

North Carolina Department of Transportation

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# **Saving Lives by Preventing Across Median Crashes in North Carolina**



North Carolina Division of Highways  
Traffic Engineering & Safety Systems Branch

**September 1998**

# **North Carolina's Freeway Across Median Safety Study**

**A Comprehensive Investigation  
and Recommended Course of Action  
to Prevent Across Median Crashes  
on North Carolina's Freeways**

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## *EXECUTIVE SUMMARY*

Across median crashes are deadly, and have been found three (3) times more severe than other freeway crashes. There were 96 people killed in across median crashes on North Carolina's freeways between January 1994 and June 1997. While making up less than five (5) percent of all freeway crashes, across median crashes result in over 20 percent of all fatalities and 13 percent of the severe injuries on our freeways. Fortunately, with the installation of engineered protective median barrier systems, deadly across median crashes can be prevented.

Following a tragic across median crash in western North Carolina in the Summer of 1997, the North Carolina Department of Transportation accelerated and completed the programming of 24 sections (approximately 92 miles) of interstate highway identified and recommended for median protection under *North Carolina's Interstate Across Median Accident Study* (1993). Recognizing the effectiveness of median barrier systems that have been installed in North Carolina, such as the cable I-40 barrier in Durham and Wake Counties, former Secretary of Transportation Garland Garret directed the Department to identify other sections of highways where median barriers would prevent across median crashes. In addition to the initial 92 miles of interstate recommended for median protection, the Traffic Engineering and Safety Systems Branch identified over 30 additional miles of interstate that had across median crash histories. By the end of October 1998, all but one (1) of these sections will have median barrier installed.

In February of 1998, newly appointed Secretary of Transportation E. Norris Tolson specifically directed "state engineers to study freeways across the state to determine where more median barriers or guardrails are needed to prevent across the median accidents."<sup>1</sup> This study would include all freeways throughout the state including non-interstate highways (Appendix F).

Across median crashes and the resulting fatalities have been recognized as a national safety problem. Addressing this problem has been identified in the American Association of State Highway and Transportation Officials' (AASHTO) *Strategic Highway Safety Plan* (Appendix G) as a key strategy in reducing fatalities on our nation's highways.

The Traffic Engineering and Safety Systems Branch recommends a Three (3) Pronged Proactive Strategy to Save Lives by Preventing Across Median Crashes in North Carolina.

- Phase I. Identify and Install Protective Median Barriers on Freeways with Across Median Crash Histories.
- Phase II. Identify and Systematically Protect all Freeway Sections with Median Widths of 70 feet or less.
- Phase III. Revise Policies to Prevent Creating Additional Unprotected Narrow Freeway Median Sections.

This report includes details of the North Carolina Department of Transportation's activities to identify, analyze, and prevent these severe crashes, and includes specific recommendations for further action.

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<sup>1</sup> E. Norris Tolson, Secretary of Transportation, North Carolina Department of Transportation, Press Release, February, 1998.

## INTRODUCTION

One of North Carolina's most important elements of infrastructure is its vast transportation network of highways. This transportation network is made up of almost 100,000 miles of state and municipality maintained public roads. The quality and safety of this transportation network is fundamental to North Carolina's economy, and the mobility and quality of life of North Carolina's citizens. According to Governor James B. Hunt Jr. "*Our commitment to improving the quality of life and attracting new industry is made possible by emphasizing and maintaining a first-rate transportation network<sup>2</sup>.*" As North Carolina continues to realize the benefits of a healthy economy and the reputation for being one of the nation's best locations to live, work, and visit, across median crashes continue to beleaguer the "Good Roads State."



Across median crashes continue to have a tremendous socioeconomic impact in terms of lives, injuries and property damage on North Carolina's freeways (Appendix J). On average, more than 30 people lose their lives and nearly 300 others are injured in across median crashes each year on North Carolina freeways. The causes of these crashes are difficult to identify and therefore difficult to address directly. However, it is possible and practical to address the results of these very dangerous crashes. The installation of median barriers can prevent across median crashes. Recent experience with cable barrier and weak post barrier systems in North Carolina indicate reductions in across median fatalities and reductions in the severity of crashes.

North Carolina is not the only state that is suffering the consequences of across median crashes (See Appendix L). Preventing across median and head on collisions has been identified in AASHTO's Strategic Highway Safety Plan as a key strategy in reducing fatalities on our nation's highways. The Federal Highway Administration has identified preventing across median crashes as a safety focus program area for the Traffic Engineering and Safety Systems Branch (Appendix H).

The State of California has recently enacted strong median protection guidelines and is now requiring median protection or freeway barriers for all freeways with medians widths of 75 feet or less (See California Press Release Copies in Appendix K).

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<sup>2</sup> Governor James B. Hunt Jr., 1997-98 North Carolina State Transportation Map



The strong economy in North Carolina has produced a population growth rate that is straining all infrastructure systems including our highways. The population boom is reflected in more vehicles on approximately the same number of highway miles. Increased lane densities coupled with freeway speeds and unprotected narrow medians produce a highly volatile situation. Fortunately, there are proven engineering countermeasures (protective median barrier systems), that are effective in preventing across median crashes and reducing the overall crash severity.

To counter this alarming national traffic safety issue, the Traffic Engineering and Safety Systems Branch developed a Three (3) Pronged Proactive Strategy to Save Lives by Preventing Across Median Crashes in North Carolina.

- Phase I. Identify and Install Protective Median Barriers on Freeways with Across Median Crash Histories.
- Phase II. Identify and Systematically Protect all Freeway Sections with Median Widths of 70 feet or less.
- Phase III. Revise Policies to Prevent Creating Additional Unprotected Narrow Freeway Median Sections.

## BACKGROUND

### Population and Volume

North Carolina has experienced explosive increases in daily traffic volumes all across the state. The increases in vehicle miles traveled and levels of congestion have been accompanied by increases in crashes (Appendix E). According to the North Carolina Office of State Planning, North Carolina's strong population growth is expected to continue into the 21st Century with 8.6 million residents expected by 2010, and a projected 9.5 million residents by 2019. Figure 1 shows the growth that North Carolina has experienced between 1990 and 1996. In 1997, North Carolina experienced 1,483 fatalities and 152,289 injuries in 210,666 traffic crashes that met the minimum reporting threshold of a fatal injury, personal injury or \$1000 in property damage.

Many of North Carolina's freeways were designed and constructed with the intent of minimizing the "footprint" or corridor width to reduce right of way costs and environmental impacts. As a result, hundreds of miles of North Carolina freeways have been constructed with narrow medians. In the 1960s and 1970s North Carolina's freeways were carrying significantly fewer

	1990	1996	Difference
NC Estimated Population (Office of State Planning)	6.6 million	7.3 million	+700,000 (+10.6%)
Vehicles Registered (DMV)	5.6 million	6.4 million	+800,000 (+14.3%)
Est. Vehicle Miles Traveled	62.7 billion	78.6 billion	+15.9 billion (+ 25.3 %)
"Reportable" Crashes	165,962	208,017	+42,055 (+25.3%)
Fatalities	1,384	1,492	+108 (+7.8%)
Injuries	117,862	150,788	+32,926 (+27.9%)

Figure 1 Growth in North Carolina From 1991 to 1996

cars and trucks. In the event that a vehicle happened to cross the median under these extremely low traffic volume conditions, it was likely that they would not encounter opposing traffic. Today, it is almost the exact opposite. Many of our freeways have a substantial number of vehicles traveling all hours of the day, and the probability of striking another vehicle has increased. During peak periods of the business day on most North Carolina freeways, a driver crossing the median will encounter a wall of high speed opposing traffic.



### What is a Narrow Median?

Visualize “narrow” medians, not so much from the physical dimension in feet, but rather in terms of the time in seconds it would take a vehicle traveling at or near posted speeds to cross a median. Figure 2 shows that a 46 foot wide median provides less than a standard tractor trailer length of physical separation between opposing traffic. It also shows that there is little to no time to react to a vehicle coming from the opposite direction. When traveling at 60 miles per hour, a vehicle covers 88 feet in a single second.

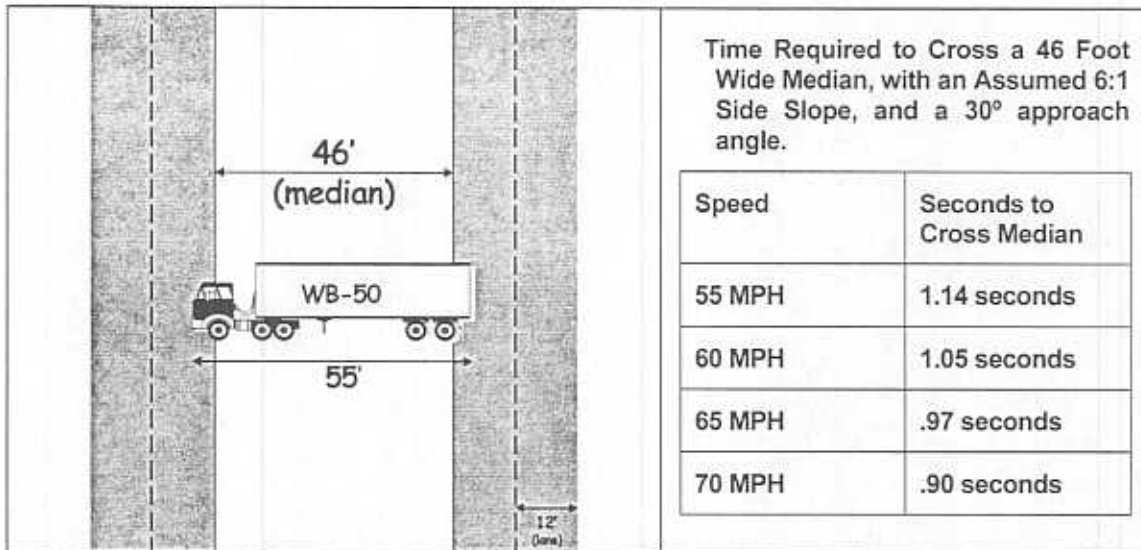


Figure 2 Graphical Representation of a 46 Foot Wide Median with Time to Cross in Seconds

In about the time taken to yawn, change a radio station, or answer a cellular phone, a vehicle travelling at posted freeway speeds can cross a median and strike equally fast opposing traffic head-on. In most cases, there is not even time enough for any of the drivers to begin reacting to the impending tragedy.

## **STATEMENT OF THE PROBLEM**

### **Across Median Crashes are more Severe than Other Freeway Crashes**

Given the freeway speeds and opposing forces typically involved, across median crashes are over three (3) times more severe than other freeway crashes. Crashes that involve a vehicle crossing the median and entering the opposing travel lanes comprise nearly 23 percent of all fatal injuries and 13 percent of severe injuries on North Carolina freeways. However, across median crashes make up less than five percent (5%) of all injuries on our freeways. Across median crashes are clearly over-represented in fatal and severe injury crashes.

### **Across Median Crashes Appear to Occur in Random Clusters along North Carolina Freeways**

Across median crashes do not have a time of day or day of week when they are more prevalent, and there does not appear to be a well-defined "season" for these crashes. The events that lead up to an across median crash range from fatigue, improper lane changes, medical emergencies and a variety of others. In many cases, the vehicle crossing the median is a secondary event. A vehicle was cut off, sideswiped, or overcorrected and crossed the median out of control. Across median crashes appear to be random and yet periodic. For instance, one section in Orange County experienced nine (9) across median crashes in less than three years and then went three years without an across median crash.

Across median crashes are occurring on horizontally and vertically curved sections of highways as well as along straight sections. The proximity to the weaving sections around interchanges does not appear to have a significant influence either. Across median crashes occur on freeways with median widths ranging from less than ten (10) feet to more than 100 feet. The traffic volumes where across median crashes have occurred also vary considerably, from less than 5,000 vehicles per day, to more than 100,000 vehicles per day. The geometric and operating characteristics of freeways that have experienced across median crashes do not have highly defined patterns of associated geometric characteristics. In fact, the narrow median freeway sections that have not developed across median crash histories are in most ways identical to historically more dangerous sections with extensive across median crash histories.

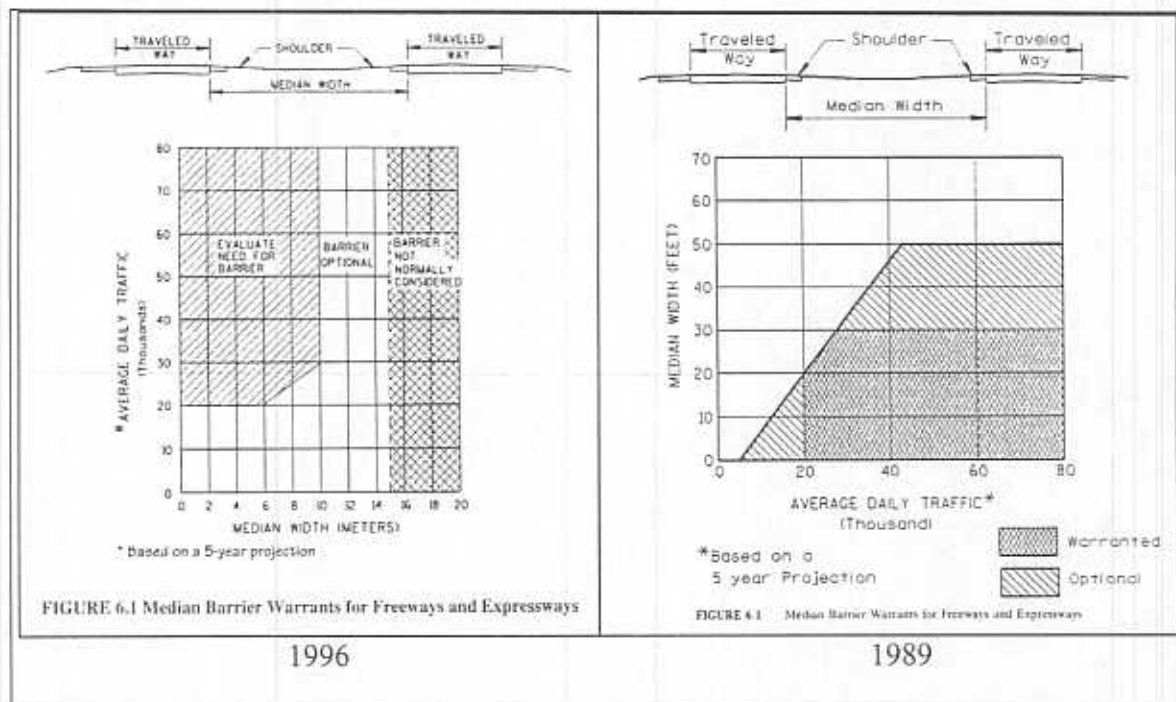
### **Across Median Crashes are Preventable**

Across median crashes are over three (3) times more severe than other crashes on our freeways and **do not** have specific geometric and operating conditions that can be identified and targeted. Across median crashes **do not** have a "season," day or time of day that can be targeted for educational purposes. Across median crashes **do not** have a single cause or a limited number of causes that can be targeted. With all the reasons why it is not possible to address the specific causes of these crashes, it is still possible to prevent across median crashes. The installation of a protective median barrier system can effectively prevent a vehicle from crossing the median and striking another vehicle or hitting fixed objects on the other side of the freeway. The simple fact is that median barriers, when properly designed, constructed, and maintained, can and do protect motorists travelling in both directions of a freeway from the devastation of an across median crash.

The Federal Highway Administration's Highway Evaluation Safety System<sup>3</sup> identified 20 safety improvements with the highest benefit-cost (B/C) Ratios. In this study, upgrading of existing median barriers was ranked as the second best B/C safety improvement with an 8:1 B/C ratio, and the installation of new median barriers was ranked 4th with a 4.9:1 B/C ratio. The safety benefit to cost ratios for North Carolina freeway median barrier installations frequently exceed 20:1. That means for every dollar spent on the median barrier, there would be an expected net 20 dollars in savings to North Carolina citizens in the form of reduced crash injuries, fatalities, and property damage.

### National Guidelines for Installation of Median Barriers

Chapter six (6) of the AASHTO Roadside Design Guide provides design guidance on the installation of median barriers. The warranting criteria identified in section 6.2 are shown below in Figure 3. These criteria are based on a limited analysis of across median crashes in California in the mid 1960s and other research completed in the early 1970s, and have been found not to be representative of contemporary traffic operating conditions.

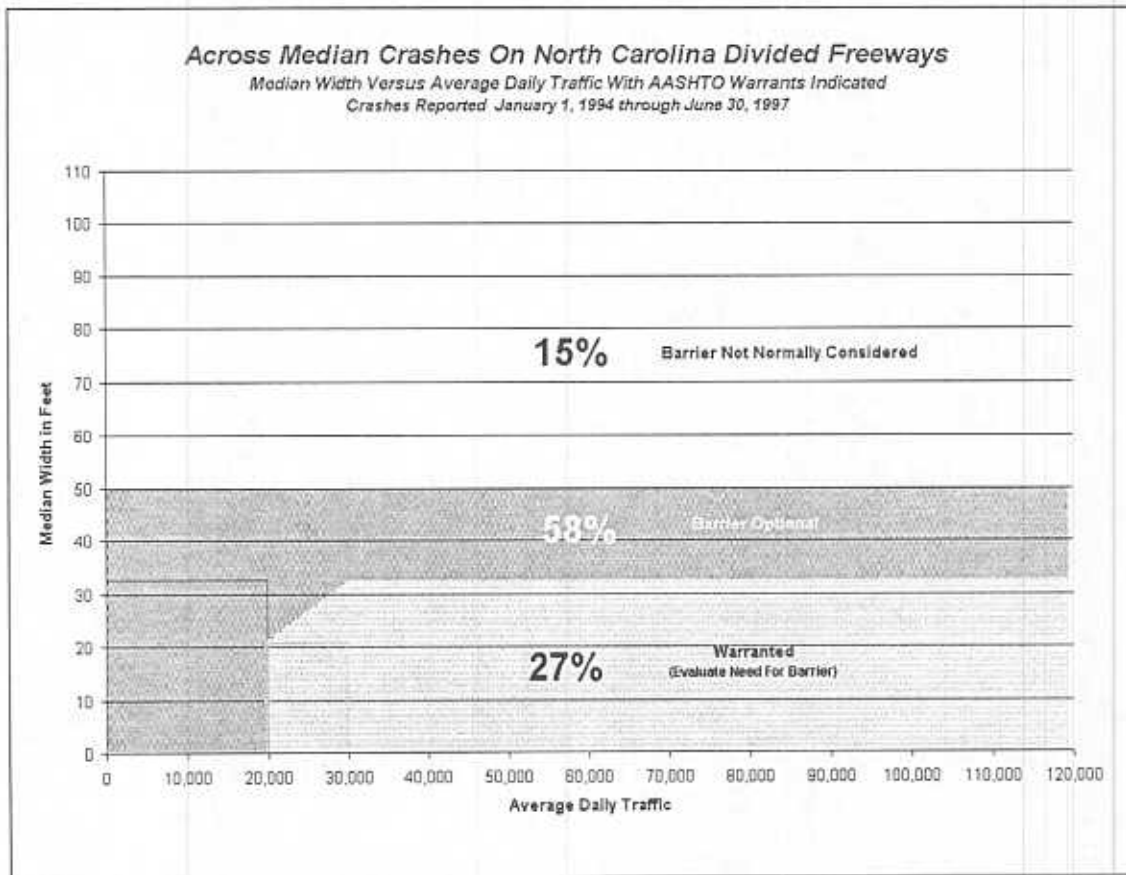


**Figure 3 Median Barrier Warrants from Chapter 6 of the 1996 and 1989 AASHTO Roadside Design Guide**

The warranting criteria are based on the average daily traffic and width of the median. The 1989 figure shows the same criteria as the 1996 figure but in English units; however, the warrant limit of 30 feet (9.1 meters) was changed to 32.8 feet (10 meters) due to metrification and ease of reading the chart.

<sup>3</sup> Federal Highway Administration, The 1995 Annual Report on Highway Safety Improvement Programs, Highway Evaluation Safety System, 1995.

The AASHTO median barrier design criteria were based on research completed in the 1960s and 1970s. The across median crash experience on North Carolina freeways indicate that the situation has changed dramatically since the development of these criteria. While reviewing across median crash histories in North Carolina, it is apparent that the warranting criteria would fail to prevent the majority of the across median crashes that it is intended to prevent. Figure 4 shows the percentage of across median crashes on North Carolina freeways in each of the three (3) current AASHTO warranting categories. Seventy-three percent (73%) of all North Carolina freeway across median crashes are not in the category "Evaluate Need for Barrier" formerly referred to as the "Warranted" category. The warranting criteria are not currently adequate to provide the necessary guidance to highway designers as to when to provide median barrier. Developing more effective guidelines and tools for highway engineers to identify and apply median barrier when needed, is a primary goal of ongoing research under the National Cooperative Highway Research Program Project 17-14, Improved Guidelines for Median Safety.



**Figure 4 Percentage of Across Median Crashes on North Carolina Freeways by AASHTO Warranting Category**

**Previous Across Median Crash Studies Completed by North Carolina Department of Transportation**

July 1993 Across Median Study

The *North Carolina Interstate Across Median Accident Study* was completed in July of 1993. This was a comprehensive study that involved a large field component. There were four objectives in this study:

- Use available accident history to identify interstate locations that had an unusually high number of across median accidents.
- Determine what safety improvements can be made.
- Develop a priority listing of these locations with recommended improvements which are justified and based on sound analytical procedures and engineering practices.
- Use the information collected to develop a model that will aid in identification of potentially dangerous locations on North Carolina interstates based on relevant variables such as median width, traffic volume, and other geometric and operational characteristics.

The last objective was the only one not accomplished in this study. Developing a reliable methodology to identify across median crashes continues to impede researchers and engineers on a national level. The results of this study included the recommendation of median protection for 24 sections of interstate throughout the state. All the recommended sections identified in this report either have been constructed or are programmed for construction.

July 1997 Across Median Study Update

The study conducted in 1997 was in response to the Secretary of Transportation Garland Garrett's directive to identify other locations that need median barrier. The time requirements to complete this study were very restrictive and reduced the scope of the study. This study identified approximately 30 miles of interstate (in addition to the 92 miles identified in the July 1993 study), that needed median barrier protection. These locations have also either been completed or programmed for completion in the near future. Table 1 shows the results of this study in addition to the remaining projects from the 1993 study.

**Table 1 Median Barrier Projects Added to the Transportation Improvement Program in 1997**

PROJECT NUMBER	DIVISION (S)	LOCATIONS	ESTIMATED COST	CONSTRUCTION FFY
I-3811	5	I-85, 0.02 MILES SOUTH OF THE VANCE COUNTY LINE TO SR 1369 IN VANCE COUNTY (12.0 MILES). INSTALL GUARDRAIL IN MEDIAN	\$1,200,000	1998
I-3809	5 & 7	I-40, 1.0 MILE WEST OF NC 86 TO 0.5 MILES WEST OF SR 1734 IN ORANGE COUNTY (3.6 MILES) AND 0.7 MILES WEST OF NC 54 TO SR 1118 IN DURHAM COUNTY (3.7 MILES). INSTALL GUARDRAIL IN MEDIAN	\$730,000	1998
I-3813	6	I-95, 0.4 MILE SOUTH OF US 74 TO 0.3 MILE SOUTH OF NC 72-711 IN ROBESON COUNTY (3.4 MILES) AND 0.5 MILE SOUTH OF SR 1006 IN ROBESON COUNTY TO 0.22 MILE NORTH OF I-95 BUSINESS IN CUMBERLAND COUNTY (10.4 MILES). INSTAL GUARDRAIL IN MEDIAN.	\$1,380,000	1998
I-3810	9 & 10	I-85, 0.9 MILES SOUTH OF SR 2472 TO 0.9 MILE NORTH OF SR 2472 IN MECKLEMBURG COUNTY (1.8 MILES), 0.8 MILE NORTH OF SR 1430 IN CABARRUS COUNTY TO US 290601 IN ROWAN COUNTY (14.8 MILES), US 70-601 IN ROWAN COUNTY TO I-85 BUSINESS IN DAVIDSON COUNTY (13.0 MILES) AND 0.8 MILE SOUTH OF NC 109 TO 1.0 MILE NORTH ON NC109 IN DAVIDSON COUNTY (1.8 MILES). INSTALL GUARDRAIL IN MEDIAN.	\$3,570,000	1998
I-3808	13	I-40, 0.2 MILE WEST OF US 64 TO SR 1758 IN BURKE COUNTY (12.0 MILES). INSTALL GUARDRAIL IN MEDIAN.	\$1,200,000	1998



## **1998 NORTH CAROLINA'S FREEWAY ACROSS MEDIAN SAFETY STUDY**

The objectives of *North Carolina's Freeway Across Median Safety Study* (1998) are to:

- 1.) Save lives by reducing the number and severity of across median crashes on North Carolina's high-speed freeway facilities.
- 2.) Improve the criteria used to warrant median barrier protection in North Carolina.
- 3.) Identify, program, and protect North Carolina's divided freeway facilities (both interstate and non-interstate) that have across median crash histories.

This study includes the research, identification, and subsequent engineering investigation of over 800 across median crashes along approximately 1,375 miles of interstate and non-interstate freeway type divided facilities. A three and one half (3.5) year study period from January 1, 1994 through June 30, 1997 was utilized. Actual hard copies of crash reports were reviewed to validate the across median event and to better isolate crash locations. Area Traffic Engineering staff performed on-site traffic safety investigations for identified locations and developed engineering recommendations based on the combined analysis of the results of the crash histories, traffic operational conditions, and geometric considerations.

Following completion of the field validation and safety investigation of these locations, each Area Office developed recommendations to address the across median freeway crashes. All project recommendations were then submitted to Traffic Engineering Headquarters where they were entered into a database developed specifically for evaluation, comparison, and prioritization.

The 1998 *North Carolina Freeway Across Median Safety Study* differs from previous North Carolina across median crash studies in that it includes interstate and non-interstate freeway locations. There are over 1,200 miles of freeways in North Carolina and the majority have median widths of less than 70 feet. The traffic volumes on these facilities are increasing at a higher rate than other facilities. Locations with narrow medians, increasing traffic and high rates of speed are prime candidates for across median crashes. The results of this study further support the earlier statements on the unpredictability of across median crashes. Many of the identified locations were along tangent sections and would not have traditionally been thought of as across median crash sites. The methodologies and results of this study are discussed in the following sections.

It should be noted that divided, non-freeway sections were reviewed in several Divisions throughout the state, and the majority of the across median crashes along these sections occurred at intersections or existing median breaks. There were relatively few across median crashes at locations where median breaks were not already existing. Installing median barriers in these locations would require closing the median break or intersection. This would require a much more in-depth impact analysis of the location and surrounding traffic patterns, and was considered outside the scope of this study.

### **Methodology for Identifying Interstate Locations with Existing Across Median Crash Histories.**

In order to accurately identify across median crashes and isolate sections of North Carolina's freeways, the Traffic Safety Systems Management Unit of the Traffic Engineering and Safety Systems Management Branch developed a comprehensive work plan and problem identification



algorithms to help review and filter three and one-half years of crash records and over 10,000 crashes. To compensate for inherent system limitations, hard copies of crashes (Form DMV-349) were pulled and reviewed by safety engineers and technicians to validate the type crash and to help verify location information.

Once the crash and safety analyses were completed, target sections of freeways with across median crash histories and patterns were identified for further engineering investigation and analyses. For each identified freeway section, crash summaries and actual hard copies of the DMV-349 crash reports were delivered to Traffic Engineering's Area Traffic Engineering Offices in Raleigh, Asheville, Fayetteville, Winston-Salem, and Wilson.

The field validation and engineering investigations performed by the Area Traffic Engineering staff were an essential part of the effort to verify and select the most appropriate sections for median protection based on not only across median crash history, but also traffic volumes, speeds, and physical characteristics. The Area staff investigated each identified section and was charged with the responsibility to identify other candidate divided freeway locations to "prevent across median crashes."

The standardized North Carolina collision report form (DMV-349) used by the North Carolina State Highway Patrol and other reporting agencies, has a field where the reporting officer can indicate if a vehicle crossed the median. However, after reviewing the information coded in the crash database, it has been determined that this field is not a reliable mechanism to identify across median crashes. Less than 50 percent of the across median crashes were actually coded as across median crashes by the investigating officer. As a result of this coding limitation, a more accurate method has been identified to isolate across median crashes and will be discussed in a subsequent section. The methodology used was to develop a selection model for an across median crash based on collected data elements that are more reliable. The first "cut" identified all crashes that involved any of the following conditions:

- Head on collision,
- Crash that involved two vehicles traveling in opposite directions, or
- Reporting officer indicated that one or more of the vehicles crossed the median.

These selection criteria were used on the interstate system in North Carolina that includes over 1,000 miles of highway. More than 10,000 crashes were identified by selection of one or more of the criteria for the period from January 1, 1994 through June 1997. Each crash was reviewed to see if it met the stated definition of an across median crash. All the crashes were categorized into four categories; (1) Across Median, (2) Median Involved, (3) Struck Shoulder Barrier and (4) Other. The first cut of this methodology identified approximately 1,000 across median crashes.

After the across median crashes were located, they were analyzed to identify any patterns and concentrations. A sample of the printout is shown in Figure 5. The shaded area indicates the concentration recommended for investigation by the Area Traffic Engineers. Locations with concentrations were sent to the Area Traffic Engineers to review and develop projects for proposed median barrier protection. The actual project limits recommended may be different to accommodate situations such as closing gaps in median protection, a better defined beginning or ending point, and to cover adjacent sections with narrow medians.

**Figure 5 Sample Printout for Identifying Concentrations of Across Median Crashes**

<i>I 26 Henderson County</i>									
Year	Milepost	Severity	Dist to Next	EPDO	7/21/98 17:27				
96	1.75	o	6.74	1					
96	8.49	o	0.99	1					
94	9.48	o	1.62	1					
96	11.10	o	0.18	1					
96	11.28	c	0.08	8.4		<b>Beginning</b>	<b>Ending</b>	<b>Length</b>	
96	11.36	b	0.73	8.4	<b>Crash</b>	8.49	16.69		
95	12.09	o	0.28	1	<b>Point (+/-)</b>	8.24	16.94	8.70	
96	12.37	o	0.64	1	<b>Recom</b>	8.21	16.91	8.70	
94	13.01	a	2.72	76.8					
96	15.73	a	0.00	76.8					
97	15.73	a	0.86	76.8		<b>EPDO</b>	<b>Crashes</b>	<b>S.I</b>	
97	16.59	c	0.10	8.4		337.40	12	28.12	
96	16.69	f		76.8					
<b>Crashes For Recommended Section</b>									
Fatal							1		
A Type							3		
B Type							1		
C Type							2		
PDO							5		
							12		
<b>Section Recommended for Review</b>									
From 0.5 mile east of SR 1503 to 0.5 mile west of the Polk County Line									

The following table (Figure 6) shows the locations recommended for investigation for all interstates. Please note that the crash data used to identify these locations was approximately six (6) months old and several of these locations and other locations not initially identified on this list have since experienced additional across median crashes. In the cases where the Area Traffic Engineers had knowledge of such information, an effort was made to utilize the most current available information. The time to complete the manual task was several months, and several locations had experienced across median crashes in this time period. Where more current information was available, the Area Traffic Engineering Staff used such information to extend and add additional locations.

Figure 6 Recommended Interstate Locations for Investigation for Median Barrier Projects

**Potential Median Barrier Locations Based on Interstate Across Median Crashes**  
Study Range From January 1, 1994 through June 30, 1997

Area	County	Route	Description	Length (Miles)	Median Type	Median Width (Feet)	Across Median Crashes		
							Total	Fatal	Severity Index
5	Henderson	I 25	From 0.5 mile east of SR 1503 to 0.5 mile west of the Polk County Line	8.70	Grass	30-44	12	1	38.1
5	Burke	I 40	From SR 1129 to 0.2 mile west of US 64	8.57	Grass	33	10	0	13.8
5	Catawba	I 40	From 0.5 mile East of SR 1476 to 0.95 mile west of SR 1717	8.10	Grass	35	16	5	36.0
4	Forsyth	I 40	From 0.2 mile west of SR 1101-Harper to SR 3153-Hanes Mall	7.30	Grass	36-52	12	0	45.5
2	Guilford	I 40	TIP Project I-2201	12.00	Grass	22-48	28	3	18.2
4	Iredell	I 40	From 0.22 mile east of SR 1005 to US 64 Ext 153	9.00	Grass	30-36	15	2	28.7
1	Johnston	I 40	From 0.25 mile west of SR 1521 to I 95	10.70	Grass	35-48	11	1	30.6
2	Wake	I 40	From 0.38 mile east of SR 1321-Avent Ferry to 0.36 mile east of SR 2026-Hammond	5.00	Grass	36-50	5	2	34.3
2	Wake	I 440	From I 40-US 1-64 to SR 1878-Lake Boone Trail	4.70	Grass	4-36	13	0	28.3
4	Iredell	I 77	From 0.2 mile south SR 2342 to 1.0 mile south of SR 1892	11.20	Grass	25-30	16	1	28.4
4	Iredell	I 77	From the Mecklenburg County Line to 0.25 mile south of US 21-NC115	11.20	Grass	44-65	16	3	23.2
4	Cabarrus	I 85	From 1.0 mile north of Mecklenburg County to 0.5 mile south of SR 1790-Winecoff	6.80	Grass	44-68	13	1	16.7
2	Durham	I 85	From US 70 to Vance County Line	12.00	Grass	30-40	24	3	13.6
5	Gaston	I 85	From 0.25 mile west of Cleveland County Line (in Cleveland County) to 0.25 mile east of SR 1312-Dates	5.50	Grass	30-44	7	1	36.7
1	Northampton	I 95	From SR 1202 to the Virginia State Line	4.40	Grass	varying	5	2	48.0
3	Robeson	I 95	From 0.5 mile south of US 74 to the Cumberland County Line	25.50	Grass	varying	49	7	25.5

150 07

**Methodology for Identifying Non-Interstate Locations with Existing Across Median Crash Histories.**

Originally, all across median work was limited to North Carolina's Interstate Highway System. However, as directed by Secretary of Transportation E. Norris Tolson, this study includes other freeways and four or more lane divided highways with full access control. The majority of North Carolina's highways are not freeways, and the algorithm used to identify across median crashes on the interstate system could not be used on the non-interstate system. It is possible to have a head on collision or have two vehicles striking each other while traveling the opposite direction on undivided sections. The reliability of the across median flag greatly inhibits the efficiency in identifying across median crashes on facilities other than interstates.

A crash analysis was completed on all sections that were identified as freeways. These locations were identified by reviewing maps and field inspections by the Area Traffic Engineers. Once all freeway sections were identified, a crash analysis was completed and all run-off-road, head-on and sideswipe crashes were reviewed to identify the crashes that meet the stated definition for an across median crash. Copies of the across median crashes and analyses were sent to Area Traffic Engineers to develop projects for proposed median barrier protection. Once the Area Traffic Engineers investigated the locations, they forwarded all results and recommendations to the Traffic Field Operations, Investigations, & Support Unit.

**Recommended Improvements in Methodology**

In order to address the problems associated with the accurate identification of an across median crash, it is recommended that a selection algorithm be developed that would be equally effective

for both interstate and non-interstate facilities. Work to accomplish this is currently in progress in the Traffic Safety Systems Management Unit. An across median crash selection algorithm will improve the efficiency of any project that requires a large-scale study of these crashes. It will reduce potential human errors that are inherent to extensive manual procedures. An improved selection process will allow more timely investigations of sections of freeways that may develop across median crash histories.

### **Case Study of Existing Median Barrier Project on I-40 in Wake and Durham Counties**

#### Prior to Installation of Cable Barrier System

Interstate 40 (I-40) between Raleigh and the Research Triangle Park had three through lanes with a 44-foot wide median on a majority of the section. The average daily traffic was approximately 90,000 vehicles per day with the peak periods between 7:00 and 9:00 AM and 4:00 to 6:00 PM. In the five years prior to installing the median barrier system, this section was averaging one fatal and nearly ten across median crashes per year. During this period of time, six (6) people were killed and 54 others were injured in across median crashes. In 1993, former Highway Administrator L. R. Goode declared an emergency action and ordered that a median barrier system be installed along this section of I-40. The installation of a cable guardrail system was completed in the spring of 1994.

#### Situation Following Installation of Barrier System on I-40 Wake/Durham Counties

Since the installation of the cable barrier system, the average daily traffic has increased to nearly 120,000 vehicles per day. Construction and rehabilitation of both I-40 interchanges and Y-lines continue. The subject section of I-40 has experienced only one (1) across median crash since the installation of the barrier system, and that occurred when the cable was lowered to construct the I-540 interchange. There have not been any across median fatalities or injuries reported since, and there have been many recorded "hits" on the cable by various vehicle types.

In the first 30 months after the installation, 118 hits were matched against corresponding crash reports of cable guardrail strikes. There had clearly been more than 118 "hits" in this time period, but many vehicles were able to drive away without reporting the event. Drive-aways after striking a barrier system indicate that the system did its job and vehicles did not cross the median or sustain severe damage that is often accompanied by severe injuries. Of the 118 crashes reported, only two (2) involved severe injuries, and one of those was a motorist traveling in excess of 85 miles per hour and rolling his vehicle before hitting the guardrail. Less than half of all these crashes involved an injury of any type. The crash history indicated an overall increase in total crashes, with a remarkable average crash severity reduction of 50 percent. It should be noted that this section of I-40 experienced an average traffic increase of nearly 30,000 vehicles per day, over the same time period of the increase in frequency and decrease in the severity of crashes on this section.

The I-40 cable guardrail between SR 1999 (Davis Drive) and SR 1655 (Trenton Road) performed exceptionally well as a safety countermeasure. However, due to the placement of the system up against the paved shoulder, it sustains more "hits" and requires more frequent repairs than a system with additional clearance from the travelway. From a maintenance perspective, this was probably a worst case scenario. For sections that required a run of cable along both directions of traffic, the cable guardrail was installed right at the edge of pavement. This reduced the recovery area for errant vehicles on the median side to ten feet of paved shoulder. The small recovery area in conjunction with the high volumes, heavy construction and aggressive driving



of some motorists dramatically increased the number of hits on the system and drastically increased the cable downtime and maintenance costs. The cable system installed at this location is currently being replaced because an additional travel lane is being added further reducing the median width along this high volume section of interstate. The reduced I-40 median widths do not provide adequate space for the cable to deflect when struck by an errant vehicle, and therefore a rigid barrier is being installed as part of this widening project.

## **RECOMMENDATIONS**

In order to address the across median safety issue, the Traffic Engineering and Safety Systems Branch has developed and presented a “three (3) pronged,” systematic plan of action:

### **Phase I - Identify and Install Protective Median Barriers on Freeways with Across Median Crash Histories**

The first phase (Phase I) includes the identification of 23 recommended high priority locations, along approximately 240 miles of freeway, with documented across median crash histories. It is recommended that positive median barrier protection be installed along these freeway segments as soon as possible. Phase I locations were ranked according to an incremental safety benefit-cost methodology. A preliminary listing of Phase I locations is included Appendix B, with refined project sections included in Appendix D (Page A-20). Freeway sections recommended for median barrier protection are graphically displayed in red on the map included in Appendix M (Page A-64).

### **Phase II - Identify and Systematically Protect all Freeway Sections with Median Widths of 70 feet or less**

Phase II proactively addresses the freeway locations that have not developed extensive across median crash histories. These locations are the “ticking” locations that have median widths of 70 feet wide or less, with other physical and operational characteristics similar to Phase I locations. The across median crash issue does not lend itself to traditional “spot” type treatments due to the nature of across median crashes. In order to effectively prevent across median crashes, a comprehensive strategy that not only addresses existing crash locations, but also isolates and corrects the most likely future across median sites must be applied. This comprehensive strategy must include the necessary commitment of resources to maintain these life saving barriers.

In order to prioritize these freeways in a systematic method, a hazard index was developed that integrates the ADT, speed limit, and median widths as factors. The fundamental difference between Phase II and previous attempts to “spot” treat corridors is that Phase II eliminates gaps in median protection and will encompass 93 percent of all across median crashes and 94 percent of fatal across median crashes (Scatter Plot Appendix A, Page A-2). The locations originally identified as Phase II locations are shown prioritized in Appendix C, and are graphically displayed in yellow on the map included in Appendix M (Page A-64). Refined Phase II project sections are included on pages A-21 and A-22 of Appendix D.

Approximately 100 sections, covering approximately 820 miles of freeway, were identified as candidate Phase II locations. It is recommended that these locations be systematically programmed over a reasonable four to five year time frame. Although Phase II locations do not (yet) have as high a history of across median crashes as Phase I locations, they clearly fall under the category of locations that will become next year’s across median crash sites. These events

typically receive intense media scrutiny and unfortunately, significant litigation activity involving the Department and its personnel.

### **Phase III - Revise Policies to Prevent Creating Additional Unprotected Narrow Freeway Median Sections**

Phase III recommends the necessary policy and procedural design guideline changes to prevent the creation of additional unprotected medians on freeways with median widths of 70 feet or less. In effect, these design criteria changes would enable North Carolina to avoid designing and constructing divided freeways without adequate median barrier protection. Efforts are already underway to add barrier to active TIP projects that do not have greater than 70 foot wide medians (Appendix I). This change effectively corrects the inadequacies of the AASHTO median barrier warrants that have historically offered a misleading sense of security to highway designers.

## **CONCLUSIONS**

Across median crashes are deadly and more than three (3) times as severe as other freeway crashes. From January 1994 through June 1997, nearly 100 people were killed in across median crashes on North Carolina freeways. These crashes accounted for over 20 percent (one out of every five) of all fatal crashes and 13 percent of the severe injuries on our freeways. Fortunately, with the installation of engineered protective median barrier systems, deadly across median crashes can be prevented.

Across median crashes and the resulting fatalities have been recognized as a national safety problem and addressing this problem has been identified as a key strategy in reducing fatalities on our nation's highways in AASHTO's Strategic Highway Safety Plan. North Carolina is viewed as a leader in highway safety issues and **many states experiencing across median crashes are waiting to see what North Carolina will do to do to address this growing safety issue.**

The Traffic Engineering and Safety Systems Branch's recommended **Three (3) Pronged Proactive Strategy to Save Lives by Preventing Across Median Crashes in North Carolina** is summarized in below.

- Phase I. Identify and Install Protective Median Barriers on Freeways with Across Median Crash Histories.**
- Phase II. Identify and Systematically Protect all Freeway Sections with Median Widths of 70 feet or less.**
- Phase III. Revise Policies to Prevent Creating Additional Unprotected Narrow Freeway Median Sections.**

The expected results of completing these recommendations are:

- An estimated 90 percent reduction in freeway across median crashes,
- Approximately 25 to 30 lives saved each year,
- Hundreds of injuries prevented or reduced in severity,
- Savings of millions of dollars in crash costs annually.



The current standards for median barrier installation do not adequately protect the driving public in North Carolina. Across median crashes are highly unpredictable as far when, where and how they occur. However, across median crashes are preventable and this has been proven on Interstate 40 between Raleigh and the Research Triangle Park. The recommendations in this report address the locations with existing crash histories, locations with a high potential for across median crashes and changing design standards to prevent designing and building new freeways that have high potential for across median crashes.

Across median crashes are over three (3) times more severe than other crashes on our freeways and **do not** have specific geometric and operating conditions that can be identified and targeted. Across median crashes **do not** have a "season," day or time of day that can be targeted for educational purposes. Across median crashes **do not** have a single cause or a limited number of causes that can be targeted. **With all the reasons why it is not possible to address the specific causes of these crashes, it is still possible to prevent across median crashes.** The installation of a protective median barrier system can effectively prevent a vehicle from crossing the median and striking another vehicle or hitting fixed objects on the other side of the freeway. The simple fact is that proven engineered barriers when properly designed, constructed, and maintained, can and do protect motorists travelling in both directions of a freeway from the devastation of an across median crash.

If the current level of median protection is maintained, we should expect that the toll of across median crashes would continue to increase. It is paramount to act now and provide the necessary levels of protection on our freeways. Fully implementing the recommendations in this report is the right thing to do. Among the many safety challenges that we face throughout the state, the across median safety issue has an identified proven solution that can provide immediate benefit to all North Carolina highway travelers.

## ***DEFINITIONS***

<b>Across Median Crash</b>	An across median crash is where a vehicle crosses the median of a divided highway and enters or passes through the travel way of the opposing direction.
<b>Freeway</b>	A divided highway with four or more lanes having full control access (no at-grade intersections). These highways are interstate like facilities with the highest design standards.
<b>Median</b>	The median as defined by the American Association of State Highway and Transportation Officials is the "portion of a divided highway separating the traveled way for traffic in opposing directions. The median width is expressed as the dimension between the through-lane edges and includes the left shoulder, if any.
<b>Median Barrier</b>	A median barrier is a longitudinal barrier used to separate opposing traffic on a divided highway.

## ***REFERENCES***

1. Lynch, J. M., Crowe, N.C., Rosendahl, J.F., Interstate Across Median Accident Study, July 1993, North Carolina Department of Transportation.
2. AASHTO Strategic Highway Safety Plan, September 1997, American Association of State Highway and Transportation Officials, Washington, DC, Pages 41-50.
3. A Policy on Geometric Design of Highways and Streets. American Association of State Highway and Transportation Officials, Washington , DC, 1994, pages 367-369
4. AASHTO Roadside Design Guide, American Association of State highway and Transportation Officials, Washington, DC, 1996. Pages 6-1 through 6-14.

## *EPILOGUE*

To underscore the urgency of taking action to prevent across median crashes, the Traffic Engineering and Safety Systems Branch has continued to track freeway crashes that involved across median crashes. As the traffic volumes on North Carolina's freeways have continued to increase, so to have the occurrences of across the median crashes on these vital freeways. Since June 1997, there have been an additional forty (40) across median fatalities on North Carolina's freeways in the ten (10) months of available crash data following the completion of the updated study. These crashes continue to involve tragic circumstances and emphasize the need to keep "Safety as a Top Priority," and implement North Carolina's three pronged strategy to save lives by preventing across median crashes. In the Greensboro Triad area, there have been nine (9) fatalities in six (6) separate across median crashes along unprotected sections of Interstates I-40, I-40 Business, and I-85 since April 3, 1998 and in Western North Carolina during the summer of 1998, sections of I-40 and I-26 have experienced four (4) additional across median crashes that have resulted in six (6) fatalities.

In just five (5) years, many of the moderate to lower volume divided freeway facilities will experience traffic increases of 20% or more as North Carolina's population is projected to increase by over 12% per year to 9.5 million by 2019. With the need for swift action to prevent additional across median fatalities and crashes, the following key actions have taken place.

On July 6, 1998 State Traffic Engineer J. M. Lynch presented the findings of North Carolina's 1998 Across Median Safety Study to the North Carolina Board of Transportation. His recommended "Three Pronged Approach to Preventing Across Median Crashes" was emphasized and 23 Phase I, and 101 Phase II locations were presented for action.

On July 29, 1998, a meeting was held to discuss programming Phase I and Phase II locations. Secretary of Transportation E. Norris Tolson, Board of Transportation Member G. R. Kindley, State Highway Administrator Len A. Sanderson, Deputy Secretary of Transportation David King, Deputy Highway Administrator-Preconstruction Don R. Morton, State Design Engineer R. Len Hill, State Traffic Engineer J. M. Lynch, and Program Development Branch Manager Whit Webb met, and as a result, the schedule for Phase I barrier medians was programmed for construction within 12 to 18 months, with the remaining Phase II locations to be programmed for construction over a three (3) to four (4) year period.

Following the July meeting, a follow-up meeting was held on August 3, 1998 to finalize the scheduling of Phase II median barrier locations. In attendance was State Highway Administrator Len Sanderson, Deputy Secretary of Transportation David King, Deputy Highway Administrator-Preconstruction Don R. Morton, State Design Engineer R. Len Hill, State Traffic Engineer J. M. Lynch, and Program Development Branch Manager Whit Webb. During this meeting, a compromise was reached that would allow the programming of Phase II locations over a four (4) year time frame, and a decision was made to revise North Carolina's Policy for providing median protection to include all freeway medians 70 feet wide or less.

The North Carolina Department of Transportation's Board of Transportation met on October 2, 1998, and during that meeting a handout showing proposed additions to the 1998-2004 Transportation Improvement Program (TIP) was distributed to all Board of Transportation Members. A copy of this handout (dated October 2, 1998) is included in Appendix N. Under state law the Board of Transportation will have 30 days to review the proposed sections, which

would allow final action to be authorized during the November 6, 1998 Board of Transportation meeting. If approved on November 6, 1998, this will ensure that approximately 340 miles of median protection will be constructed on sections of freeway identified in this report. Construction is scheduled to take place in the fiscal years shown in the third column of the Proposed Revisions to 1998-2004 TIP in Appendix N.

The remaining Phase II locations are included in Appendix D in a draft worksheet prepared by NCDOT's TIP Programming Unit. This draft worksheet includes the preliminary project IDs, descriptions, cost estimates, and schedules for the recommended median barrier projects (Phase I and Phase II) as they are expected to be presented in North Carolina's upcoming Draft 2000-2006 Transportation Improvement Program (TIP) document. The draft TIP is currently tentatively scheduled for adoption by the Board of Transportation in May of 1999.

There has been a considerable amount of progress made, but with the ever increasing traffic volumes, there is a lot more to do and not much time to do it in. As volumes and associated lane densities continue to increase, time is working against us and it is vital that across median safety be addressed now. **Median protection/barrier treatments save lives.** The recommended three pronged attack will have an immediate impact on the safety of North Carolina's freeways, and in doing so we will be able to prevent more across median fatalities.

**October 7, 1998**

**Date**

## ***APPENDIX INDEX***

- Appendix A. Median Width and Average Daily Traffic Scatter Plot of Across Median Crashes (Page A-2)
- Appendix B. Phase I Recommended Locations Listing (Pages A-4 through A-6)
- Appendix C. Phase II Recommended Locations Listing (Pages A-8 through A-18)
- Appendix D. TIP Programming Unit Preliminary Across Median Project Worksheet (Pages A-20 through A-22)
- Appendix E. 1993-1997 Growth and Crash Trends for North Carolina (Page A-24)
- Appendix F. DOT Press Releases concerning Median Safety (Pages A-26 through A-32)
- Appendix G. AASHTO Excerpts from Strategic Highway Safety Plan (Pages A-34 through A-35)
- Appendix H. Across Median Crash Safety Focus Letter from Federal Highway Administration (Page A-37)
- Appendix I. Letters from State Highway Design Engineer Authorizing Median Barrier Policy Change and Barrier Additions to Active Projects (Page A-39 through A-40)
- Appendix J. Examples of North Carolina Across Median Crash News Headlines (Pages A-42 through A-50)
- Appendix K. CalTrans Freeway Barrier Policy Press Release (Pages A-52 through A-53)
- Appendix L. Other Examples of the National Importance of Across Median Safety (Pages A-55 through A-62)
- Appendix M. Schematic Map of Locations Recommended for Median Barrier Protection (Page A-64)
- Appendix N. Proposed Additions to 1998-2004 TIP Handout from October 2, 1998 Board Meeting (Pages A-66 through A-69)

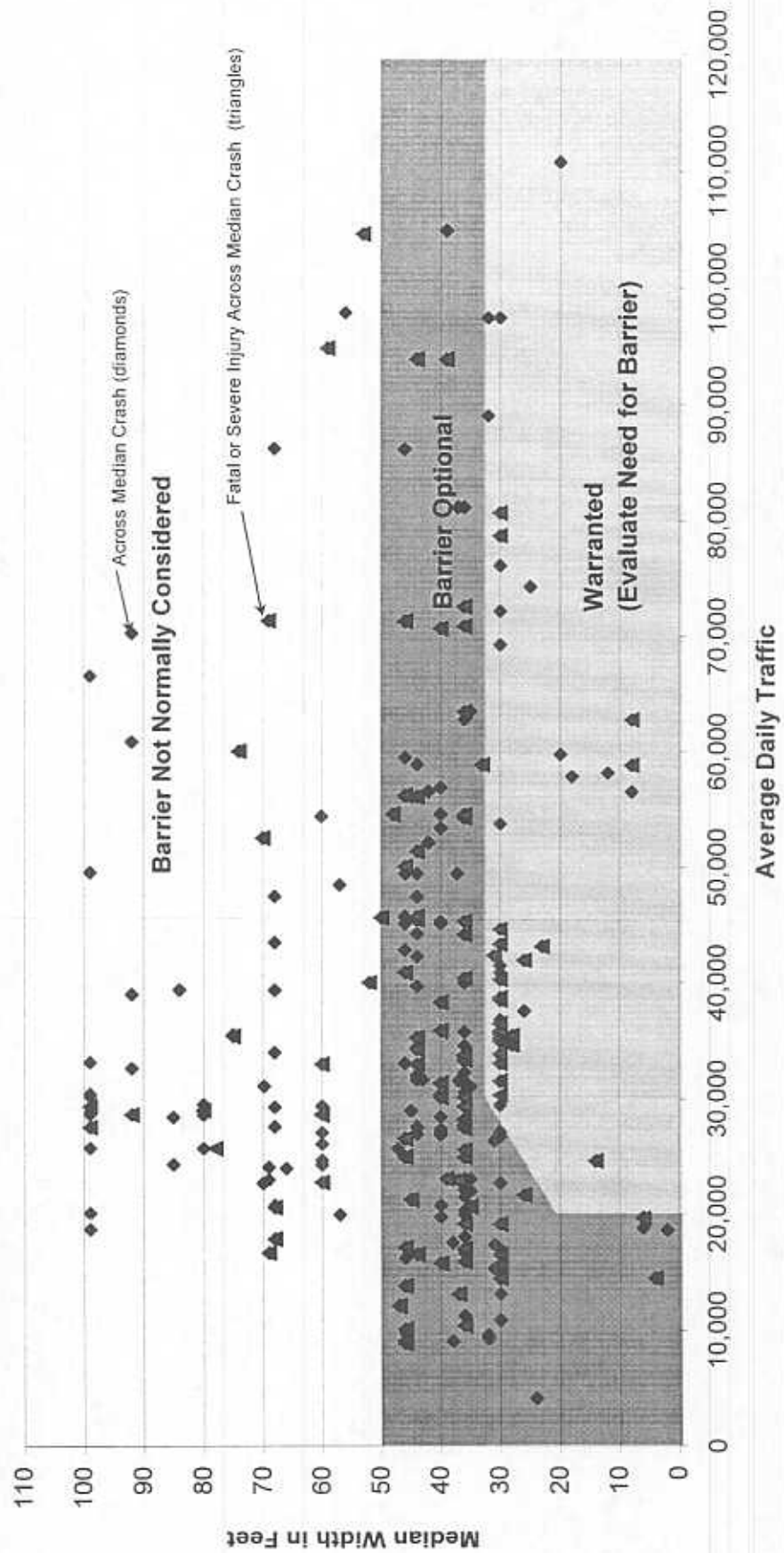


# Appendix A

# Across Median Crashes On North Carolina Divided Freeways

Median Width Versus Average Daily Traffic With AASHTO Warrants Indicated

Crashes Reported January 1, 1994 through June 30, 1997



# Appendix B

## Median Barrier Locations - Phase 1

(SORTED by B/C PRIORITY) - Preliminary List

DIVISION	COUNTY	MEDIAN WIDTH		PROJECT LENGTH (miles)	FILE #	DESCRIPTION	B/C	ADT	SPEED LIMIT (mph)	TOTAL PROJECT COST
		MAX	MIN							
04	Nash	40	40	4.50	4-98-223	US 64 from SR 1435 eastward to I-95.	236.00	21,000	65	\$467,500
06	Cumberland	68	68	8.00	6-98-207	SR 1007 (All American Freeway) from community access road to just north of Raeford Road in Cumberland County.	159.00	44,900	55	\$118,800
07	Guilford	46	22	2.48	7-98-213	I-40 from 0.11 mile east of Holden Road to 0.23 mile west of I-85.	88.83	76,000	55	\$409,200
12	Iredell	44	30	25.00	12-98-21	I-77 from Mecklenburg County line to SR 1892.	59.00	45,000	65	\$1,355,000
05	Wake	68	60	7.27	5-98-225	US 64-264 from 0.15 mile west of SR 1003 to US 264.	55.00	36,000	65	\$406,300
05	Wake	57	4	4.00	5-98-211	I-440 from I-40 to SR 1728 (Wade Avenue).	38.44	60,700	55	\$517,000
14	Henderson	44	30	11.50	14-98-11	I-26 from SR 1528 to the Polk County line.	33.00	38,000	65	\$795,000
05	Durham	30	16	3.10	5-98-226	US 15-501 Bypass from 0.4 mile north of SR 1303 (Pickett Road) north to I-85.	31.26	45,000	55	\$306,130

DIVISION	COUNTY	MEDIAN WIDTH		PROJECT LENGTH (miles)	FILE #	DESCRIPTION	B/C	ADT	SPEED LIMIT (mph)	TOTAL PROJECT COST
		MAX	MIN							
05	Wake	57	36	4.25	5-98-224	US 1 from 1.4 mile north of SR 1010 to I-40.	31.17	64,000	65	\$357,700
10	Mecklenburg	68	68	7.00	10-98-202	I-85 from 0.90 mile north of SR 2472 in Mecklenburg County to 0.56 mile north of SR 1430 in Cabarrus County.	31.00	64,300	65	\$385,000
07	Guilford	16	4	3.21	7-98-210	SR 2254 (Wendover Avenue) from 0.22 mile east of Holden Road to Grayland Avenue.	28.00	57,500	45	\$578,000
08	Scotland	46	46	16.00	8-98-206	US 74 just west of US 74 Business (west interchange) to the Robeson County line.	22.18	16,000	55	\$1,109,000
03	Duplin	46	46	28.60	3-98-201	I-40 from the Sampson County line to the Pender County line.	22.00	13,300	70	\$1,232,000
05	Wake	36	36	3.00	5-98-212	I-40/440 from 0.5 mile East of SR 1009 (Lake Wheeler Road) eastward to I-440.	22.00	71,500	65	\$184,580
06	Cumberland	36	36	5.20	6-98-206	I-95 Business/US 301 from NC 24 northward to I-95.	21.00	17,500	60	\$490,100
09	Stokes	36	36	6.51	9-98-206	US 52 from Forsyth County line to Surry County line.	18.00	22,900	65	\$608,685
12	Cleveland	36	26	9.50	12-98-23	I-85 from the South Carolina line to US 29-74 in Gaston County.	17.00	40,000	65	\$715,000

DIVISION	COUNTY	MEDIAN WIDTH		PROJECT LENGTH (miles)	FILE #	DESCRIPTION	B/C	ADT	SPEED LIMIT (mph)	TOTAL PROJECT COST
		MAX	MIN							
13	Burke	36	30	8.50	13-98-10	I-40 from SR 1129 to 0.2 mile west of US 64.	16.44	30,000	65	\$730,000
13	Rutherford	40	40	8.40	13-98-9	US 74 from the Cleveland County line to US 74A. (this section has 20 substandard end treatments)	16.00	17,000	65	\$715,000
12	Iredell	36	30	14.50	12-98-20	I-40 from the Catawaha County line to 0.5 mile east of SR 2158 (Exit 154).	15.00	45,000	65	\$1,095,000
14	Swain	40	40	8.00	14-98-9	US 74 from US 19/SR 1140 (Alarka) to the Jackson County Line. (this section has 26 substandard end treatments)	15.00	10,600	60	\$680,000
03	Sampson	46	46	19.50	3-98-200	I-40 from the Johnston County line to the Duplin County line.	12.00	14,500	70	\$880,000
03	Pender	46	46	31.20	3-98-202	I-40 from the Duplin County line to NC 132 in New Hanover County.	8.00	17,100	70	\$1,403,600

TOTAL # of PROJECTS = 23

TOTAL # of MILES = 239.22

TOTAL COST = \$15,538,595



# Appendix C

## Median Barrier, Phase 2

(SORTED by HAZARD INDEX PRIORITY ORDER) - Preliminary List

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
07	Guilford	I-85 from 0.84 mile south of NC 6 to 0.52 mile north to McConnell Road.	3.75	40	30	65,700	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	220.21
05	Wake	I-40 from 0.50 mile east of US 70 to Johnston County line.	4.10	40	40	65,000	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	189.50
05	Wake	I-40 from I-440 to 0.50 mile east of US 70.	4.90	40	40	65,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	163.40
05	Durham	I-40 from NC 147 westward to Fayetteville Road.	3.49	46	46	73,700	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	161.10
07	Guilford	I-85 from 0.63 mile south of Holden Road to 0.52 mile north of Holden Road.	1.15	42	42	55,000	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	152.71
14	Haywood	US 23/74 from US 23 Bus/SR 1164 to 0.7 mile east of SR 1660.	9.75	40	12	25,000	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	149.98
10	Mecklenburg	I-77 from the South Carolina State line 0.7 mile north of SR 1138.	3.40	40	40	82,100	55	<input checked="" type="checkbox"/>	<input type="checkbox"/>	147.77
09	Forsyth	I-40 from 0.5 mile east of SR 1109 to US 421.	3.50	36	36	46,400	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	129.60

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
05	Wake	I-440 from I-40 eastward to Poole Road.	1.90	40	40	60,000	60	<input checked="" type="checkbox"/>	<input type="checkbox"/>	128.52
05	Durham	I-40 from 1.46 miles west of NC 54 to the Orange County line.	1.49	46	46	54,800	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	119.79
13	Burke	I-40 from SR 1758 to SR 1002 (Exit 119).	4.25	30	30	35,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	117.31
05	Durham	NC 147 (Durham Freeway) from I-40 to SR 1118 (Fayetteville Street).	6.69	60	30	34,400	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	115.30
01	Northampton	I-95 from Halifax County line to Virginia State line.	7.51	75	36	35,400	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	114.67
09	Forsyth	US 421/I-40 Business from end of concrete barrier near SR 1508 (Fifth Street) in Forsyth County to I-40 in Guilford County.	11.60	30	30	39,500	60	<input type="checkbox"/>	<input checked="" type="checkbox"/>	112.81
10	Mecklenburg	NC 16 from I-77 to Bellhaven Boulevard.	1.90	30	30	46,400	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	111.35
09	Forsyth	US 52 from 0.12 mile north of the Davidson County line to 0.70 mile south of SR 2747.	3.50	44	26	28,500	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	110.22
09	Forsyth	I-40 from US 311 to the Guilford County line.	8.70	68	46	49,200	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	107.55
04	Nash	I-95 from Wilson County to Halifax County.	26.27	90	40	36,500	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	106.41

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
09	Forsyth	US 421 from I-40 /US 421 to 0.4 mile east of NC 67.	2.00	40	36	52,500	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	104.99
07	Guilford	I-40 from Forsyth County line to 0.12 mile west of I-40 Business.	1.64	46	46	48,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	104.92
09	Forsyth	US 52 from SR 1672 to Stokes County line.	7.03	36	36	37,400	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	104.46
04	Halifax	I-95 from Nash County to Northampton County.	22.99	90	40	35,400	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	103.21
10	Mecklenburg	I-85 from SR 2772 to 0.93 mile south of SR 2472.	2.90	68	68	67,700	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	100.11
04	Wilson	I-95 from Johnston County to Nash County.	16.39	90	40	32,900	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	95.92
07	Orange	I-40 from Durham County line eastward 1.7 miles toward NC 86.	1.62	46	46	43,500	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	95.09
04	Johnston	I-40 from Wake County to Sampson County.	29.58	46	40	32,500	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	94.75
07	Guilford	I-85 from 0.52 mile north of Holden Road to I-40.	2.65	42	42	55,000	55	<input checked="" type="checkbox"/>	<input type="checkbox"/>	94.28
07	Orange	I-85 from 1.94 mile south of the SR 1009 to the Durham County line.	8.83	36	36	33,500	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	93.57

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
13	Burcombe	I-26 from I-40 to Henderson County Line.	4.75	60	44	48,000	60	<input checked="" type="checkbox"/>	<input type="checkbox"/>	93.47
13	Buncombe	I-40 from SR 2838 to the McDowell County line.	11.64	44	30	27,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	90.50
09	Forsyth	US 421 from I-40 to Yadkin County, 10.56 miles.	10.56	36	36	31,600	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	88.26
09	Forsyth	US 52 from 0.46 mile north of SR 2264 (Akron Drive) to SR 1672.	3.80	36	36	43,900	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	87.79
07	Orange	I-40 from 1.40 miles east of new Hope Church road to 0.36 mile east of I-85.	5.84	46	46	40,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	87.44
08	Randolph	US 220 from SR 1150 to SR 2269.	4.50	60	15	17,900	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	85.91
07	Guilford	US 29/70 from 0.30 mile south of 16th Street to 0.64 mile north of Cone Boulevard.	1.51	30	30	35,000	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	83.99
10	Mecklenburg	SR 2772 from I-85 to US 29.	0.80	30	30	34,500	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	82.79
08	Randolph	I-85 from Davidson County to Guilford County.	7.30	157	59	40,800	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	80.64
05	Durham	US 70 from I-85 to NC 98.	2.14	30	30	33,200	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	79.67



DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT		MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
			PROJECT	PROJECT	MAX	MIN					
05	Wake	SR 1728 (Wade Avenue) from I-440 to I-40.	2.22		50	50	54,500	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	78.47
05	Granville	I-85 from Durham County line to Vance County line.	23.60		69	37	28,600	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	77.72
11	Surry	US 52 from Stokes County line to US 52 Business, 12.44 miles.	12.44		39	30	22,900	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	76.75
14	Henderson	I-26, Buncombe County Line to SR 1528.	5.80		44	44	37,000	60	<input checked="" type="checkbox"/>	<input type="checkbox"/>	72.05
05	Warren	I-85 from SR 1237 (exit 223) to the Virginia State line.	8.50		30	30	21,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	70.39
14	Polk	I-26, Henderson County Line to SR 1188.	4.54		30	30	21,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	70.39
13	Buncombe	I-40, from SR 1205 to SR 2838	17.00		44	44	36,000	60	<input checked="" type="checkbox"/>	<input type="checkbox"/>	70.10
09	Davidson	I-85 from 0.97 mile north of NC 109 to the Randolph County line.	0.30		68	68	40,700	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	69.80
09	Davidson	US 52 from I-85 to Forsyth County line.	19.80		68	30	20,600	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	69.05
11	Surry	I-77 from the Yadkin County line to 0.16 mile north of US 21.	1.20		44	44	25,600	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	67.85

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
11	Yadkin	I-77 from the Iredell County line to the Surry County line.	15.20	44	44	25,600	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	67.85
10	Mecklenburg	I-485 from Brown Grier Road to US 74.	20.00	70	70	46,700	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	67.08
13	McDowell	I-40, from US 70/MP 4.87 to one mile east of US 221/MP 18.85.	13.98	36	36	23,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	64.24
14	Polk	I-26, 0.74 mile west of SR 1135 to the South Carolina State line.	6.74	36	30	19,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	63.68
09	Davidson	I-85 from US 29/52/70/I-85 Business to 0.77 mile south of NC 109.	15.20	68	68	35,700	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	61.22
04	Nash	US 64 from I-95 (MP 21.62) to Edgecombe County line (MP 26.98).	5.36	68	45	31,400	60	<input type="checkbox"/>	<input checked="" type="checkbox"/>	59.78
07	Guilford	I-85 Business/US 29-70 from Brentwood Street to the Randolph County Line.	2.78	40	30	24,000	55	<input checked="" type="checkbox"/>	<input type="checkbox"/>	57.59
11	Surry	I-77 from 0.32 mile north of SR 1136 to the Virginia State line.	20.00	44	44	21,400	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	56.72
09	Davie	I-40 from the Iredell County line to 0.5 mile west of NC 801.	17.40	60	60	26,600	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	51.70
12	Iredell	I-40, from SR 2167/MP 18.85 to Davie County/MP 22.76.	3.91	60	60	25,000	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	48.59

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
13	Buncombe	US 19/23 from I-240 to SR 1768 (Exit 132).	14.00	42	42	28,000	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	48.00
14	Haywood	I-40, one mile east of US 276 from MP 21.5 to MP 27.	5.50	40	40	19,000	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	47.76
11	Yadkin	US 421 from Forsyth County line to US 601, 8.72 miles.	8.72	35	35	16,100	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	46.25
07	Guilford	SR 2176 (Joseph Bryan Boulevard) from North Triad Boulevard to 0.48 mile east of Holden Road.	6.78	45	20	12,000	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	43.20
07	Guilford	NC 68 from Triad Center Road to Pleasant Ridge Road.	2.65	44	44	25,600	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	41.89
11	Wilkes	US 421 from NC 268 to SR 2433, 8.94 miles.	8.94	39	29	14,700	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	36.49
07	Rockingham	US 29 from the Guilford County line to the Caswell County line.	5.29	69	43	14,700	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	34.37
08	Lee	US 1 from 0.1 mile north of SR 1333 to 0.84 mile north of US 15/501/NC 87.	6.30	62	30	11,400	60	<input type="checkbox"/>	<input checked="" type="checkbox"/>	32.56
04	Nash	US 264 from Wake County line (MP 0.00) to Wilson County line (MP 11.05).	11.05	84	30	9,500	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	31.84
08	Randolph	US 220 from SR 2269 to Guilford County.	12.70	60	60	17,900	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	30.00

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
08	Randolph	US 220 from NC 134 to SR 1150.	3.60	60	60	17,900	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	30.00
04	Nash	US 64 from Franklin County line (MP 0.00) to SR 1435 (MP 16.51).	16.51	68	45	13,100	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	29.27
04	Edgecombe	US 64 from Nash County to Martin County. (some sections have 60 mph speed limit)	28.13	220	40	9,600	70	<input type="checkbox"/>	<input checked="" type="checkbox"/>	27.99
05	Wake	US 1 from the Chatham County line to NC 55.	9.30	36	36	10,000	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	27.93
12	Cleveland	US 74 from SR 2245 to the Gaston County line.	7.33	68	68	18,000	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	26.62
08	Randolph	I-73/74 from Montgomery County to NC 134.	7.90	70	70	17,900	65	<input checked="" type="checkbox"/>	<input type="checkbox"/>	25.71
02	Pitt	US 264 from Greene County to US 13. (some sections have a 55 mph speed limit)	24.17	46	46	11,600	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	25.36
04	Wilson	US 264 from 0.73 mile east of SR 1301 (MP 1.30) to US 264 Alternate (MP 2.47). (construction speed limit is 55 mph, will be 65 upon completion)	1.17	80	50	12,600	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	25.34
07	Caswell	US 29 from Rockingham County line to Virginia State line.	5.86	74	60	14,100	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	23.63
04	Wilson	US 264 from NC 58 (MP 16.27) to Greene County line (MP 25.26). (construction speed limit is 55 mph, will be 65 upon completion)	8.99	46	46	10,600	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	23.17

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT		MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
			MAX	MIN	MAX	MIN					
14	Macon	US 441 from US 441 Bus. To US 441 Bus.	44	44	14,000	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>		22.91	
08	Chatham	US 1 from Lee County to Wake County.	36	36	11,400	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>		22.80	
08	Lee	US 1 from 0.84 mile north of US 15/501/NC 87 to the Chatham County line.	62	36	11,400	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>		22.80	
08	Lee	US 1 from SR 1237 to 0.1 mile north of SR 1333.	62	36	11,400	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>		22.80	
02	Greene	US 264 from Wilson County line to the Pitt County line.	68	40	8,900	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>		22.37	
03	Sampson	US 421/701 from US 701 Business to SR 1934.	45	45	13,500	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>		21.60	
02	Craven	US 70 from the Jones County line (MP 0.00) to US 70 Bus. (MP14.17).	68	40	8,400	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>		21.12	
09	Forsyth	US 311 from I-40 to Guilford County line.	99	68	13,400	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>		19.81	
12	Lincoln	US 321 from the Gaston County line to the Catawba County line.	44	44	8,000	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>		18.28	
14	Polk	US 74 from I-26 to the Rutherford County line.	56	44	8,000	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>		18.28	

DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		ADT	SPEED LIMIT	INTERSTATE	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN					
05	Vance	US 1 from US 1 Business to US 158.	5.31	30	30	7,500	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	18.00
04	Wayne	US 117 from NC 55 (MP 2.91) to US 117 Alt. (MP 10.66). (project includes a few at-grade intersections spaced at various distances)	7.75	64	28	7,000	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	18.00
14	Jackson	US 74 from SR 1514 to SR 1527.	4.84	44	44	11,000	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	18.00
13	Rutherford	US 74 from Polk County line to US 74A.	8.00	46	46	8,000	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	17.49
06	Columbus	US 74-76 from US 76 to SR 1001.	12.20	70	60	11,500	60	<input type="checkbox"/>	<input checked="" type="checkbox"/>	16.42
02	Lenoir	US 70 from NC 903 (MP 2.67) to 3.84 miles east of NC 903 (MP 6.51).	3.84	60	60	13,500	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	16.20
12	Gaston	US 321 from NC 275 to the Lincoln County line.	7.50	68	68	10,000	65	<input type="checkbox"/>	<input checked="" type="checkbox"/>	14.79
11	Surry	US 21 Bypass from I-77 to SR 1138.	1.20	44	44	8,400	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	13.74
05	Franklin	US 64 from the Wake County line to the Nash County line.	3.56	68	68	10,300	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10.90
08	Chatham	US 421 from the Randolph County line to SR 2210.	13.10	68	68	7,700	55	<input type="checkbox"/>	<input checked="" type="checkbox"/>	8.15



DIVISION	COUNTY	DESCRIPTION	LENGTH OF PROJECT	MEDIAN WIDTH		SPEED LIMIT	NON-INTERSTATE	HAZARD INDEX
				MAX	MIN			

TOTAL # OF PROJECTS = 98

TOTAL # OF MILES = 811.9

TOTAL COST (miles x \$80,000/mile) = \$64,955,200

# Appendix D

**DRAFT WORKSHEET FOR MEDIAN BARRIER LOCATIONS - PHASE 1**

(Note: Preliminary Project ID's, Limits, and Schedules are Subject to Change.)

I.D.	TIP	LET	DIVISION	COUNTY	DESCRIPTION	EST. COST (in Thousands)	REMARKS
1-1	R-4027	99	4	Nash	US 64 from SR 1435 eastward to I-95.	\$468	Combine with 2-55
1-2	U-3859	99	6	Cumberland	SR 1007 (All American Freeway) from Community Access Road to just north of Raeford R.	\$120	Combine with 1-15
1-3	I-4018	99	7	Guilford	I-40 from 0.11 mile east of Holden Road to 0.23 mile west of I-85.	\$410	Combine with 1-11, 2-1
1-4	I-4023	99	12	Iredell	I-77 from Mecklenburg County line to SR 1892.	\$1,355	Stand alone project
1-5	R-4037	99	5	Wake	US 64-264 from 0.15 mile west of SR 1003 to US 264.	\$410	Stand alone project
1-6	U-4003	99	5	Wake	I-440 from I-40 to SR 1728 (Wade Avenue).	\$520	Combine with 1-9
1-7	I-4000	99	14	Henderson	I-26 from SR 1528 to the Folk County line.	\$795	Combine with 2-45, 2-54, 2-44
1-8	U-4000	99	5	Durham	US 15-501 Bypass from 0.4 mile north of SR 1303 (Pickett Road) north to I-85.	\$310	Combine with 2-12
1-9	U-4003	99	5	Wake	US 1 from 1.4 mile north of SR 1010 to I-40.	\$360	Combine with 1-5
1-10	I-4034	99	10	Mecklenburg	I-85 from 0.90 mile north of SR 2472 in Mecklenburg County to 0.56 mile north of SR 1430	\$385	Stand alone project
1-11	I-4018	99	7	Guilford	SR 2254 (Wendover Avenue) from 0.22 mile east of Holden Road to Grayland Avenue.	\$580	Combine with 1-3, 2-1
1-12	R-4032	99	6	Scotland	US 74 just west of US 74 Business (west interchange) to the Robeson County line.	\$1,110	Stand alone project
1-13	I-4004	99	3	Duplin	I-40 from the Sampson County line to the Pender County line.	\$1,240	Stand alone project
1-14	I-4020	99	5	Wake	I-40/440 from 0.5 mile East of SR 1009 (Lake Wheeler Road) eastward to I-440.	\$185	Combine with 2-9, 2-3, 2-2
1-15	U-3859	96	6	Cumberland	I-95 Business/US 301 from NC 24 northward to I-95.	\$490	Combine with 1-2
1-16	R-4014	99	9	Stokes	US 52 from Forsyth County line to Surry County line.	\$610	Combine with 2-20, 2-31, 2-42
1-17	I-4031	99	12	Cleveland/Gaston	I-85 from the South Carolina line to US 29-74 in Gaston County.	\$715	Stand alone project
1-18	I-4002	99	13	Burke	I-40 from SR 1129 to 0.2 mile west of US 64.	\$730	Combine with 2-11
1-19	R-4030	99	13	Rutherford	US 74 from the Cleveland County line to US 74A.	\$715	Stand alone project
1-20	I-4007	99	12	Iredell	I-40 from the Catawba County line to 0.5 mile east of SR 2158 (Exit 154).	\$1,100	Stand alone project
1-21	R-4033	99	14	Swain	US 74 from US 19/SR 1140 (Alarka) to the Jackson County Line.	\$680	Stand alone project
1-22	I-4014	99	3	Sampson	I-40 from the Johnston County line to the Duplin County line.	\$880	Stand alone project
1-23	I-4012	99	3	Pender	I-40 from the Duplin County line to NC 132 in New Hanover County.	\$1,405	Stand alone project

DRAFT WORKSHEET FOR MEDIAN BARRIER LOCATIONS - PHASE 2

(Note: Preliminary Project ID's, Limits, and Schedules are Subject to Change.)

I.D.	TIP	LET DIVISION	COUNTY	DESCRIPTION	EST. COST (in Thousands)	REMARKS
2-1	I-4018	99	Guilford	I-85 from 0.84 mile south of NC 6 to 0.52 mile north of McConnell Road.	\$470	Combine with 1-3, 1-11
2-2	I-4020	99	Wake	I-40 from 0.50 mile east of US 70 to Johnston County line.	\$510	Combine with 1-14, 2-3, 2-9
2-3	I-4020	99	Wake	I-40 from I-440 to 0.50 mile east of US 70.	\$610	Combine with 1-14, 2-9, 2-2
2-4	I-4017	00	Durham	I-40 from .77 miles east of NC 147 westward to Fayetteville Road.	\$435	Combine with 2-10, 2-24, 2-33, 2-27
2-5	I-2402A	99	Guilford	I-85 from 0.63 mile south of Holden Road to 0.52 mile north of Holden Road.	\$145	Work to be included with I-2402A.
2-6	I-4015	00	Haywood	US 23/74 from US 23 Bus/SR 1164 to 0.7 mile east of SR 1660.	\$1,220	Combine with 2-62
2-7	I-4028	00	Mecklenburg	I-77 from the South Carolina State line 0.7 mile north of SR 1138.	\$425	Combine with 2-15, 2-22, 2-37, 2-52
2-8	U-3829	99	Forsyth	I-40 from 0.5 mile east of SR 1109 to US 421.	\$440	Work to be included with U-3829
2-9	I-4020	99	Wake	I-440 from I-40 eastward to Poole Road.	\$240	Combine with 1-14, 2-3, 2-2
2-10	I-4017	00	Durham	I-40 from I-45 miles west of NC 54 to the Orange County line.	\$185	Combine with 2-4, 2-24, 2-33, 2-27
2-11	I-4002	99	Burke	I-40 from SR 1759 to SR 1002 (Exit 119).	\$530	Combine with 1-18
2-12	U-4000	99	Durham	NC 147 (Durham Freeway) from I-40 to SR 1118 (Fayetteville Street).	\$835	Combine with 1-8
2-13	I-4039	00	Northampton	I-95 from Halifax County line to Virginia State line.	\$940	Combine with 2-23, 2-21, 2-17, 2-79
2-14	I-4021, R-952f	00, 02	Forsyth	US 421/1-40 Business near SR 1508 (Fifth Street) in Forsyth County to I-40 in Guilford Co	\$1,450	Part included with R-952A. Remaining to be combined with 2-43
2-15	I-4028	00	Mecklenburg	NC 16 from I-77 to Belhaven Boulevard.	\$240	Combine with 2-49
2-16	R-4012	01	Forsyth	US 52 from 0.12 mile north of the Davidson County line to 0.70 mile south of SR 2747.	\$3,285	Combine with 2-13, 2-23, 2-21, 2-79
2-17	I-4039	00	Nash	I-95 from Wilson County to Halifax County.	\$250	Work to be included with U-2827A
2-18	U-2827A	02	Forsyth	US 421 from I-40/US 421 to 0.4 mile east of NC 67.	\$205	Combine with 2-14, 2-43, 2-89
2-19	I-4021	00	Guilford	I-40 from Forsyth County line to 0.12 mile west of I-40 Business.	\$980	Combine with 2-31, 2-42, 1-16
2-20	R-4014	99	Forsyth	US 52 from SR 1672 to Stokes County line.	\$2,875	Combine with 2-17, 2-23, 2-13, 2-79
2-21	I-4039	00	Halifax	I-95 from Nash County to Northampton County.	\$365	Combine with 2-52, 2-7, 2-15, 2-37
2-22	I-4028	00	Mecklenburg	I-85 from SR 2772 to 0.93 mile south of SR 2472.	\$2,050	Combine with 2-13, 2-17, 2-21, 2-79
2-23	I-4039	00	Wilson	I-95 from Johnston County to Nash County.	\$200	Combine with 2-4, 2-10, 2-33, 2-27
2-24	I-4017	00	Orange	I-40 from Durham County line eastward 1.7 miles toward NC 86.	\$3,700	Stand alone project
2-25	I-4008	01	Johnston	I-40 from Wake County to Sampson County.	\$330	Work to be included with I-2402A
2-26	I-402A	99	Guilford	I-85 from 0.52 mile north of Holden Road to I-40.	\$1,100	Combine with 2-33, 2-24, 2-4, 2-10
2-27	I-4017	00	Orange	I-85 from 1.94 mile south of SR 1009 to the Durham County line.	\$515	Combine with 2-29, 2-47
2-28	I-4016	01	Buncombe	I-26, from I-40 to Henderson County.	\$1,455	Combine with 2-28, 2-47
2-29	I-4016	01	Buncombe	I-40, from SR 2836/MP 18.5 to McDowell County at MP 30.14.	\$1,320	Combine with 2-63
2-30	I-4019	00	Forsyth	US 421 from I-40 to Yadkin County, 10.55 miles.	\$475	Combine with 2-20, 2-42, 1-16
2-31	R-4014	99	Forsyth	US 52 from 0.46 mile north of SR 2264 (Akron Drive) to SR 1672.	\$88	Delete. Completed with I-3810
2-32	N/A	N/A	Cabarrus	I-85 from 0.7 mile south of SR 1790 to SR 1790, 0.7 mile in length.	\$200	Combine with 2-71, 2-72, 2-77
2-33	I-4017	00	Orange	I-85 from 1.40 miles east of New Hope Church road to 0.36 mile east of I-85.	\$190	Delete. Location identified in 2-14
2-34	I-4022	01	Randolph	US 220 from SR 1150 to SR 2269.	\$100	Combine with 2-65, 2-64, 2-57
2-35	N/A	N/A	Guilford	I-40 Business from 0.22 mile south of I-40 to the Forsyth County line.	\$915	Combine with 2-22, 2-15, 2-7, 2-52
2-36	U-4001	01	Guilford	US 29170 from 0.30 mile south of 16th Street to 0.64 mile north of Come Boulevard.	\$270	Combine with 2-48
2-37	I-4026	00	Mecklenburg	SR 2772 from I-85 to US 28.	\$270	Work to be included with I-3060C
2-38	I-4032	01	Randolph	I-85 from Davidson County to Guilford County.	\$280	Work to be included with U-2582B
2-39	I-3060C	99	Durham	US 70 from I-85 to NC 98.	\$2,950	Work to be included with I-2508BC
2-40	U-2582B	01	Wake	SR 1728 (Wade Avenue) from I-440 to I-40.	\$1,555	Combine with 2-14, 2-19, 2-89
2-41	I-2508BC	01	Granville	I-85 from Durham County line to Vance County line.	\$725	Combine with 1-7, 2-46, 2-54
2-42	R-4014	99	Surry	US 52 from Stokes County line to US 52 Business, 12.44 miles.	\$1,065	Stand alone project
2-43	I-4021	00	Forsyth	I-40 from US 311 to the Guilford County line.	\$570	Combine with 1-7, 2-44, 2-54
2-44	I-4000	99	Henderson	I-26, Buncombe County/MP 0.0 to SR 1528/MP 5.80.	\$2,125	Combine with 2-28, 2-29
2-45	I-4037	01	Warren	I-85 from SR 1237 (exit 223) to the Virginia State line.	\$40	Combine with 2-38
2-46	I-4000	99	Polk	I-26, Henderson County/MP 0.0 to SR 1188/MP 4.54.	\$2,475	Combine with 2-16
2-47	I-4016	01	Buncombe	I-40, from SR 1205/MP 1.5 to SR 2838/MP 18.5.	\$150	Combine with 2-99, 2-51
2-48	I-4032	01	Davidson	I-85 from 0.97 mile north of NC 109 to the Randolph County line.	\$1,900	Combine with 2-50, 2-59
2-49	R-4012	01	Davidson	US 52 from I-85 to Forsyth County line.		
2-50	I-4027	01	Surry	I-77 from the Yadkin County line to 0.16 mile north of US 21.		
2-51	I-4027	01	Yadkin	I-77 from the Iredell County line to the Surry County line.		

DRAFT WORKSHEET FOR MEDIAN BARRIER LOCATIONS - PHASE 2

(Note: Preliminary Project IDs, Limits, and Schedules are Subject to Change.)

EST. COST (in Thousands)

REMARKS

DESCRIPTION

LET DIVISION COUNTY

I.D.

TIP

LET

DIVISION

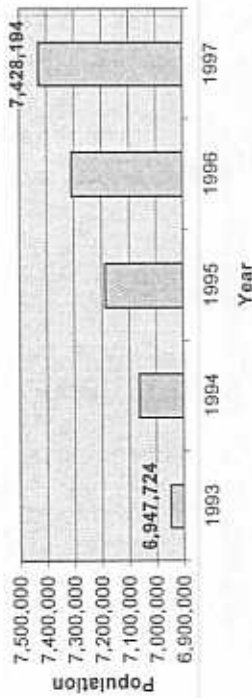
COUNTY

I.D.	TIP	LET	DIVISION	COUNTY	DESCRIPTION	EST. COST (in Thousands)	REMARKS
2-52	I-402B	00	10	Mecklenburg	I-485 from Brown Grier Road to US 74.	\$2,500	Combine with 2-7, 2-15, 2-22, 2-37
2-53	I-4010	02	13	McDowell	I-40, from US 70/MP 4.87 to one mile east of US 221/MP 18.85.	\$1,750	Stand alone project
2-54	I-4000	99	14	Polk	I-26, from west of SR 1135 to South Carolina State line.	\$645	Combine with 1-7, 2-44, 2-46
2-55	I-4033	02	9	Davidson	I-85 from US 29/5270/0-85 Business to 0.77 mile south of NC 109.	\$1,900	Stand alone project
2-56	R-4027	99	4	Nash	US 64 from I-95 (MP 21.62) to Edgecombe County line (MP 26.98).	\$670	Combine with 1-1
2-57	U-4001	01	7	Guilford	I-85 Business/US 29-70 from Brentwood Street to the Randolph County Line.	\$350	Combine with 2-35, 2-64, 2-66
2-58	I-2807A & C	99, 00	11	Surry	I-77 from 0.32 mile north of SR 1136 to the Virginia State line.	\$2,500	Work to be included with I-2807A & C
2-59	I-4006	01	9	Davie	I-40 from the Iredell County line to 0.5 mile west of NC 801.	\$2,175	Combine with 2-60
2-60	I-4006	01	12	Iredell	I-40, from SR 2167/MP 18.85 to Davie County/MP 22.76.	\$490	Combine with 2-59
2-61	U-4005	02	13	Buncombe	US 19/23 from I-240 to SR 1768 (Exit 132).	\$1,750	Stand alone project
2-62	I-4015	00	14	Haywood	I-40, US 276 to US 19-23-74 Connector.	\$690	Combine with 2-6
2-63	I-4019	00	11	Yadkin	US 421 from Forsyth County line to US 601, 8.72 miles.	\$1,090	Combine with 2-30
2-64	U-4001	01	7	Guilford	SR 2176 (Joseph Bryan Boulevard) from North Triad Boulevard to 0.48 mile east of Holden	\$850	Combine with 2-36, 2-66, 2-57
2-65	N/A	N/A	14	Haywood	US 74 from SR 1164 to NC 209.	\$600	Delete, Overlaps with 2-6
2-66	U-4001	01	7	Guilford	NC 68 from Triad Center Road to Pleasant Ridge Road.	\$330	Combine with 2-36, 2-64, 2-57
2-67	R-4041	02	11	Wilkes	US 421 from NC 268 to SR 2433, 8.94 miles.	\$1,120	Stand alone project
2-68	R-4029	02	7	Rockingham	US 29 from the Guilford County line to the Caswell County line.	\$665	Combine with 2-80
2-69	R-4023	02	8	Lee	US 1 from 0.1 mile north of SR 1333 to 0.84 mile north of US 15/601/NC 87.	\$790	Combine with 2-75, 2-83, 2-84, 2-85
2-70	R-4015	02	4	Nash	US 264 from Wake County line (MP 0.00) to Wilson County line (MP 11.05).	\$1,385	Combine with 2-73, 2-100
2-71	I-4022	01	8	Randolph	US 220 from NC 134 to SR 1150.	\$450	Combine with 2-34, 2-72, 2-77
2-72	R-4015	02	4	Nash	US 220 from SR 2269 to Guilford County.	\$1,590	Combine with 2-34, 2-71, 2-77
2-73	R-4015	02	4	Nash	US 64 from Franklin County line (MP 0.00) to SR 1435 (MP 16.51).	\$2,065	Combine with 2-70, 2-100
2-74	R-4013	02	4	Edgecombe	US 64 from Nash County to Martin County.	\$3,520	Stand alone project
2-75	R-4023	02	5	Wake	US 1 from the Chatham County line to NC 55.	\$1,165	Combine with 2-83, 2-84, 2-68, 2-85
2-76	R-4009	02	12	Clayland	US 74 from SR 2245 to the Gaston County line.	\$920	Stand alone project
2-77	I-4022	01	8	Randolph	I-73/74 from Montgomery County to NC 134.	\$590	Combine with 2-34, 2-71, 2-72
2-78	R-4036	03	2	Pitt	US 264 from Greene County to US 13.	\$3,020	Combine with 2-81, 2-86
2-79	I-4039	00	4	Wilson	US 264 from 0.73 mile east of SR 1301 (MP 1.30) to US 264 Alternate (MP 2.47).	\$145	Combine with 2-23, 2-21, 2-17, 2-13
2-80	R-4029	02	7	Caswell	US 29 from Rockingham County line to Virginia State line.	\$735	Combine with 2-68
2-81	R-4036	03	4	Wilson	US 264 from NC 58 (MP 16.27) to Greene County line (MP 25.26).	\$1,125	Combine with 2-78, 2-96
2-82	R-4025	03	14	Macon	US 441 from US 441 Bus. To US 441 Bus.	\$440	Stand alone project
2-83	R-4023	02	8	Chatham	US 1 from Lee County to Wake County.	\$825	Combine with 2-75, 2-84, 2-69, 2-85
2-84	R-4023	02	8	Lee	US 1 from 0.84 mile north of US 15/501/NC 87 to the Chatham County line.	\$100	Combine with 2-75, 2-83, 2-69, 2-85
2-85	R-4023	02	8	Lee	US 1 from SR 1237 to 0.1 miles north of SR 1333.	\$1,015	Combine with 2-75, 2-83, 2-84, 2-69
2-86	R-4036	03	2	Greene	US 264 from Wilson County line to the Pitt County line.	\$520	Combine with 2-78, 2-81
2-87	R-4031	03	3	Sampson	US 421/701 from US 701 Business to SR 1934.	\$650	Stand alone project
2-88	R-4010	03	2	Craven	US 70 from West of NC 43 (Glensburne Road) to the Trent River Bridge.	\$375	Stand alone project
2-89	I-4021	00	9	Forsyth	US 311 from I-40 to Guilford County line.	\$1,115	Combine with 2-14, 2-19, 2-43
2-90	R-4016	03	12	Lincoln	US 321 from the Gaston County line to the Catawba County line.	\$1,625	Combine with 2-58
2-91	R-4028	03	14	Polk	US 74 from I-26 to the Rutherford County line.	\$1,625	Combine with 2-95
2-92	U-4004	03	5	Vance	US 1 from US 1 Business to US 158.	\$665	Stand alone project
2-93	R-4040	03	4	Wayne	US 117 from NC 55 (MP 2.91) to US 117 Alt. (MP 10.66).	\$970	Stand alone project
2-94	R-4021	03	14	Jackson	US 74 from SR 1514 to SR 1527.	\$695	Stand alone project
2-95	R-4028	03	13	Rutherford	US 74 from Polk County line to US 74A.	\$1,000	Combine with 2-91
2-96	R-3847	98	6	Columbus	US 74-76 from US 76 to SR 1001.	\$1,525	Stand alone project
2-97	R-4024	03	2	Lenoir	US 70 from NC 903 (MP 2.67) to 3.84 miles east of NC 903 (MP 6.51).	\$480	Stand alone project
2-98	R-4016	03	12	Gaston	US 321 from NC 275 to the Lincoln County line.	\$840	Combine with 2-90
2-99	I-4027	01	11	Surry	US 21 Bypass from I-77 to SR 1138.	\$150	Combine with 2-50, 2-51
2-100	R-4015	02	5	Franklin	US 64 from the Wake County line to the Nash County line.	\$445	Combine with 2-73, 2-70
2-101	R-4007	03	8	Chatham	US 421 from the Randolph County line to SR 2210.	\$1,640	Stand alone project

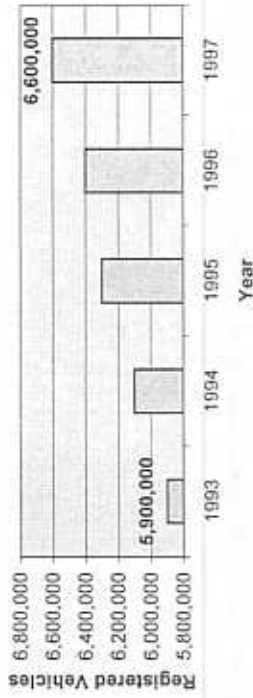
# Appendix E



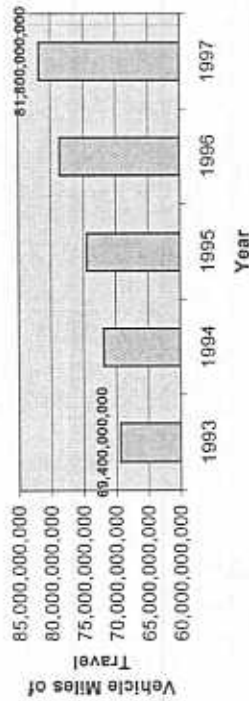
North Carolina Population  
(1993-1997)



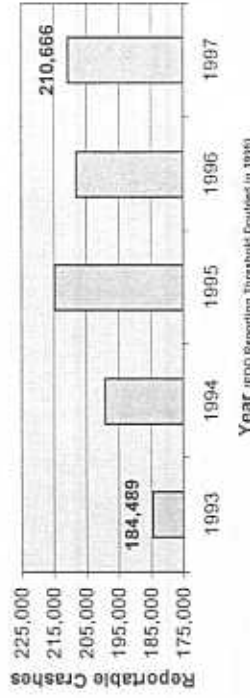
North Carolina Registered Vehicles  
(1993-1997)



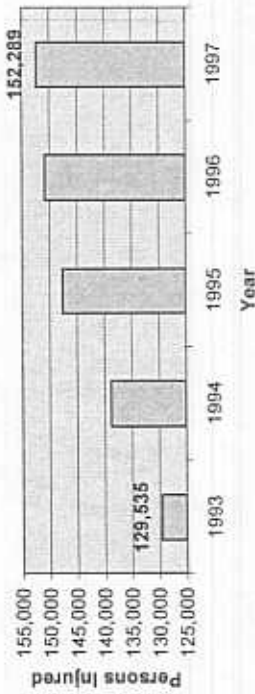
North Carolina Vehicle Miles of Travel  
(1993-1997)



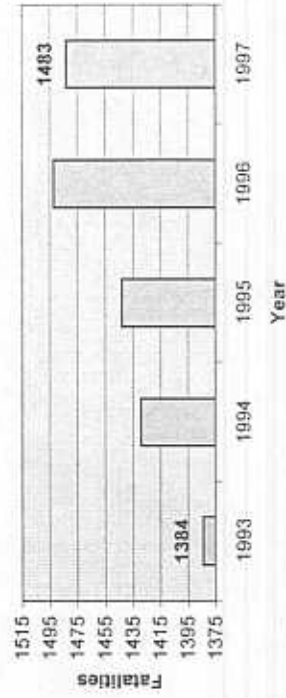
North Carolina Reportable Crashes  
(1993-1997)



North Carolina Persons Injured in Traffic Crashes  
(1993-1997)



North Carolina Traffic Fatalities (1993-1997)



# Appendix F

## TRANSPORTATION SECRETARY PUTS SAFETY AS TOP PRIORITY

RALEIGH - State Transportation Secretary Norris Tolson has directed traffic engineers to determine where across the state to place additional highway safety measures including installation of safety barriers, rumble strips and advance warning signs and reducing speed limits.

Tolson said he also will ask law enforcement agencies to step up patrols in areas where it is needed to make highways safer.

When Tolson first came to the department in January he directed engineers to increase safety measures in the I-95 work zone in Lumberton. Since then, more than 500 speeding tickets have been written and more than \$100,000 in fines have been issued.

"I've made a commitment to the motoring public -- safety is my number one priority," Tolson said. "The department will take all necessary steps to make sure our highways are safe."

Tolson directed state engineers to implement the following safety measures:

- Study freeways across the state to determine where more median barriers or guardrails are needed to prevent across-the-median accidents. Since August 1997, the department has been working to install median barriers on more than 115 miles of interstate.
- Improving safety in work zones across the state. Tolson has directed state engineers to study work zones across the state and to implement additional safety measures. State traffic engineers will conduct "windshield reviews" - where they will drive work zones across the state and study traffic control and work zone safety devices.
- Produce public information plans for major work zones across the state to provide motorists with safe travel tips, alternate routes and information about construction projects.

Some of the safety measures Tolson directed engineers to implement in the I-95 work zone include:

- Closed ramps to prevent traffic from merging onto the I-95 work zone
- Installed barrels to better identify entry into the work zone (northbound and southbound), additional advance warning message boards, rumble strips to alert motorists to the approaching work zone and reflectors on top of concrete barriers to increase visibility
- Enhanced sight distance at interchanges by removing sections of barriers at on-ramps to increase visibility
- Extended the reduced speed limit area (from 65 to 55) by three miles at both ends of the project to help speed limit enforcement
- Installed Highway Advisory Radios and additional signs with flashers and \$250 speeding penalty signs, replacing existing \$100 penalty signs
- Utilized off-duty N.C. Highway Patrol troopers for stepped up enforcement
- produced a public information plan about the work zone, giving motorists alternate routes safe travel tips

"We are studying this very closely," Tolson said. "We are looking at highways, interstates and work zones on a case-by-case basis to ensure the safest highways possible. We are keeping our commitment to the motoring public."

\*\*\* NCDOT \*\*\*





STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.  
GOVERNOR

P.O. BOX 25291, RALEIGH, N.C. 27611-5201

GARLAND B. GARRETT JR.  
SECRETARY

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RELEASE: IMMEDIATE  
CONTACT: Hannah Jemigan, (919) 715-2392  
RELEASE NO: 247

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DATE: July 10, 1997  
DISTRIBUTION: NC

### NCDOT ANNOUNCES WHERE MORE SAFETY BARRIERS WILL BE INSTALLED

**RALEIGH** – State Transportation Secretary Garland Garrett today announced where safety barriers will be installed on more than 110 miles of interstate highways across the state. (see attached list)

“We have made a commitment to the motoring public – safety is our top priority,” said Garrett. “This list is a minimum. We’re looking at doing more. As we continue our research – if more sections can benefit from these safety barriers -- we will install them.”

The department has installed safety barriers as interstates were upgraded and improved. As a result of the department’s statewide traffic research, Garrett directed highway engineers on June 27 to immediately begin compiling a list of highways where barriers can improve safety and to begin designing plans and advertising bids to contractors to help expedite the process. Median barriers to be installed include cable barriers – which are more cost effective – and standard guardrail. At a cost of more than \$11 million dollars, these barriers will be let to contract this fiscal year.

“We will study this very closely,” said Garrett. “We want to move quickly on this and ensure that North Carolina has the safest highways possible.”

\*\*\* more \*\*\*

PHONE (919) 733-2520 FAX (919) 733-9150



July 10, 1997

## **SAFETY BARRIER LOCATIONS ANNOUNCED**

**RALEIGH** - State Transportation Secretary Garland Garrett today announced where safety barriers will be installed on more than 110 miles of interstate highways across the state ([list](#))

"We have made a commitment to the motoring public - safety is our top priority," said Garrett. "This list is a minimum. We're looking at doing more. As we continue our research - if more sections can benefit from these safety barriers -- we will install them."

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"We will study this very closely," said Garrett. "We want to move quickly on this and ensure that North Carolina has the safest highways possible."

### **SAFETY BARRIERS TO BE INSTALLED**

#### **New Transportation Improvement Program (TIP) Projects**

- I-40 in Burke County - From 0.2 miles west of U.S. 64 to S.R. 1758. Length: 12.0 miles
- I-40 in Orange County - From 1.0 miles west of N.C. 56 to 0.5 miles west of S.R. 1734 in Orange County. Length: 3.6 miles.
- I-40 in Durham County - From 0.7 miles west of N.C. 54 to S.R. 1118 in Durham County. Length: 3.7 miles
- I-85 in Mecklenburg County - From 0.9 miles south of S.R. 2472 to 0.9 miles north of S.R. 2472. Length: 1.8 miles
- I-85 in Cabarrus County - From 0.6 miles north of S.R. 1430 in Cabarrus County to U.S. 29/601 in Rowan County. Length: 14.8 miles
- I-85 in Rowan County - From U.S. 70/601 in Rowan County to I-85 Business in Davidson County. Length: 13 miles
- I-85 in Davidson County - From 0.8 miles south of N.C. 109 to 1 mile north of N.C. 109 in Davidson County. Length: 1.8 miles
- I-85 in Vance County - From .02 miles south of Vance County line to S.R. 1369. Length: 12 miles
- I-95 in Robeson County - From 0.4 miles south of U.S. 74 to 0.3 miles south of N.C. 72/711. Length: 3.4 miles.
- I-95 in Robeson/Cumberland counties - From 0.5 miles south of S.R. 1006 to 0.22 miles north of I-95 Business. Length: 10.4 miles

#### **Existing TIP Projects**

- I-40 in McDowell/Burke counties - From 0.15 miles east of S.R. 1760 to 0.25 miles east of S.R. 1138. Length: 5.3 miles





## SAFETY BARRIERS TO BE INSTALLED

### New Transportation Improvement Program (TIP) Projects

- I-40 in Burke County – From 0.2 miles west of U.S. 64 to S.R. 1758. Length: 12.0 miles
- I-40 in Orange County – From 1.0 miles west of N.C. 56 to 0.5 miles west of S.R. 1734 in Orange County. Length: 3.6 miles.
- I-40 in Durham County – From 0.7 miles west of N.C. 54 to S.R. 1118 in Durham County. Length: 3.7 miles
- I-85 in Mecklenburg County – From 0.9 miles south of S.R. 2472 to 0.9 miles north of S.R. 2472. Length: 1.8 miles
- I-85 in Cabarrus County – From 0.6 miles north of S.R. 1430 in Cabarrus County to U.S. 29/601 in Rowan County. Length: 14.8 miles
- I-85 in Rowan County – From U.S. 70/601 in Rowan County to I-85 Business in Davidson County. Length: 13 miles
- I-85 in Davidson County – From 0.8 miles south of N.C. 109 to 1 mile north of N.C. 109 in Davidson County. Length: 1.8 miles
- I-85 in Vance County – From .02 miles south of Vance County line to S.R. 1369. Length: 12 miles
- I-95 in Robeson County – From 0.4 miles south of U.S. 74 to 0.3 miles south of N.C. 72/711. Length: 3.4 miles.
- I-95 in Robeson/Cumberland counties – From 0.5 miles south of S.R. 1006 to 0.22 miles north of I-95 Business. Length: 10.4 miles

### Existing TIP Projects

- I-40 in McDowell/Burke counties – From 0.15 miles east of S.R. 1760 to 0.25 miles east of S.R. 1138. Length: 5.3 miles
- I-40 in Catawba County – From N.C. 16 to Iredell County line. Length: 7.5 miles.
- I-77 in Mecklenburg County – N.C. 73 to Iredell County line. Length: 2.8 miles
- I-95 in Harnett/Cumberland counties – From S.R. 1005 in Cumberland County to Johnston County line. Length: 18.3 miles.

June 27, 1997

### **NCDOT To Install Safety Barriers On More Interstate Highways**

**RALEIGH** - State Transportation Secretary Garland Garrett today directed Highway Administrator Larry Goode to install median barriers where needed on sections of interstate highways as soon as possible.

"The department is committed to safety - it's our top priority," said Garrett. "After careful review of increased traffic congestion on our interstates, we feel it is necessary to install barriers to help make our highways safer."

The department is compiling a list of sections of interstate highways where barriers can improve safety. Median barriers being considered are cable barriers - which are more cost effective - standard guardrail and possibly concrete medians.

The department has installed safety barriers as interstates were upgraded and improved. As a result of the department's statewide traffic research, Garrett directed highway engineers to immediately begin designing plans and advertising bids to contractors to help expedite the process.

"We will study this very closely," said Garrett. "We will look at these sections on a case-by-case basis and decide what types of barriers will ensure the safest highways possible. We are keeping our commitment to the motoring public."

\*\*\* NCDOT \*\*\*

**CONTACT:** Hannah Jernigan, (919) 715-2392 or email: [hjernigan@mail.dot.state.nc.us](mailto:hjernigan@mail.dot.state.nc.us)

# Appendix G

# AASHTO

## STRATEGIC HIGHWAY SAFETY PLAN

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September 1997

**A Comprehensive Plan to Substantially Reduce Vehicle-Related Fatalities and Injuries on the Nation's Highways**



**Drivers**



**Special Users**



**Vehicles**



**Highways**



**Emergency Medical Services**



**Management**

# 18 Reducing Head-On and Across-Median Crashes

## Highways



### BACKGROUND

One of the most severe types of crashes occurs when a vehicle shifts into an opposing flow lane and crashes head on with an oncoming vehicle. Severe crashes of this sort occur primarily on rural two-lane highways and freeways with narrow medians. The severity of these crashes is compounded because of the additive nature of the vehicle speeds at the time of collision.

### THE STRATEGIES

Develop and test innovative centerline treatments to reduce head-on crashes on two-lane highways

Head-on crashes in which one vehicle crosses the centerline are a major cause of death on two-lane highways. This effort seeks to identify promising countermeasures that can reduce the level of head-on crashes, field test the most promising alternatives, including center rumble strips and define effective treatments that are cost effective. The countermeasures will subsequently be implemented nationally and targeted to those highways with high numbers of head-on crashes.

### Reduce across-median crashes on freeways and arteries that have narrow medians

Combinations of heavy traffic flow and high operating speeds, narrow medians, and inadequate left shoulders can increase the probability of a head-on collision caused by median cross over. In many cases, the solution is placement of a median barrier between opposing flows. This initiative will identify those freeways and arterials with historically high numbers of across-median crashes and will encourage States and local governments to incorporate median barriers or other positive protection elements between the flows.

# Appendix H





U.S. DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION  
 Region Four  
 310 New Bern Avenue, Suite 410  
 Raleigh, North Carolina 27601  
 June 18, 1998

IN REPLY REFER TO  
 HRT-NC

*Original Lynch*

Mr. J. M. Lynch, P.E.  
 State Traffic Engineer  
 Division of Highways  
 Raleigh, North Carolina

Xc: ~~David King~~  
~~Don Martin~~  
~~Ken Sanderson~~  
~~Ken Hill~~  
~~Jim Curren~~  
 F. Rosenthal

*F.H.I.  
 King  
 Hill*

Dear Mr. Lynch:

Subject: Performance Plan Safety Initiative

The Federal Highway Administration (FHWA) Fiscal Year (FY) 1998 Performance Plan contains within it a safety initiative designed to identify a safety focus area within each State. This initiative is to be expanded in FY 99 by the FHWA Division offices working with the State Highway Agencies (SHA) to implement countermeasures to deal with the identified safety focus area.

Based on our conversation earlier this week, the North Carolina Division office would like to identify the across median crashes as the North Carolina Department of Transportation's (NCDOT) safety focus area. This is in recognition of the NCDOT's placement of barriers in the median of Interstate sections that have a high across median fatality frequency. The NCDOT has also made the Division office aware of the planned revision to the 1993 report: "Interstate Across Median Accident Study." We look forward to seeing those results, and to working with NCDOT to develop countermeasures to reduce and eliminate across median fatalities on North Carolina's freeways.

If you have any comments or questions concerning the Performance Plan Initiative, please contact Mr. Brad Hibbs in our office at 856-4354. Thank you for your consideration in this matter.

Sincerely yours,

*Bradley G. Hibbs*

For Nicholas L. Graf, P.E.  
 Division Administrator

cc: Frank Julian, Southern Technical Resource Center

Bradley Hibbs, 6/18/98  
 File: 807.9

# Appendix I



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.  
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

E. NORRIS TOLSON  
SECRETARY

ROADWAY DESIGN UNIT	
RECEIVED	FILE _____
JUN 09 1998	
___ BARBOUR	___ ALFORD
___ BREW	___ ALLEN
___ GOODNIGHT	___ BENNETT
___ LASSITER	___ FLOWERS
___ McWILLIAN	___ NORRIS
___ STEWNEY	___ SYKES
___ DURHAM	___ PURYEAR
___ PREPARE REPLY FOR	___ SIGNATURE
___ FYI	
___ REVIEW/DISCUSS WITH	

MEMORANDUM TO: Tom Shearin, PE  
Bob Brown, PE  
Debbie Barbour, PE

FROM: Len Hill, PE *Len Hill*

DATE: June 8, 1998

SUBJECT: Median Guardrail and Rumble Strips

In order to improve safety by preventing cross median accidents, please incorporate median guardrail on all freeway projects with median widths of 70 feet or less. This includes all new construction, reconstruction, or resurfacing projects. Please begin this policy as soon as possible. I am asking the Guardrail Committee to develop and revise standards, details, policies, etc.

In addition, rumble strips should be installed on all rural freeways and certain non-freeways. The milled rumble strips provide the most audible sound and should be used.

Please contact me if you have any questions.

RLH:st

cc: David King  
Len Sanderson, PE  
Don Morton, PE  
Don Goins, PE  
Calvin Leggett, PE  
Whit Webb, PE  
Jimmy Lynch, PE  
Bill Gilmore, PE  
FHWA



*Joan Egan*

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.  
GOVERNOR

P.O. BOX 25201 RALEIGH, N.C. 27611-5201

E. NORRIS TOLSON  
SECRETARY

MEMORANDUM TO: Tom Shearin, PE

FROM: Len Hill, PE *Len Hill*

DATE: June 15, 1998

SUBJECT: Median Guardrail Projects in Division 6  
 - US 74-76 from US 76 to SR 1001 in Columbus Co.  
 - SR 1007 (All American Freeway) from Community Access Road to north of Raeford Road in Cumberland Co.  
 - I-95 Business from NC 24 to I-95 in Cumberland Co.

Please proceed with developing plans for adding median guardrail on the subject projects. The projects need to be turned in to Proposals and Contracts by mid-July to make a September 1998 let. Charge the PE time to variance. The projects will be authorized for letting at the July board. The Program Development Branch needs description limits and cost estimates as soon as possible.

Please contact me if we need to discuss.

RLH/smt

cc: Don Morton, PE  
Whit Webb, PE  
Bob Brown, PE

DEPUTY ADMINISTRATOR  
PRECONSTRUCTION

*Median Guardrail*

JUN 17 1998

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# Appendix J

# Two lives cut tragically short

## Deaths of Henderson County native and her daughter sadden many

By BENNY LEE SMITH III

Times-News Staff Writer

Just last Friday Miranda Wyatt Banks brought in brownies for her co-workers at Telco Credit Union in Asheville.

It was a small act of kindness that friends say typified the Henderson County native, someone a college classmate called "the sweetest girl I have known."

On Monday morning the tellers were left with the memory and a struggle to understand how a life so sweet could be stopped so short.

Miranda, 29, and her 3-year-old daughter, Madison, driving to church on Sunday morning, were killed in a collision near Biltmore Square Mall on Interstate 26.

Sixteen-year-old Jose Macias of Asheville was charged with reckless driving and misdemeanor death by vehicle after his car crossed the Interstate 26 median, hitting the Banks' vehicle.

Troopers say Macias' car crossed the median after he fell asleep. They did not have any other information on Monday explaining why he fell asleep at the wheel.

Friends and family members remembered Miranda with fondness.

"She was the only child in her family and I was the only child in my family," said Miranda's first cousin, Melissa Hutchinson. "I guess we were the closest thing each one could have as a sister."

She described Miranda as a person who loved children even before having her own daughter.

"She was just an angel," Hutchinson said.

Miranda loved nature and photography, she said. "She carried a camera around all the time."

WHKP Radio Production Manager Paul Adams went to high school and college with Miranda.

"She was probably the sweetest girl I have known," Adams said. "We took some photography classes together at school and I can say that she had a keen eye."

Miranda earned a bachelor's degree in mass communication from the University of North Carolina at Asheville in 1991 and worked as a part-time photographer in the early 1990s for the Asheville *Citizen-Times*.

In the short time she had been

working at the credit union, she had made strong friendships.

"Tellers have been in tears," said Marietta Smith, a manager at the credit union. "They felt like they have lost a really good friend because they worked with her day in and day out."

Smith said Miranda was the "most positive upbeat employee" that she ever knew. "I just couldn't say enough about her," Smith said.

Miranda had only worked at the credit union for three months, but her co-workers said that was enough time to get to know her well.

Teller Debbie Watkins trained Miranda three months ago when she came to work.

"You liked her from the minute you met her," Watkins said. "You never know just how well you can get to know someone in such a short time and then miss them so much when they are gone."

Miranda is the daughter of Donald and Priscilla Hill Wyatt of Hendersonville. She was a 1987 graduate of West Henderson High School.

She was a member of the Swannanoa Heights Missionary Baptist Church. Her daughter, Madison Kaye



SPECIAL TO THE TIMES-NEWS  
Miranda Wyatt Banks holds her 3-year-old daughter Madison in this undated family photo. They were killed in a traffic accident Sunday morning.

TRAGIC Continues on Page 11A

# Tragic

*Continued from page 1A*

Banks, was born in Buncombe County.

"I think she (Miranda) was definitely a Christian because she showed that by the way she treated other people," Smith said. "She also was a very proud wife and mother."

Teller Becky Greene said she was close to Miranda because she worked beside her and because she and Miranda were from Hendersonville.

"What I remember about her is that she is somebody that you will meet only once in your life," she said. "We shared a lot together."

In addition to her parents, Miranda is survived by her husband, Jeffrey Scott Banks; maternal grandmother, Ida Hill; and her

paternal grandmother, Ruby Jo Wyatt.

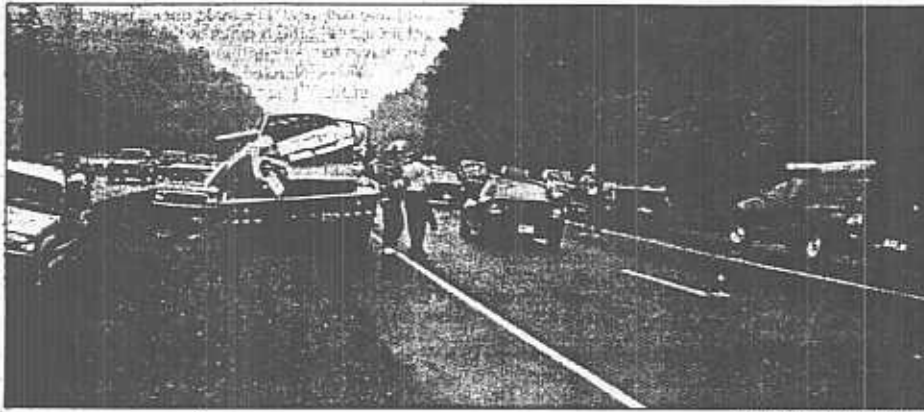
In addition to her father and great-grandmothers, Madison is survived by her maternal grandparents, Donald and Priscilla Hill Wyatt of Hendersonville; and her paternal grandparents, Paul Banks of Fletcher and Mike and Janet Goodson of Swannanoa.

The funeral will be held at 2 p.m. today at the Swannanoa Heights Missionary Baptist Church with the Revs. B.P. Boyle and Claude Justice officiating. Burial will be at Mountain View Memorial Park. The family will receive friends one hour prior to the service at the church. In lieu of flowers, memorials may be made to the Miranda and Madison Banks Memorial Funds, in care of Telco Credit Union, 7 Orchard St., Asheville, N.C., 28801.

Arrangements are by Brigman's Funeral Service, Black Mountain.

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PATRICK SULLIVAN/TIMES NEWS

Rescue workers remove one of the cars involved in a fatal accident on I-26 Saturday afternoon.

\$1.00

STREET FIGHT FOR THE  
Championship 1C

# Multi-vehicle wreck kills 1, injures 11

## Hendersonville woman dies; 3 people taken to hospital

BY VERONIKA GUNTER

Times-News Staff Writer

**SALUDA** — A Hendersonville woman died and three people were transported to the hospital following a five-vehicle accident in heavy rains Saturday afternoon on I-26 near Saluda.

Shirley Ann Merritt, 58, of 23 Lake Drive, was driv-

ing alone westbound on the interstate when she lost control of her white, four-door Lincoln and skidded through the median and into eastbound traffic, according to a Highway Patrol report.

Merritt's car flipped several times, striking three vehicles before stopping in the eastbound lanes about a mile west of Saluda.

Merritt was pronounced dead at the scene. Three people were transported to St. Luke's Hospital in Tryon. Eight others were injured but declined going

**WRECK** Continues on Page 11A

## Wreck

Continued from page 1A

to the hospital, Saluda Fire Chief Jerry Pace said.

A woman involved in the wreck said the multi-vehicle accident took her by surprise. She and others who tried in vain to help the victim appeared shaken by the event.

"It happened so quick. All of a sudden I saw the white car — it was flying in the air. She hit two other cars, they were totaled, and she just kept flipping," Lynn Pike of Tryon said.

Pike said she just recently learned CPR and first aid through her employer and immediately went to the crushed remains of the woman's vehicle and attempted to assist.

"I couldn't feel a pulse. Another man tried and he couldn't find it either."

Pike was driving in the left lane, headed home from Hendersonville, when the accident occurred. Pike said rain was falling so heavily "You couldn't see in front of you."

Among the vehicles involved was a black Ford Explorer that received serious damage to its

front end as did a Chevy Suburban towing a boat. Their occupants went to the hospital.

Pike's gray Ford van was the last to be struck in the accident and had to be towed from the scene, but she was not seriously injured.

Someone called the wreck into 911 on a cellular phone at 1:57 p.m., according to the Highway Patrol.

One lane of east bound traffic was closed for an hour, delaying traffic for miles. With rain still falling, emergency personnel lay signal flares and guided vehicles past as they worked to clear the scene. West bound traffic slowed as well, as passersby paused to view the wreckage.

Saluda Fire and Rescue supplied 20 emergency personnel at the scene. Polk County EMS, the Saluda Police Department and Polk County Sheriff's Department also assisted.

"It was one of the worst wrecks I've seen on the interstate," Saluda Police Chief Rick Corley said.

The fatal accident was one of four wrecks reported to the Henderson County dispatch Saturday.

**THE NEWS-OBSERVER**  
Thursday  
January 22, 1998

N.C.

## 2 killed in wreck on I-95

**A truck crosses the median and smashes a New York couple's car in the second fatal accident in the construction zone near Lumberton in five days.**

By KNIGHT CHAMBERLAIN, Correspondent

LUMBERTON -- A husband and wife from New York were killed Wednesday in the second fatal accident in five days along an 8-mile construction zone of Interstate 95 near here.

After the crash, the state Department of Transportation directed its engineers to take immediate steps to make the construction zone safer for traffic.

The wreck Wednesday occurred when an out-of-control truck crossed the median and struck the couple's car head-on.

In 1993, DOT engineers identified the same section of I-95 as one of 18 stretches of interstate highway in North Carolina that were especially vulnerable to across-the-median accidents.

"Every time I hear about across-the-median or one-way collisions, I often wonder if there is something we could have done to prevent this," Jimmy Lynch, DOT's chief traffic engineer, said Wednesday.

He said that North Carolina follows national safety standards for medians, which are 30 years old and out of date.

The occupants of the car, Conrad Morency, 63, and his wife, Mary Morency, 62, of Huntington, N.Y., were pronounced dead at the scene, said Robert Carver, spokesman for the state Department of Crime Control and Public Safety.

The truck driver, Edward Ray Youmons, 37, of Statesboro, Ga., was taken to Southeast Regional Medical Center in Lumberton, where he was listed in fair condition.

Carver quoted a state Highway Patrol officer on the scene as saying the truck, loaded with cages for transporting poultry, crossed the grassy median and "just drove right over the car."

The accident occurred about 2 p.m. at mile marker 17, two miles south of where two people died Friday in an accident that police said was caused in part by high speed and poor weather conditions. There have been at least seven serious accidents, 27 injuries and four deaths in the construction zone since work began in August.

"The drivers just are not slowing down," patrol Sgt. Randy Hammonds told reporters at the scene. "I'm afraid the death toll and injuries will rise if people don't lay off the gas. There's very little room for error here."

The purpose of the construction project is to widen I-95 in the Lumberton area to six lanes and to install a median barrier.

Through much of the construction zone, the highway lanes have been narrowed by a foot or more and concrete barriers have been erected along the outer edges of the roadway to separate traffic from

the construction work area.

DOT Secretary Norris Tolson issued a statement saying his department will do "whatever it takes to make this work zone safe."

Already, DOT workers have installed barrels to more clearly identify the entries into the work zone and have closed an entrance ramp to prevent vehicles from merging into construction zone traffic.

In addition, sections of barriers were removed at on-ramps at three interchanges to improve visibility, and the speed limit reduction from 65 to 55 mph was extended by three miles at both ends of the project.

In the next 10 days, Tolson's statement said, DOT will place additional warning signs and flashers in the area, seek more enforcement support from the Highway Patrol, the Division of Motor Vehicles and local police. Tolson urged local residents to stay off I-95 by using alternate routes where possible.

*Staff writer Wade Rawlins and The Associated Press contributed to this report.*

Knight Chamberlain can be reached at (910) 739-1499 or [tret86@nando.com](mailto:tret86@nando.com)

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**Crash on I-40 injures 6**

**A van crosses the median between N.C. 55 and Fayetteville Road and hits two vehicles headed west. Two women are flown to hospitals.**

By JEN GOMEZ, Staff Writer

DURHAM -- Two women were airlifted to area hospitals Saturday after a severe three-vehicle collision on Interstate 40 forced the westbound lanes between N.C. 55 and Fayetteville Road to be closed and snarled traffic for more than three hours.

Ambulances took at least four other people to hospitals soon after the wreck, which occurred near the Fayetteville Road exit. The victims' names were not immediately available.

Authorities said one woman was airlifted to Duke Hospital while the other was taken to UNC Hospitals.

Police said a van heading east blew a tire, crossed the median and struck westbound traffic about 3:30 p.m. A woman riding in the van with her husband was pinned between the passenger door and the van's frame, police said. It took rescuers about 20 minutes to pull her free by removing the door. She was later airlifted. The husband was taken from the scene by ambulance with a head injury.

A green Honda Accord suffered the most damage. It lay on its roof against the guard rail in the emergency lane within several feet of the van, which landed on its right side. This section of I-40 does not have median cable guardrails designed to prevent this type of accident, although portions of the interstate just west and east of the accident area do have them.

Durham Police Cpl. M.S. Montgomery said authorities had feared that a child might be injured in the wreck, because a car seat, with the name "Teddy" written on masking tape on the back, was thrown on the road near the Honda. The woman who was driving the Honda was airlifted.

It wasn't until police found the woman's cellular telephone, which had been ringing in her purse, that they located the child. Montgomery said he called the last number the woman riding in the Honda had dialed and reached the child's baby sitter on the other end.

"That was a relief for us, because we didn't know 100 percent if the child was out there," Montgomery said.

A maroon Ford Explorer also was badly damaged in the wreck. Most of its windows were smashed. It was stopped near the median. Authorities said two adults and two children were riding in the Ford, which had Virginia license plates.

A man riding in a vehicle that was traveling east in the left lane told

FRAME/1 NCRVH

police his car was sideswiped by the van moments after the van's tire blew out. Police said that the van, which had been heading east in the right lane, then turned into the median while the other vehicle continued to head east.

People got out of their cars and walked around in stopped traffic during the delay. A man and woman in a minivan said they were traveling west when they saw the van cross the grassy median and run head-on into traffic. There were tire marks through the median, and dug-up dirt and grass covered the highway.

Jen Gomez can be reached at 956-2468 or [jgomez@nando.com](mailto:jgomez@nando.com)



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## TWO CHILDREN KILLED ON I-40 WHEN CAR CROSSES THE MEDIAN

Date: Saturday, June 6, 1998 Edition(s): CITY/HIGH POINT  
Page: B10 Section: TRIAD/STATE

Two children died Friday afternoon when the car they were riding in crossed the median of Interstate 40 and was hit by another vehicle during rush-hour traffic.

Rasheed Malik Williams, 8, and Rawdy Henderson McAuley, 10, were riding in a 1992 Ford Escort driven by their mother, Kecia Lynette McAuley-Couch of 523 Martin St. in Greensboro.

McAuley-Couch, 30, was driving westbound on the interstate, east of the Vanstory Street overpass, about 3:30 p.m. Friday. She turned to say something to her children, and when she turned back, traffic had stopped in front of her, said C.N. Walker, a Greensboro police investigator. McAuley-Couch braked and her car swerved to the left, crossing the median and heading into oncoming traffic. In the center lane, a 1990 Buick driven by Andrew Paul Stewart, 54, of 8 Mustang Court in Durham, hit McAuley-Couch's car on the passenger side. The Ford spun, glanced off the front of an Interstate Motorist Assistance Patrol truck and came to rest on an embankment on the south side of the highway. A third child, 9-year-old Romeo Henderson McAuley, was injured in the wreck and was in serious but stable condition Friday night at Moses Cone Memorial Hospital, Walker said. Stewart and McAuley-Couch were treated at Moses Cone and released, he said.

The driver of the IMAP truck, 62-year-old Vanburen Smith of Thomasville, was uninjured. As of Friday night, police had not pressed charges, Walker said. Neither excessive speed nor alcohol were factors in the wreck, and the people in the front seat were wearing seatbelts.

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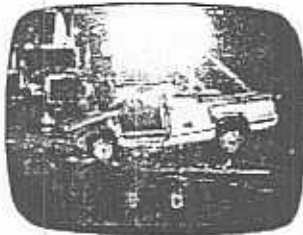
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# Two Killed, Three Injured in Cary Wreck

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**Thursday**  
February 13, 1998  
7:27 a.m. EST



Investigators say this pickup truck lost control and crossed the median on U.S. 1



Investigators say alcohol may have been a factor in the crash.

**CARY** -- Traffic returned to normal Thursday night on U.S. 1 in Cary after an accident killed a Holly Springs woman and her mother.

It happened at around 7 p.m. at the Cary Parkway exit. Cary Police say the evening commuter traffic had just thinned out when the driver of a Ford pickup truck heading south lost control of his vehicle.

Roy Strickland, 55, of Apex, struck a four-door Nissan car driven by 31-year-old Brenda Richardson, killing her. Richardson's mother, Emma Richardson, was also killed.

The driver's two daughters were injured. Friday morning, 9-year-old Kasheca Richardson was in critical condition. Her 16-year-old sister, Anesha Richardson, was in stable condition. Strickland was in critical condition.

The cause of the crash is under investigation. According to The News & Observer, officers at the scene said alcohol may have been a factor in the crash.

*OnLine Producers: [Brian Shrader](#) and [Kerrie Hudzinski](#)*

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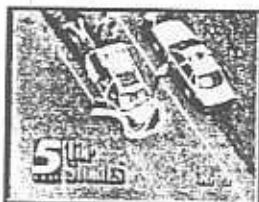
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*Last updated on February 20, 1998 at 05:01:00 PM*  
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## Toddler Killed in Nash County Accident

*October 04, 1996 - a.m. EDT*



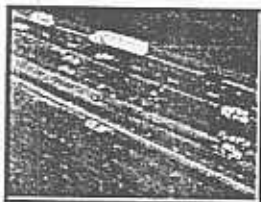
**NASHVILLE** -- A 3-year-old Asheville boy died in a Nash County traffic accident Thursday afternoon. The wreck, which also injured the boy's mother and three people from Raleigh, occurred on Highway 64 just north of Nashville.

The mother apparently lost control of her car at about 3 p.m. near the Red Oak exit just east of Rocky Mount. The car then crossed the median and, sliding sideways, collided with a mini-van.



Troopers say the car was cut in half, and the boy and his mother were thrown from the car. Debris was scattered for hundreds of yards.

There is no word at this time on whether any charges will be filed.



Shiva Tavafraшти, 27, Terry Alford, 49, and Lenya Moore, 26, all of Raleigh, were passengers in the van. All three are in stable condition in Nash General Hospital.

Police were unable to reach relatives of the boy and his mother Thursday and did not release their names.

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*Last updated on October 4, 1996 at 10:48:14 AM*

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# Appendix K

# newsrelease

California Department of Transportation

1120 N St., Sacramento, CA 95814

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July 7, 1997

Contact: Jim Drago  
(916) 654-4677  
E-Mail: [jdrago@trmx2.dot.ca.gov](mailto:jdrago@trmx2.dot.ca.gov)

## CUNNEEN, CALTRANS ANNOUNCE NEW FREEWAY BARRIER POLICY

Assemblyman Jim Cunneen, R-Santa Clara County, and the California Department of Transportation (Caltrans) today announced a new policy designed to reduce the potential for high-speed fatal cross-median freeway accidents.

Under the revised policy, Caltrans will install barriers on high volume freeways with medians up to 75 feet wide. For nearly 40 years, barriers were installed on high-volume freeways with medians up to 45 feet wide and on wider medians based on accident data.

The change is expected to cut the annual number of fatal cross median accidents on the state's freeway system in half. During the past five years, California has averaged 35 fatal cross-median accidents a year.

Review of the Caltrans policy was prompted by Assemblyman Cunneen following a July 1996 cross-median accident on Highway 85 in Santa Clara County that claimed four lives.

"This change represents a significant step forward in trying to reduce the likelihood of tragedies like the Highway 85 accident in the future," said Cunneen. "The engineers at Caltrans are to be commended for their thoroughness in analyzing thousands of pages of accident data. They have developed a workable solution that will result in increased public safety."

With the new policy in place, Caltrans plans to install approximately 400 miles of freeway median barrier during the next five years at a cost of \$110 million. Funding for the effort will come from the department's State Highway Operation and Protection Program (SHOPP).

Caltrans Director James van Loben Sels credited Cunneen's leadership in sparking a detailed review of the department's policy.

"The Caltrans traffic experts analyzed five years of accident data. They concluded that installing

barriers in medians up to 75 feet wide would reduce the severity of accidents while not significantly increasing the total number of accidents caused by vehicles striking the barrier," van Loben Sels said.

He added that the cost of median barriers in selected circumstances represented a prudent investment to advance public safety.

The installation of median barriers on freeways in California was launched nearly 40 years ago. The standard was based on the engineering finding that 90 percent of vehicles traveling at high speed would come to rest within 45 feet.

California currently has more than 1,600 miles of concrete and metal freeway median barriers across the state.

###

# Appendix L

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# Median barrier is expected to make I-96 safer on stretch from Novi to U.S. 23

By Douglas Ilka / The Detroit News

A 14-mile stretch of Interstate 96 running through Livingston and Oakland counties is one of the most dangerous roadways in Michigan, say police and traffic officials.

A particular concern is crossover accidents, where drivers lose control and their vehicles cross through the median into oncoming traffic.

From 1983 to September, 1995, there were 101 crossover median crashes on the stretch of I-96 from U.S. 23 to Novi, said Bob Lariviere, a traffic and safety engineer for Michigan Department of Transportation (MDOT). The crashes caused 13 fatalities and 77 injuries.

Lariviere said a two-year, \$16-million project begun earlier this year will add concrete barriers along the median and help make the freeway safer. The project will be paid for with Michigan highway funds.

"When you have a crossover accident, the results are usually a serious injury or fatality," said Lariviere.

"We're concerned and that is why we pressed so hard to shake funds loose for this project. There are a lot of bridges and roads in the area that also need repair but we are pleased with this project getting under way."

The age of the freeway, which was completed in 1956, and its design have contributed to the severity of the accidents, said Bob DeCorte, a traffic engineer with the Traffic Improvement Association of Oakland County.

"When the highway was designed, there was a deep ditch," said DeCorte.

"But through the years, the ditch got filled in and created a swale. Cars running off the road hit that swale and it's a launching pad -- they are catapulted into the other roadway."

Last December, a 35-year-old Lansing woman and her mother were driving westbound on I-96 near Brighton when their Hyundai spun out of control while making a lane change.

The Hyundai crossed the grass median and became airborne before hitting a Ford Aerostar traveling eastbound on I-96, said State Police Sgt. Patrick McGreevy.

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The Lansing woman died at the scene. Her mother and the male driver of the Aerostar were airlifted to the University of Michigan Hospital for treatment of serious injuries. The crash closed the freeway in both directions for five hours.

Lariviere said expanding the 30-foot wide median is a difficult and expensive road project because a completely new drainage system must be installed.

"The ditch in the median is there for drainage," said Lariviere. "It's expensive to put in a new drainage system, but you have to do that before you can put up the concrete barriers."

The entire project, connecting U.S. 23 to the barriers along the road in Novi, should be completed by the spring of 1999.

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Saturday, November 22, 1997

Story last updated at 10:45 p.m. on Friday, November 21, 1997

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## 2 killed in crashes

### Potatoes, paper scattered on I-95 in northern Camden

By Teresa Stepzinski and Terry Dickson  
*Times-Union staff writers*



A truck loaded with potatoes veered across the median and struck a southbound truck carrying rolls of paper, police said.

- Terry Dickson/staff

A Canadian woman died and five people were injured yesterday morning in a seven-vehicle collision that closed the southbound lanes of Interstate 95 for 5 1/2 hours in northern Camden County, Ga.

An hour later, a Glynn County man was killed in a second crash when his pickup truck rear-ended a tractor-trailer that was stopped in the traffic backup from the first wreck. That accident happened about 2 miles north of the first, police said.

Authorities withheld the names of the dead and injured last night, pending notification of their next of kin. Condition reports on the injured, who were taken to Jacksonville and Southeast Georgia hospitals, were not immediately available.

The first accident, which involved two tractor-trailers and five cars, occurred about 10 a.m. on I-95 at the Horse Stamp Road overpass, which is between Dover Bluff and Woodbine, Georgia State Patrol troopers said.

Camden County Sheriff Bill Smith said one truck loaded with potatoes was northbound on I-95 when its driver lost control, veered across the median and struck a southbound truck carrying large rolls of paper.

Both trucks overturned and split open during the collision, scattering their cargoes across the interstate, witnesses said.

Five southbound cars then crashed into each other as their drivers tried to avoid the wrecked trucks and debris, police said.

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The Charlotte Observer

Posted at 10:28 p.m. EDT Saturday, July 4, 1998

**7 killed in Virginia highway crash**

SALEM, Va. -- A car crossed a highway median strip during heavy rain and smashed into a tractor-trailer Saturday, killing seven people.

The Honda had six people inside; all were killed. The truck driver died as well.

"It basically disintegrated," state police 1st Sgt. Joe Peters said of the two-door Honda.

Shards of metal littering Interstate 81 was all that remained of the car, he said.

The collision happened shortly after 5 p.m. near Buchanan, a few miles outside of Roanoke in southwestern Virginia.

Police said the Honda was trying to pass another vehicle when it began to skid and lose control. The Honda was hit broadside and the truck, which was hauling diesel fuel, overturned.

All of the victims died at the scene.

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## Columbus man dies in I-275 crash

*May 2, 1998*

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An 18-year-old Columbus man was killed and another critically injured in a two-car crash near Cincinnati yesterday afternoon, police say.

• Back to  
the home  
page

Dead is Cliff Gasbarro, 18, who was a passenger in a car driven by Luke Buffum, 18, also of Columbus.

Police in Forest Park, Ohio, would not release the addresses for the men last night.

The accident happened on I-275 about 10 miles north of Cincinnati. Buffum apparently swerved to miss an injured dog, police said. He swerved into the median, lost control and went across traffic.

His car was hit by an eastbound car driven by Cathy Davis, 43, from Hamilton County, Ohio.

Gasbarro was pronounced dead at the scene. Buffum was flown to University Hospital in Cincinnati and was in critical condition after undergoing surgery last night. Davis was treated at a Cincinnati hospital and released.

The accident remains under investigation.



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Friday, April 25, 1997

Story last updated at 11:24 p.m. on Thursday, April 24, 1997

## Jury awards family \$5M in fatal crash

By Terry Dickson  
Times-Union staff writer

BRUNSWICK - A federal court jury has awarded more than \$5 million to the parents of a 13-month-old McIntosh County child who died in a fiery, three-vehicle crash in July.

The jury decided this week that Fletcher Trucking Company Inc. of Dunlap, Tenn., and the Kiawah-Seabrook Seafood Company Inc. of Charleston, S.C., owed that much in damages to Cheryl Anita Fleming and Issac Fleming. Their daughter, Angel, died in the July 17 accident.

Cheryl Fleming's auto crashed into a tractor-trailer rig that had veered across the roadway and blocked both southbound lanes of Interstate 95 between the exit and access ramps at the Darien interchange.

The driver for Fletcher Trucking, James Tucker of San Antonio, Texas, died after his truck struck the rear of a Kiawah-Seabrook Seafood truck parked on the paved shoulder of the highway. The impact ripped the cab off the Fletcher truck and sent the cab's frame and the trailer to the left where it was struck by Cheryl Fleming's car.

At the time, witnesses said the car and the front end of the truck came to rest in the median and caught fire while the trailer blocked both southbound lanes of the roadway.

Witnesses said Tucker appeared to drive into the rear of the parked seafood truck without applying brakes and that Cheryl Fleming braked her car hard and steered left, trying to avoid the overturned tractor-trailer.

Lawyers for Kiawah-Seabrook had said the accident occurred as a result of the negligence of Fletcher's driver and had asked for \$85,000 for its losses, but the jury awarded the seafood company nothing.

In addition to the \$5 million awarded the Flemings for the wrongful death of their daughter, the jury awarded Cheryl Fleming \$258,588.23 for injuries in the wreck, Issac Fleming \$10,000 and Angel Fleming's estate \$1,981.30 for funeral expenses.

The award is not final until Senior U.S. District Judge Anthony A. Alaimo, who presided over the trial, signs the order. Attorney fees will be decided later.

Savannah lawyer David Roberson, who represented the Flemings, owes at least \$384,750 to the estate of Julie Mae Shiggs, a Chatham County woman who Roberson and lawyer John Woodall represented in a malpractice case.

That suit was settled in January 1996, for \$3.3 million in cash and other services. The two lawyers said the total settlement was worth \$4.8 million and Roberson took \$1.3 million in fees and Woodall \$1.1 million.

The estate took the lawyers to court for taking too much in fees and the two lawyers admitted they owe Shiggs' estate \$712,500.

The estate filed a motion to intervene in the Flemings' case and has filed a petition asking Alaimo to order Roberson to pay attorney fees into the State Court of Chatham County to satisfy the debt to Shiggs' estate.

Woodall is seeking to get a portion of the fees from the Fleming case but Roberson has said Woodall did not work on the case and cannot lay claim to any of the legal fees.



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# Appendix M



# Appendix N

PROPOSED REVISIONS TO 1998-2004 TIP  
DIVISION OF HIGHWAYS

## TIP ADDITIONS

## DIVISION 3

- |    |        |   |  |
|----|--------|---|--|
| 1. | I-4004 | I-40, Sampson County Line to the Pender County Line, Duplin County, 28.6 miles. Install median guardrail.                                     | Construction FFY 99 - \$1,240,000 (IM) |
| 2. | I-4012 | I-40, Duplin County Line to NC 132 in New Hanover County, Pender and New Hanover Counties, 31.2 miles. Install median guardrail.              | Construction FFY 99 - \$1,405,000 (IM) |
| 3. | I-4013 | I-40, Johnston County line to north of US 117 (Mile Post 389.5) in Pender County, Sampson, Duplin and Pender Counties, 50.3 miles. Resurface. | Construction FFY 99 - \$4,100,000 (IM) |
| 4. | I-4014 | I-40, Johnston County Line to the Duplin County Line, Sampson County, 19.5 miles. Install median guardrail.                                   | Construction FFY 99 - \$880,000 (IM)   |

## Division 4

- |    |        |  |  |
|----|--------|--|--|
| 1. | I-4009 | I-40, South of I-95 (mile post 328.8) to the Sampson county Line, Johnston County, 10.9 miles. Mill and resurface.                                     | Construction FFY 99 - \$6,400,000 (IM)   |
| 2. | R-3853 | New Route, Extension of SR 1317 (Buck Swamp Road), SR 1300 to existing US 117, 0.8 miles, Wayne County. Construct a two lane facility on new location. | Right of way FFY 99 - \$ 500,000 (STP)<br>Construction FFY 01 - <u>\$3,800,000</u> (STP)<br>Total Cost - \$4,300,000 |
| 3. | R-4027 | US 64, SR 1435 eastward to the Edgembe County Line, Nash County, 9.9 miles. Install median guardrail.  | Construction FFY 99 - \$1,140,000 (NHS)  |

**Division 5**

- |    |        |  |  |
|----|--------|--|--|
| 1. | I-3826 | I-40 and I-440, West of NC 50 (Exit 298) to 0.5 miles south of SR 1007 (Poole Road), 5.1 miles, Wake County. Install median guardrail and resurface.   | Construction FFY 99 - \$15,315,000 (IM)  |
| 2. | I-4005 | I-40, Orange County Line to NC 147, 9.0 miles, Durham County. Diamond grind and joint repair.  | Construction FFY 99 - \$750,000 (IM)   |
| 3. | I-4020 | I-40, I-440 to Johnston County Line, 4.1 miles, Wake County. Install median guardrail.   | Construction FFY 99 - \$510,000 (IM)   |
| 4. | I-4038 | I-85, US 1 to Virginia State Line, 1.0 mile, Warren County. Mill and resurface.  | Construction FFY 99 - \$450,000 (IM)   |
| 5. | I-4040 | I-440, SR 1313 to SR 1728, 5.2 miles, Wake County. Resurface with Novachip.  | Construction FFY 99 - \$1,200,000 (IM)   |
| 6. | R-4037 | US 64-264, West of SR 1003 (Rolesville Road) to US 264, 7.3 miles, Wake County. Install median guardrail.  | Construction FFY 99 - \$410,000 (NHS)  |
| 7. | U-4000 | Durham, US 15-501 Bypass, North of SR 1303 (Pickett Road) to north of I-85 and NC 147 (Durham Freeway), I-40 to SR 1118 (Fayetteville Street), 9.9 miles, Durham County. Install median guardrail. | Construction FFY 99 - \$1,145,000 (NHS)  |
| 8. | U-4003 | Raleigh, US 1/I-440, 1.4 miles north of SR 1010 to SR 1728, 8.3 miles, Wake County. Install median guardrail.  | Construction FFY 99 - \$360,000 (NHS)<br>Construction FFY 00 - <u>\$520,000</u> (IM)<br>Total Cost - \$880,000 |

**Division 7**

- |    |        |   |  |
|----|--------|---|--|
| 1. | I-4018 | I-40 and SR 2254, I-40, East of Holden Road to west of I-85 and I-85, 0.8 miles south of NC 6 to 0.5 miles north of McConnell Road and SR 2254 (Wendover Avenue), east of Holden Road to Grayland Avenue, 9.5 miles, Guilford County. Install median guardrail. | Construction FFY 99 - \$ 880,000 (IM)<br>Construction FFY 99 - <u>\$ 580,000</u> (STP)<br>Total Cost - \$1,460,000 |
|----|--------|---|--|

**Division 8**

1. R-4032 US 74, West of US 74 Business (West Interchange) to the Robeson County Line, 16.0 miles, Scotland County. Install median guardrail. Construction FFY 99 - \$1,110,000 (NHS)

**Division 9 and 11**

1. R-4014 US 52, 0.5 miles north of SR 2264 (Akron Drive) in Forsyth County to US 52 Business in Surry County, 29.8 miles, Forsyth, Stokes and Surry Counties. Install median guardrail. Construction FFY 99 - \$3,520,000 (NHS)

**Division 10**

1. I-4034 I-85, 0.9 miles north of SR 2472 in Mecklenburg County to 0.6 miles north of SR 1430 in Cabarrus County, 7.0 miles, Mecklenburg and Cabarrus Counties. Install median guardrail. Construction FFY 99 - \$385,000 (IM)

**Division 12**

1. I-4007 I-40, Catawba County Line to east of SR 2158 (Old Mocksville Road - Exit 154), 14.5 miles, Iredell County. Install median guardrail. Construction FFY 99 - \$1,100,000 (IM)
2. I-4023 I-77, Mecklenburg County Line to SR 1892 (Jennings Road), 25.0 miles, Iredell County. Install median guardrail. Construction FFY 99 - \$1,355,000 (IM)
3. I-4031 I-85, South Carolina State Line to US 74, 9.5 miles, Cleveland and Gaston Counties. Install median guardrail. Construction FFY 99 - \$715,000 (IM)

### Division 13

1. I-4002 I-40, SR 1129 (Dysartville Road) to west of US 64 and SR 1758 to SR 1002, 8.5 miles, Burke County. Install median guardrail. Construction FFY 99 - \$1,260,000 (IM)
2. I-4003 I-40, SR 1129 (Mile Post 94) to SR 1002 (Mile Post 119), 25.0 miles, Burke County. Mill and overlay. Construction FFY 99 - \$ 4,400,000 (IM)  
Construction FFY 00 - \$ 9,100,000 (IM)  
Total Cost - \$13,500,000
3. I-4010 I-40, US 70 to 1.0 mile east of US 221, 8.5 miles, McDowell County. Install median guardrail. Construction FFY 99 - \$1,750,000 (IM)
4. I-4011 I-40, West of US 70 near Old Fort (Mile Post 71) to east of Mile Post 71.5, McDowell County. Repair two pipes under I-40. Construction FFY 99 - \$1,500,000 (IM)
5. I-4016 I-40 and I-26; I-40, SR 1205 to the McDowell County line and I-26, Henderson County Line to I-40, 34.7 miles, Buncombe County. Install median guardrail. Construction FFY 99 - \$4,240,000 (IM)
6. R-4030 US 74, Cleveland County Line to US 74A, 8.4 miles, Rutherford County. Install median guardrail. Construction FFY 99 - \$715,000 (NHS)
7. B-4332 SR 1755, Replace Bridge No. 156 over I-40, Burke County. Right of way FFY 99 - \$ 300,000 (IM)  
Construction FFY 99 - \$1,200,000 (IM)  
Total Cost - \$1,500,000

### Division 14

1. I-4000 I-26, South Carolina State Line to west of SR 1135 in Polk County and SR 1188 in Polk County to the Buncombe County Line, 28.5 miles, Polk and Henderson Counties. Install median guardrail. Construction FFY 99 - \$2,940,000 (IM)
2. I-4001 I-26, 0.6 miles west of SR 1188 to south of NC 108 (Mile Post 33.9), 6.3 miles, Polk County. Mill and overlay. Construction FFY 99 - \$1,600,000 (IM)
3. R-4033 US 74, US 19-SR 1140 (Alarka Road) to the Jackson County Line, 8.0 miles, Swain County. Install median guardrail. Construction FFY 99 - \$680,000 (NHS)