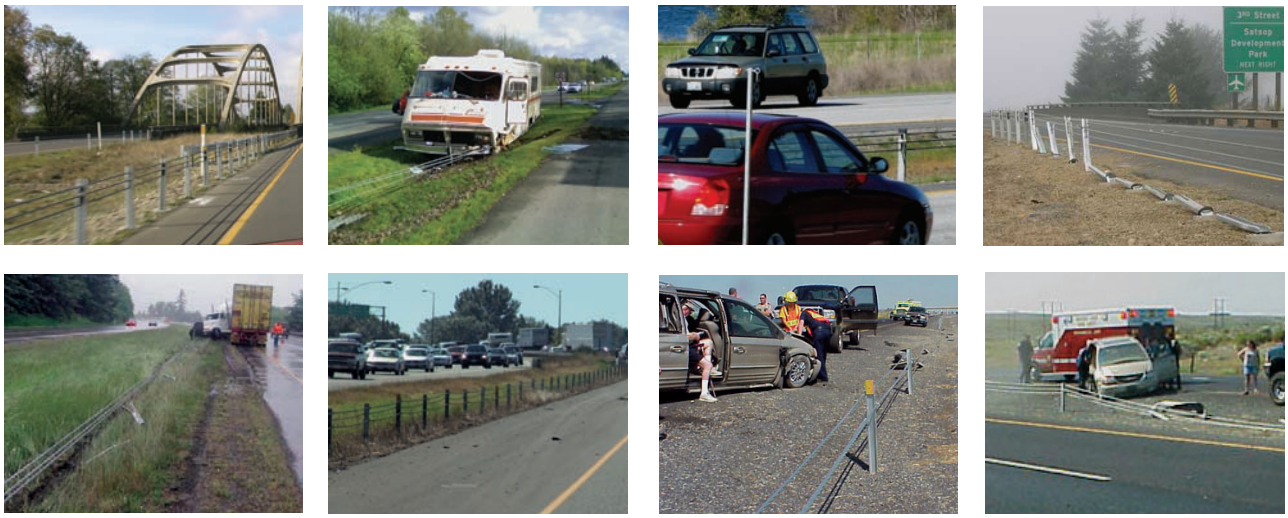
A report requested by the Governor of the state of Washington

Cable Median Barrier
Reassessment and Recommendations

June 2007

Douglas B. MacDonald
Secretary of Transportation

John R. Batiste
Chief, Washington State Patrol



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June 29, 2007

Governor Chris Gregoire
Office of the Governor
PO Box 40002
Olympia, WA 98504-0002

Dear Governor Gregoire:

We submit to you today a report on the use of cable median barrier on state highways in Washington state. The report includes a complete account, as you requested, of the fatal median cross-over collision that occurred on Interstate 5 in Marysville on February 13, 2007.

The report presents data collected and analyzed by our two agencies and, as you requested, incorporates and relies upon independent expert review. Dr. Malcolm Ray, a nationally recognized expert in highway barrier protection systems, principally conducted that review. The work of other independent experts is also presented in the report in the detailed analysis of the crash on February 13, 2007.

We offer several recommendations in this report.

We believe our state should continue to install cable median barrier because of its demonstrated effectiveness in reducing highway fatalities and serious injuries. However, in a ten-mile stretch of I-5 in Marysville we recommend installation of concrete barrier on the northbound inside shoulder while leaving the existing cable median barrier that is adjacent to the southbound lanes. The benefit would be that some added protection against cross-over collisions would be gained when errant drivers traveling south run off the road into the median, the situation that has led to the worst crashes. This would be achieved by providing concrete barrier in addition to cable median barrier as truly belt-and-suspenders protection against crossing into the northbound lanes.

Here are some other important points covered in this report.

Cable Median Barrier Use among the States is Spreading

Washington is one of at least 25 states around the country using modern cable median barrier to protect vehicle occupants in run off the road accidents, including the particularly dangerous cases of median crossovers. With about 165 miles of cable median barrier installed, we rank behind North Carolina (600 miles), Texas (500 miles), South Carolina (470 miles), Missouri (250 miles) and Florida (187 miles) in our use of this system. Many states are just now starting cable median barrier programs after seeing results in pioneering states, including ours. In addition, the Federal Highway Administration in its technical literature is now encouraging states to consider using this type of protection.

Cable Median Barrier is Achieving Major Improvements in Safety at Low Cost

This report shows that cable median barrier is saving lives in our state and will continue to do so in the future. Its use therefore contributes to our state's paramount goal of reducing highway collisions' toll in lives, injury and property damage. But cable median barrier is not the only choice for protecting against median cross-over collisions. What about alternative systems like guardrail or concrete barriers? Every system has pros and cons. The report discusses which systems are best suited for which situations and how WSDOT tries to strike the best balance of risks, benefits and costs when choosing how systems should be selected and placed. A system's performance depends on many factors. An important consideration that often favors cable median barrier is that when struck by a vehicle, the cable absorbs the impact for vehicle occupants and discourages vehicles from uncontrolled ricochets back into high-speed travel lanes. The success of cable median barrier is marked in many settings by an overall reduction in injuries and their seriousness as compared to use of concrete barrier.

Evolving Standards and Practices for Cable Median Barrier Systems; An Installation Failure Detected at the February 13 Fatality in Marysville

Like any new technology, cable median systems are being improved with time and experience. This report discusses how our state has kept step with engineering and installation best practice by supporting national testing programs and using crash-tested systems approved by federal authorities.

Unfortunately, in the February 13 fatality the crossover vehicle in which the driver was killed actually penetrated two runs of cable barrier, an outcome that surprised WSDOT. The accident examination showed that the second barrier penetrated by the vehicle did not perform as it should have apparently because of a failure to properly seat a cable-holding wedge into an anchor socket at the time of installation. The report describes the evidence for this conclusion and the steps WSDOT took immediately to protect against its recurrence.

This report also suggests additional areas in which more work should be considered to improve today's cable barrier systems. These should be taken up as items of nation-wide review, testing and design guidance. They relate in particular to the appropriate installation of cable median barrier where medians are sloped away from the highway and the proper height of the barrier systems given trends towards Sport Utility Vehicles (SUVs) and light trucks with high bumpers. Installation of cable median barrier on I-5 in Marysville conformed to national standards. But investigation of the February 13 crash suggests attention should be given to these aspects of current standards and practices. These issues are presented in the technical sections of the report.

Many Factors Contribute to the Risk of Highway Collisions

WSP's Major Accident Investigation Team examined every aspect of the February 13 crash. Erratic driving by the fatally-injured driver seems to have caused the vehicle to leave the road. Evidence suggests that the driver was very likely impaired. Beyond these features of the specific incident, the frequency of incidents in this I-5 section, especially in the southbound direction, draws attention to the many factors including highway configuration, changes in traffic volumes and speeds, interchange characteristics and drivers' behaviors and expectations. According to Dr. Ray, these conditions can increase vehicle-to-vehicle conflicts that initiate errant vehicle entry into the median. No highway can be made absolutely safe simply by lining its shoulders with barriers, whatever the selected technology. Reducing highway fatalities requires safer, more attentive and law-abiding drivers and a variety of safety strategies in operating and equipping highways to minimize the driving risks.

The Recommendation of the Marysville I-5 Section

This report has given us the opportunity to consider the Marysville I-5 section in comparison to other highway segments and to examine alternatives to the double run of cable median barrier which, until now, has seemed the best solution for median cross-over protection in this area. We also have carefully considered public attitudes and the need to assure that the state is taking the wisest approach to this problem, whatever judgments may have been reached in the past.

No answer is provided by ranking one barrier system as inherently better than another. Each system has its separate benefits and risks. No system protects travelers against every kind of impact and effect when cars leave the highway in uncontrolled entries to the median. Barrier systems also must be judged against other requirements. For example, barrier systems need to leave room for use of highway shoulders for disabled vehicles, emergency access to collision scenes, law enforcement activities and highway maintenance.

The I-5 section in Marysville is a challenging setting for developing a recommendation to improve the current situation. Indeed, one of the considerations is that the existing system has worked in many incidents in this location. We are aware, in the ten-mile stretch of I-5 in question, of at least 12 cases since February 13 where the existing system was struck by errant vehicles and no fatal or serious injuries resulted.

The recommendation also must note the expected high cost of placing a new concrete barrier. We found several factors in the cost other than the price of the barrier system components. One is the need in many sections of this I-5 stretch to perform significant grading and other construction work on the inside shoulder if concrete barrier were installed. Median barrier system also can have important effects on drainage from the surface of highway, a matter that increases the cost of environmental protections and permits.

Our recommendations in this section of I-5 are:

- The cable median barrier system adjacent to the southbound lanes should be left in place.
- The cable median barrier adjacent to the northbound lanes should be replaced with a concrete barrier.
- Concrete barrier located in the middle of the median is not a recommended solution because of the difficulty and

expense of mid-median installation especially in regard to drainage and maintenance.

More details about this recommendation are presented in the report. It has been developed with Dr. Ray.

We, Dr. Ray, the other outside consultants and our staff will be pleased to answer your questions or provide further information.

John R. Batiste
Chief, Washington State Patrol

Douglas B. MacDonald
Secretary of Transportation