

# ***NORTH CAROLINA TRANSPORTATION BY THE NUMBERS:***

Meeting the State's Need for Safe and Efficient Mobility

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**Report prepared by**



**In conjunction with**



*Founded in 1971, TRIP® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with efficient and safe surface transportation.*

## Ten Key Transportation Numbers in North Carolina

<b>\$6.5 billion</b>	TRIP estimates that North Carolina roadways that lack some desirable safety features, have inadequate capacity to meet travel demands or have poor pavement conditions cost the state's residents approximately \$6.5 billion annually in the form of additional vehicle operating costs, lost time and wasted fuel due to traffic congestion and traffic crashes.
<b>\$949 \$1,513 \$1,005 \$1,069 \$1,353</b>	The annual costs per motorist of driving on roads that are congested, deteriorated and that lack some desirable safety features in North Carolina's largest urban areas are: Asheville - \$949; Charlotte - \$1,513; Raleigh-Durham - \$1,005; the Triad - \$1,069; Wilmington - \$1,353.
<b>28% 44% 26% 36% 48%</b>	Twenty-eight percent of major urban roads in Asheville are in poor or mediocre condition. In the Charlotte area, 44 percent of major urban roads are in poor or mediocre condition. Twenty-six percent of major urban roads in the Raleigh-Durham metro area are in poor or mediocre condition. Thirty-six percent of major urban roads in the Triad area are in poor or mediocre condition. Forty-eight percent of Wilmington-area roads are in poor or mediocre condition.
<b>1,317 6,585</b>	From 2008 to 2012, on average 1,317 people were killed annually in North Carolina traffic crashes, a total of 6,585 fatalities over the five year period.
<b>30 %</b>	A total of 30 percent of North Carolina bridges are in need of repair, improvement or replacement. Twelve percent of the state's bridges are structurally deficient and eighteen percent are functionally obsolete.
<b>18 hours 40 hours 23 hours 22 hours 18 hours</b>	Asheville-area drivers lose 18 hours annually due to congestion. Drivers in the Charlotte area lose 40 hours each year as a result of congestion. The average Raleigh-Durham driver spends 23 hours annually stuck in traffic, Triad drivers lose 22 hours, while Wilmington-area drivers lose 18 hours each year.
<b>4X</b>	The fatality rate on North Carolina's non-interstate rural roads is nearly four times higher than that on all other roads in the state (2.44 fatalities per 100 million vehicle miles of travel vs. 0.64).
<b>\$1 billion</b>	If a lack of adequate revenue into the Federal Highway Trust Fund is not addressed by Congress, funding for highway and transit improvements in North Carolina could be cut by \$1 billion for federal fiscal year 2015 beginning October 1, 2014.
<b>\$364 billion \$337 billion</b>	Annually, \$364 billion in goods are shipped from sites in North Carolina and another \$337 billion in goods are shipped to sites in North Carolina, mostly by truck.
<b>\$1 billion = 27,800 jobs</b>	A <a href="#">2007 analysis by the Federal Highway Administration</a> found that every \$1 billion invested in highway construction would support approximately 27,800 jobs.

## Executive Summary

North Carolina's extensive system of roads, highways, bridges, airports and rail lines provides the state's residents, visitors and businesses with a high level of mobility. This transportation system forms the backbone that supports the state's economy. North Carolina's surface transportation system enables the state's residents and visitors to travel to work and school, visit family and friends, and frequent tourist and recreation attractions while providing its businesses with reliable access to customers, materials, suppliers and employees.

More than nine million people currently live in North Carolina. By 2030, the state's population is expected to grow to 12 million, making North Carolina the seventh most populated state in the nation.

There is an inextricable link between infrastructure and North Carolina's ability to compete for job growth and economic development. As North Carolina looks to retain its businesses, maintain its level of economic competitiveness and achieve further economic growth, the state will need to maintain and modernize its roads, highways and bridges by improving the physical condition of its transportation network and enhancing the system's ability to provide efficient and reliable mobility for motorists and businesses. Making needed improvements to North Carolina's roads, highways and bridges could also provide a significant boost to the state's economy by creating jobs in the short term and stimulating long term economic growth as a result of enhanced mobility and access.

With a current unemployment rate of 6.7 percent, North Carolina must improve its system of roads, highways and bridges to foster economic growth and keep businesses in the state. In addition to economic growth, transportation improvements are needed to ensure safe, reliable mobility and quality of life for all North Carolinians. In 2013, the North Carolina Strategic Transportation Investments bill became law. These much-needed reforms are a mechanism to guide future transportation expenditures. However, meeting North Carolina's need to modernize and maintain its system of roads, highways and bridges will require significant transportation funding reforms.

**An inadequate transportation system costs North Carolina residents a total of \$6.5 billion every year in the form of additional vehicle operating costs (VOC), congestion-related delays and traffic crashes.**

- TRIP estimates that North Carolina roadways that lack some desirable safety features, have inadequate capacity to meet travel demands or have poor pavement conditions cost the state's residents approximately \$6.5 billion annually in the form of additional vehicle operating costs (including accelerated vehicle depreciation, additional repair costs, and increased fuel consumption and tire wear), the cost of lost time and wasted fuel due to traffic congestion, and the financial cost of traffic crashes. These increased costs also impact companies transporting goods and freight, often forcing them to pass along the cost to manufacturers and consumers.
- TRIP has calculated the annual cost to North Carolina residents of driving on roads that are deteriorated, congested and lack some desirable safety features both statewide and in

the state’s largest urban areas, including Asheville, Charlotte, Raleigh-Durham, the Piedmont Triad (including Greensboro, High Point and Winston-Salem), and Wilmington. The following chart shows the cost breakdown for these areas.

<b>Location</b>	<b>VOC</b>	<b>Congestion</b>	<b>Safety</b>	<b>TOTAL</b>
Asheville	\$ 251	\$ 380	\$ 318	\$ 949
Charlotte	\$ 378	\$ 898	\$ 237	\$ 1,513
Raleigh-Durham	\$ 268	\$ 502	\$ 235	\$ 1,005
The Triad	\$ 315	\$ 465	\$ 289	\$ 1,069
Wilmington	\$ 461	\$ 360	\$ 532	\$ 1,353
<b>North Carolina - Statewide Total</b>	<b>\$1.8 Billion</b>	<b>\$2 Billion</b>	<b>\$2.7 Billion</b>	<b>\$6.5 Billion</b>

**The efficiency of North Carolina’s transportation system, particularly its highways, is critical to the health of the state’s economy. Businesses are increasingly reliant on an efficient and reliable transportation system to move products and services. A key component in business efficiency and success is the level and ease of access to customers, markets, materials and workers.**

- Annually, \$364 billion in goods are shipped from sites in North Carolina and another \$337 billion in goods are shipped to sites in North Carolina, mostly by truck.
- Eighty-six percent of the goods shipped annually from sites in North Carolina are carried by trucks and another eight percent are carried by courier services or multiple mode deliveries, which include trucking.
- Increasingly, companies are looking at the quality of a region’s transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system.
- Highway accessibility was ranked the number one site selection factor in a 2011 survey of corporate executives by [Area Development Magazine](#).
- A [2007 analysis by the Federal Highway Administration](#) found that every \$1 billion invested in highway construction would support approximately 27,800 jobs, including approximately 9,500 in the construction sector, approximately 4,300 jobs in industries supporting the construction sector, and approximately 14,000 other jobs induced in non-construction related sectors of the economy.
- The [Federal Highway Administration](#) estimates that each dollar spent on road, highway and bridge improvements results in an average benefit of \$5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.

**Population and economic growth in North Carolina have resulted in increased demands on the state's major roads and highways, leading to increased wear and tear on the transportation system.**

- North Carolina's population reached 9.8 million in 2012, a 47 percent increase since 1990 and the ninth highest increase in the nation during that time.
- North Carolina's roads and highways carried 105 billion vehicle miles of travel in 2012, a 67 percent increase since 1990 and the seventh highest increase in the nation during that time.
- By 2030, vehicle travel in North Carolina is projected to increase by another 25 percent.
- From 1990 to 2012, North Carolina's gross domestic product (GDP), a measure of the state's economic output, increased by 85 percent, when adjusted for inflation. The increase in national GDP during this time was 56 percent.

**Eleven percent of major locally and state-maintained roads and highways in North Carolina have pavement surfaces in poor condition, providing a rough ride and costing motorists, trucking companies and shipping companies in the form of additional vehicle operating costs.**

- Eleven percent of North Carolina's major roads and highways have pavements in poor condition, while an additional 38 percent of the state's major roads are rated in fair or mediocre condition. The remaining 51 percent are rated in good condition.
- The pavement data in this report for all arterial roads and highways is provided by the Federal Highway Administration, based on data submitted annually by the North Carolina Department of Transportation (NCDOT) on the condition of major state and locally maintained roads and highways in the state.
- Ten percent of major urban roads in the Asheville urban area are rated in poor condition and 18 percent are rated in mediocre condition. Seventeen percent of Asheville's major urban roads are rated in fair condition and 56 percent are rated in good condition.
- In the Charlotte urban area, 17 percent of major locally and state-maintained roads are rated in poor condition and 27 percent are rated in mediocre condition. Seventeen percent of Charlotte's major urban roads are rated in fair condition and 40 percent are rated in good condition.
- In the Raleigh-Durham urban area, 12 percent of major locally and state-maintained roads are rated in poor condition and 14 percent are rated in mediocre condition. Nineteen percent of Raleigh-Durham's major urban roads are rated in fair condition and 55 percent are rated in good condition.

- Twelve percent of major urban roads in the Triad area are rated in poor condition and 24 percent are rated in mediocre condition. Eighteen percent of the Triad's major urban roads are rated in fair condition and 46 percent are rated in good condition.
- In the Wilmington urban area, 23 percent of major locally and state-maintained roads are rated in poor condition and 25 percent are rated in mediocre condition. Twenty-four percent of Wilmington's major urban roads are rated in fair condition and 27 percent are rated in good condition. The state of the roads in Wilmington has the potential to limit the access to the state's major seaport there, which raises costs and reduces its attractiveness.
- Roads rated in poor condition may show signs of deterioration, including rutting, cracks and potholes. In some cases, poor roads can be resurfaced, but often are too deteriorated and must be reconstructed. Roads rated in mediocre condition may show signs of significant wear and may also have some visible pavement distress. Most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition.
- Because vehicles operate less efficiently and under greater stress when driven on rough roads, North Carolina motorists pay an additional \$1.9 billion annually in extra vehicle operating costs as a result of driving on rough roads in the state. Costs include accelerated vehicle depreciation, additional repair costs, and increased fuel consumption and tire wear. These same costs affect trucking and shipping companies, which translates into higher costs for manufacturers, distribution companies and consumers.

**Thirty percent of bridges in North Carolina show significant deterioration or do not meet current design standards often because of narrow lanes, inadequate clearances or poor alignment. This includes all bridges that are 20 feet or more in length.**

- Twelve percent of North Carolina's bridges are structurally deficient. A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Structurally deficient bridges are often posted for lower weight or closed to traffic, restricting or redirecting large vehicles, particularly commercial trucks and emergency services vehicles.
- Eighteen percent of North Carolina's bridges are functionally obsolete. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.

**Increasing levels of traffic congestion cause significant delays in North Carolina, particularly in its larger urban areas, choking commuting and commerce. Traffic congestion robs commuters of time and money and imposes increased costs on businesses, shippers and manufacturers, which are often passed along to the consumer.**

- Applying Texas Transportation Institute (TTI) delay measures, TRIP estimates that the average driver in the Asheville urban area loses \$380 each year in the cost of lost time

and wasted fuel as a result of traffic congestion. The average commuter in the Asheville urban area wastes 18 hours each year stuck in traffic.

- According to TTI, the average driver in the Charlotte urban area loses \$898 each year in the cost of lost time and wasted fuel as a result of traffic congestion. The average commuter in the Charlotte urban area wastes 40 hours each year stuck in traffic.
- The average Raleigh-Durham-area motorist loses \$502 each year in the form of lost time and wasted fuel due to congestion. The average Raleigh-Durham driver wastes 23 hours annually in traffic congestion.
- Applying TTI delay measures, TRIP estimates that the average Triad area driver loses \$465 annually in the cost of lost time and wasted fuel due to congestion. The average Triad commuter wastes 22 hours to traffic congestion every year.
- Applying Texas Transportation Institute (TTI) delay measures, TRIP estimates that the average Wilmington-area driver loses \$360 annually in the cost of lost time and wasted fuel due to congestion. The average Wilmington commuter wastes 18 hours to traffic congestion every year.
- The increasing levels of congestion add significant costs to the transportation companies and also to manufacturers, distributors, wholesalers and consumers. The increased levels of congestion can reduce the attractiveness of a location to a company to consider expansion or even to locate a new facility. Congestion costs can also increase overall operating costs for trucking and shipping companies, leading to revenue losses and lower pay for their drivers and employees.

**North Carolina's traffic fatality rate on rural, non-Interstate routes is nearly four times higher than that on all other roads and highways in the state. Improving safety features on North Carolina's roads and highways would likely result in a decrease in the state's traffic fatalities and serious crashes. Roadway features are likely a contributing factor in approximately one-third of all fatal and serious traffic crashes.**

- Between 2008 and 2012 a total of 6,585 people were killed in traffic crashes in North Carolina, an average of 1,317 fatalities per year.
- North Carolina's overall traffic fatality rate of 1.23 fatalities per 100 million vehicle miles of travel in 2012 is higher than the national average of 1.13.
- The fatality rate on North Carolina's rural non-Interstate roads was 2.44 fatalities per 100 million vehicle miles of travel, nearly four times the 0.64 fatality rate on all other roads and highways in the state.
- Roadway features that impact safety include the number of lanes, lane widths, lighting, lane markings, rumble strips, shoulders, guard rails, other shielding devices, median

barriers and intersection design. The cost of serious crashes includes lost productivity, lost earnings, medical costs and emergency services.

- Several factors are associated with vehicle crashes that result in fatalities, including driver behavior, vehicle characteristics and roadway features. TRIP estimates that roadway features are likely a contributing factor in approximately one-third of fatal traffic crashes.
- Where appropriate, highway improvements can reduce traffic fatalities and crashes for motorists, pedestrian and bicyclists while improving traffic flow to help relieve congestion. Such improvements include removing or shielding obstacles; adding or improving medians; improved lighting; improving intersection design, adding rumble strips, wider lanes, wider and paved shoulders; upgrading roads from two lanes to four lanes; and better road markings and traffic signals.
- Investments in rural traffic safety have been found to result in significant reductions in serious traffic crashes. A 2012 report by the [Texas Transportation Institute](#) (TTI) found that improvements completed recently by the Texas Department of Transportation that widened lanes, improved shoulders and made other safety improvements on 1,159 miles of rural state roadways resulted in 133 fewer fatalities on these roads in the first three years after the improvements were completed (as compared to the three years prior). TTI estimates that the improvements on these roads are likely to save 880 lives over the next 20 years.

**The federal government remains a critical source of funding for North Carolina's roads, highways and bridges. Federal surface transportation funding provided to the states is raised primarily through federal fuel, heavy vehicle and tire taxes, as well as some general fund revenue.**

- MAP-21 (Moving Ahead for Progress in the 21<sup>st</sup> Century Act), the current federal surface transportation program approved by Congress in July 2012, greatly increased funding flexibility for states and streamlined project approval processes to improve the efficiency of state and local transportation agencies in providing needed transportation improvements in the state.
- MAP-21 does not provide sufficient long-term revenues to support the current level of federal surface transportation investment.
- The impact of inadequate federal surface transportation revenues could be felt as early as summer of 2014, when federal funding for road, highway and bridge projects is likely to be delayed because the balance in the [Highway Account of the federal Highway Trust Fund](#) is expected to drop below \$1 billion. This delay and uncertainty in funding will likely result in the postponement of numerous projects.
- Nationwide federal funding for highways is expected to be cut by almost 100 percent from the current investment level for the fiscal year starting October 1, 2014 (FY 2015)

unless Congress provides additional transportation revenues. This is due to a cash shortfall in the Highway Trust Fund as projected by the [Congressional Budget Office](#).

- If the funding shortfalls into the federal Highway Trust Fund are addressed solely by cutting spending it is estimated that federal funding for highway and transit improvements in North Carolina will be cut by \$1 billion for the federal fiscal year starting October 1, 2014, unless Congress provides additional transportation revenues.
- Many recent transportation projects throughout the state would not have been completed without significant federal funding. Since 2005, federal funds have allowed the state to complete the following projects: construction of 9.6 miles of Charlotte's LYNX rapid transit line, the construction of the I-73 Greensboro Loop, the completion of the Western Wake/Triangle Expressway, and the US 70 Bypass of Goldsboro. A more complete list of projects completed since 2005 that required significant federal funds can be found in the body of the report.
- In order to complete the following projects by 2018, the state will need significant federal funds: the Fayetteville Outer Loop, the I-74 corridor in the Piedmont Triad, the I-26 Asheville Connector, the US 74 Shelby Bypass, widening I-40 in Raleigh-Durham at Wake and Johnson counties, and widening I-85 in Concord to relieve congestion. A more complete list of projects that would require required significant federal funds to proceed by 2018 can be found in the body of the report. These needed projects are listed in no particular order and do not reflect the priorities of the North Carolina Department of Transportation.

*Sources of information for this report include the North Carolina Department of Transportation (NCDOT), the Federal Highway Administration (FHWA), the Bureau of Transportation Statistics (BTS), the U.S. Census Bureau, the Texas Transportation Institute (TTI) and the National Highway Traffic Safety Administration (NHTSA). All data used in the report is the latest available.*

## **Introduction**

North Carolina's roads, highways, bridges airports, ports and rail lines form vital transportation links for the state's residents, visitors and businesses, providing daily access to homes, jobs, schools, shopping, natural resources and recreation. Today, with the state working to foster quality of life improvements and economic competitiveness, the modernization of North Carolina's transportation system is crucial, particularly to critical areas of the state's economy including tourism, agriculture, manufacturing, distribution, research, technology and finance.

As the U.S. and North Carolina look to rebound from the economic downturn, the preservation and modernization of the state's transportation system could play an important role in enhancing North Carolina's economic competitiveness and improving economic well-being by providing critically needed jobs in the short term and by improving the productivity and competitiveness of the state's businesses in the long term. As North Carolina faces the challenge of preserving and modernizing its transportation system, the future level of federal, state and local transportation funding will be a critical factor in whether the Tar Heel State's residents and visitors continue to enjoy access to a safe and efficient transportation network. Meeting North Carolina's need to modernize and maintain its system of roads, highways and bridges will require a significant boost in local, state and federal funding.

This report examines the condition, use and safety of North Carolina's roads, highways and bridges, and the future mobility needs of the state. Sources of information for this report include the North Carolina Department of Transportation (NCDOT), the Federal Highway Administration (FHWA), the U.S. Census Bureau, the Texas Transportation Institute (TTI), the Bureau of Transportation Statistics (BTS), and the National Highway Traffic Safety

Administration (NHTSA). All data used in the report is the latest available.

## **Importance of Transportation to Economic Growth**

Today's culture of business demands that an area have well-maintained and efficient roads, highways and bridges if it is to remain economically competitive. Modern national and global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement. Consequently, the quality of a region's transportation system has become a key component in a business's ability to compete locally, nationally and internationally.

Businesses have responded to improved communications and the need to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and by Internet commerce. The result of these changes has been a significant improvement in logistics efficiency as firms move from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. These improvements have made mobile inventories the norm, resulting in the nation's trucks and trains literally becoming rolling warehouses.

Highways are vitally important to continued economic development in North Carolina, particularly to the state's tourism, lumber, agriculture, distribution and manufacturing sectors. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers and distributors ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads.

Every year, \$364 billion in goods are shipped from sites in North Carolina and another \$337 billion in goods are shipped to sites in North Carolina, mostly by trucks.<sup>1</sup> Eighty-six percent of the goods shipped annually from sites in North Carolina are carried by trucks and another eight percent are carried by multiple-mode deliveries, including trucks.<sup>2</sup>

The cost of road and bridge improvements are more than offset by the reduction of user costs associated with driving on rough roads, the improvement in business productivity, the reduction in delays and the improvement in traffic safety. The [Federal Highway Administration estimates](#) that each dollar spent on road, highway and bridge improvements results in an average benefit of \$5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.<sup>3</sup>

Local, regional and state economic performance is improved when a region's surface transportation system is expanded or repaired. This improvement comes as a result of the initial job creation and increased employment created over the long-term because of improved access, reduced transport costs and improved safety. Highway accessibility was ranked the number one site selection factor in a [2011 survey](#) of corporate executives by [Area Development Magazine](#).<sup>4</sup>

Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system.

## **Population, Travel and Economic Trends in North Carolina**

North Carolina residents and businesses require a high level of personal and commercial mobility. Population increases and economic growth in the state have resulted in an increase in

the demand for mobility as well as an increase in vehicle miles of travel (VMT). To foster a high quality of life and spur economic growth in North Carolina, it will be critical that the state provide a safe and modern transportation system that can accommodate future growth in population, tourism, recreation and vehicle travel.

North Carolina's population grew to 9.8 million residents in 2012, a 47 percent increase since 1990 and the ninth largest gain in the nation during that time.<sup>5</sup> North Carolina had 6,677,693 licensed drivers in 2012.<sup>6</sup> From 1990 to 2012, North Carolina's gross domestic product (GDP), a measure of the state's economic output, increased by 85 percent, when adjusted for inflation.<sup>7</sup> The increase in national GDP during this time was 56 percent.<sup>8</sup>

In 2012, North Carolina's roads and highways carried 105 billion vehicle miles of travel, a 67 percent jump since 1990 and the seventh highest increase in the nation during that time.<sup>9</sup> Based on population and other lifestyle trends, TRIP estimates that travel on North Carolina's roads and highways will increase by another 25 percent by 2030.<sup>10</sup>

### **Condition of North Carolina's Roads**

The life cycle of North Carolina's roads is greatly affected by the state's ability to perform timely maintenance and upgrades to ensure that road and highway surfaces last as long as possible. The pavement condition of the state's major roads – generally roads other than neighborhood roads or minor local roads --is evaluated and classified as being in poor, mediocre, fair or good condition.

Throughout the state, 11 percent of North Carolina's major roads and highways have pavements rated in poor condition.<sup>11</sup> Another 38 percent of North Carolina's major roads are rated in mediocre or fair condition, while the remaining 51 percent are rated in good condition.<sup>12</sup>

The pavement data in this report for all arterial roads and highways is provided by the Federal Highway Administration, based on data submitted annually by the North Carolina Department of Transportation (NCDOT) on the condition of major state and locally maintained roads and highways in the state.

Roads rated poor may show signs of deterioration, including rutting, cracks and potholes. In some cases, poor roads can be resurfaced but often are too deteriorated and must be reconstructed. Roads rated in mediocre condition may show signs of significant wear and may also have some visible pavement distress. Most pavements in fair condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition.

Pavement failure is caused by a combination of traffic, moisture and climate. Moisture often works its way into road surfaces and the materials that form the road's foundation. Road surfaces at intersections are even more prone to deterioration because the slow-moving or standing loads occurring at these sites subject the pavement to higher levels of stress. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.<sup>13</sup> As roads and highways continue to age, they will reach a point of deterioration where routine paving and maintenance will not be adequate to keep pavement surfaces in good condition and costly reconstruction of the roadway and its underlying surfaces will become necessary.

The chart below details pavement conditions in the state's largest urban areas:<sup>14</sup>

**Chart 1. Percentage of pavements in poor, mediocre, fair and good condition.**

<b>Location</b>	<b>Poor</b>	<b>Mediocre</b>	<b>Fair</b>	<b>Good</b>
Asheville	10%	18%	17%	56%
Charlotte	17%	27%	17%	40%
Raleigh-Durham	12%	14%	19%	55%
The Triad	12%	24%	18%	46%
Wilmington	23%	25%	24%	27%

Source: TRIP analysis of Federal Highway Administration (FHWA) data.

## **The Costs to Motorists of Roads in Inadequate Condition**

TRIP has calculated the additional cost to motorists of driving on roads in poor or unacceptable condition. When roads are in poor condition – which may include potholes, rutting or rough surfaces – the cost to operate and maintain a vehicle increases because vehicles operate less efficiently on rough roads. These additional vehicle operating costs include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear. TRIP estimates that annual additional vehicle operating costs borne by North Carolina motorists as a result of poor road conditions total \$1.8 billion statewide.<sup>15</sup>

The average driver in the Asheville area loses \$251 each year as a result of driving on rough roads.<sup>16</sup> Driving on rough roads costs the average Charlotte urban area motorist \$378 annually in extra vehicle operating costs. The average Raleigh-Durham urban area motorist loses \$283 annually due to driving on rough roads, while the average driver in the Triad urban areas loses \$315 each year as a result of driving on deteriorated roads.<sup>17</sup> Driving on rough roads costs the average Wilmington driver \$461 annually.<sup>18</sup> The poor roads in the Wilmington area create added costs to the transport companies that serve the state’s major port there. This in turn reduces the attractiveness of the port for shippers, consignees, and transport companies.

Additional vehicle operating costs have been calculated in the Highway Development and Management Model (HDM), which is recognized by the U.S. Department of Transportation and more than 100 other countries as the definitive analysis of the impact of road conditions on vehicle operating costs. The HDM report is based on numerous studies that have measured the impact of various factors, including road conditions, on vehicle operating costs.<sup>19</sup>

The HDM study found that road deterioration increases ownership, repair, fuel and tire costs. The report found that deteriorated roads accelerate the pace of depreciation of vehicles and the need for repairs because the stress on the vehicle increases in proportion to the level of roughness of the pavement surface. Similarly, tire wear and fuel consumption increase as roads deteriorate since there is less efficient transfer of power to the drive train and additional friction between the road and the tires.

TRIP's additional vehicle operating cost estimate is based on taking the average number of miles driven annually by a motorist, calculating current vehicle operating costs based on AAA's 2012 vehicle operating costs and then using the HDM model to estimate the additional vehicle operating costs paid by drivers as a result of substandard roads.<sup>20</sup> Additional research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored into TRIP's vehicle operating cost methodology.

### **Bridge Conditions in North Carolina**

North Carolina's bridges form key links in the state's highway system, providing communities and individuals access to employment, schools, shopping and medical facilities, and facilitating commerce and access for emergency vehicles.

Thirty percent of North Carolina's locally and state- maintained bridges (20 feet or longer) were rated as structurally deficient or functionally obsolete in 2012.<sup>21</sup>

Twelve percent of North Carolina's locally and state-maintained bridges are rated as structurally deficient.<sup>22</sup> A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are structurally deficient may be posted for lower weight limits or closed if their condition warrants such action. Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid posted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy. The added operating costs are conveyed to the industries and citizens that rely on truck transportation.

Eighteen percent of North Carolina's locally and state-maintained bridges are rated functionally obsolete.<sup>23</sup> Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment with the approaching roadway.

The service life of bridges can be extended by performing routine maintenance such as resurfacing decks, painting surfaces, insuring that a facility has good drainage and replacing deteriorating components. But most bridges will eventually require more costly reconstruction or major rehabilitation to remain operable.

### **Traffic Congestion in North Carolina**

Commuting and commerce in North Carolina are constrained by growing traffic congestion, which will increase in the future unless additional highway and transit capacity is provided. Vehicle travel in North Carolina has increased dramatically in recent years, without a

corresponding increase in roadway lane miles. As a result, the state's roads have become increasingly congested, choking commuting and commerce. Traffic congestion robs commuters of time and money and imposes increased costs on businesses, shippers and manufacturers, which are often passed along to the consumer.

Applying Texas Transportation Institute (TTI) delay measures, TRIP estimates that the average Asheville-area driver loses \$380 each year in the cost of lost time and wasted fuel as a result of driving on congested routes, while wasting 18 hours each year due to congestion.<sup>24</sup> The average driver in the Charlotte urban area loses \$898 each year in the cost of lost time and wasted fuel as a result of traffic congestion.<sup>25</sup> The average commuter in the Charlotte urban area wastes 40 hours each year stuck in traffic because of regional traffic congestion.<sup>26</sup> TTI estimates that the average Raleigh-Durham motorist loses \$502 each year in the cost of lost time and wasted fuel, as a result of traffic congestion.<sup>27</sup> The average commuter in the Raleigh-Durham urban area wastes 23 hours each year stuck in traffic.<sup>28</sup> In the Triad area, the average driver loses \$465 annually in the cost of lost time and wasted fuel due to congestion, while wasting 22 hours each year in congestion.<sup>29</sup> The average Wilmington-area driver loses \$360 each year and 18 hours as a result of traffic congestion.<sup>30</sup> The total cost of traffic congestion annually in North Carolina is \$2 billion in lost time and wasted fuel.<sup>31</sup>

The increasing levels of congestion add significant costs to the transportation companies and also to manufacturers, distributors, wholesalers and consumers. The increased levels of congestion can reduce the attractiveness of a location to a company to consider expansion or even to locate a new facility. Congestion costs can also increase overall operating costs for trucking and shipping companies, leading to revenue losses and lower pay for their drivers and employees.

## Traffic Safety in North Carolina

A total of 6,585 people were killed in motor vehicle crashes in North Carolina from 2008 through 2012, an average of 1,317 fatalities per year.<sup>32</sup>

**Chart 2. Traffic fatalities in North Carolina from 2008 – 2012.**

<i>Year</i>	<i>Fatalities</i>
2008	1,433
2009	1,314
2010	1,319
2011	1,227
2012	1,292
<b>Total</b>	<b>6,585</b>

**Source: National Highway Traffic Safety Administration**

Three major factors are associated with fatal vehicle crashes: driver behavior, vehicle characteristics and roadway features. It is estimated that roadway features are likely a contributing factor in approximately one-third of fatal traffic crashes. Roadway features that impact safety include the number of lanes, lane widths, lighting, lane markings, rumble strips, shoulders, guard rails, other shielding devices, median barriers and intersection design.

North Carolina's overall traffic fatality rate of 1.23 fatalities per 100 million vehicle miles of travel in 2012 is higher than the national average of 1.13.<sup>33</sup> The fatality rate on North Carolina's non-Interstate rural roads in 2012 was 2.44 fatalities per 100 million vehicle miles of travel, nearly four times times the fatality rate of 0.64 on all other roads and highways in the state.<sup>34</sup>

The annual cost of serious traffic crashes in North Carolina, in which roadway features were likely a contributing factor is approximately \$2.7 billion.<sup>35</sup>

Improving safety on North Carolina's roadways can be achieved through further improvements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and a variety of improvements in roadway safety features.

The severity of serious traffic crashes could be reduced through roadway improvements such as adding turn lanes, removing or shielding obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection layout, and providing better road markings and upgrading or installing traffic signals.

Roads with poor geometry, with insufficient clear distances, without turn lanes, having inadequate shoulders for the posted speed limits, or poorly laid out intersections or interchanges, pose greater risks to motorists, pedestrians and bicyclists.

Investments in rural traffic safety have been found to result in significant reductions in serious traffic crashes. A 2012 report by the [Texas Transportation Institute](#) (TTI) found that improvements completed recently by the Texas Department of Transportation that widened lanes, improved shoulders and made other safety improvements on 1,159 miles of rural state roadways resulted in 133 fewer fatalities on these roads in the first three years after the improvements were completed (as compared to the three years prior). TTI estimates that the improvements on these roads are likely to save 880 lives over the next 20 years.<sup>36</sup>

## **Transportation Funding**

Investment in North Carolina's roads, highways and bridges is funded by local, state and federal governments. The federal government provides funding for the state's transportation

system largely as part MAP-21 (Moving Ahead for Progress in the 21st Century Act), the current two-year federal surface transportation program, which expires on September 30, 2014.

While MAP-21, approved by Congress in July 2012, increased funding flexibility for states and improved project approval processes to improve the efficiency of state and local transportation agencies in providing needed transportation improvements, it did not provide sufficient long-term revenues to support the current level of federal surface transportation investment.

The impact of inadequate federal surface transportation revenues could be felt as early as summer of 2014, when the balance in the [Highway Account of the federal Highway Trust Fund](#) is expected to drop below \$1 billion, which will trigger delays in the federal reimbursement to states for road, highway and bridge projects. States are expected to respond to this delay in federal reimbursement for road, highway and bridge repairs and improvements by delaying or postponing numerous projects.<sup>37</sup>

Nationwide, federal funding for highways is expected to be cut by almost 100 percent from the current investment level for the fiscal year starting October 1, 2014 (FY 2015) unless Congress provides additional transportation revenues. This is due to a cash shortfall in the Highway Trust Fund as projected by the [Congressional Budget Office](#).

If the funding shortfalls into the federal Highway Trust Fund are addressed solely by cutting spending it is estimated that federal funding for highway and transit improvements in North Carolina will be cut by approximately \$1 billion for the federal fiscal year starting October 1, 2014, unless Congress provides additional transportation revenues.<sup>38</sup>

The federal government remains a critical source of funding for North Carolina's roads, highways and bridges and provides a significant return to North Carolina in road and bridge funding based on the revenue generated in the state by the federal motor fuel tax.

Numerous projects have been completed throughout North Carolina since 2005 that relied heavily on federal funding. These projects include construction of 9.6 miles of Charlotte's LYNX rapid transit line, the construction of the I-73 Greensboro Loop, the completion of the Western Wake/Triangle Expressway, and the US 70 Bypass of Goldsboro. A more complete list of projects completed since 2005 that relied heavily on federal funding can be found in [Appendix A](#).

Many needed North Carolina transportation projects would require significant federal funding to proceed before 2018. These projects include the Fayetteville Outer Loop, the I-26 Asheville Connector, the US 74 Shelby Bypass, widening I-40 in Raleigh at Wake and Johnson, the widening of I-85 in Concord to relieve congestion, and the I-74 Corridor in the Piedmont Triad. A more complete list of needed transportation projects that would require significant levels of federal transportation funding to proceed before 2018 can be found in [Appendix B](#). These needed projects are listed in no particular order and do not reflect the priorities of the North Carolina Department of Transportation.

Increasing investment in the state's roads, highways and bridges could boost North Carolina's economy by creating jobs. A [2007 analysis by the Federal Highway Administration](#) found that every \$1 billion invested in highway construction would support approximately 27,800 jobs, including approximately 9,500 in the construction sector, approximately 4,300 jobs in industries supporting the construction sector, and approximately 14,000 other jobs induced in non-construction related sectors of the economy.<sup>39</sup>

## **Conclusion**

As North Carolina looks to build and enhance a thriving, growing and dynamic state, it will be critical that it is able to provide a 21<sup>st</sup> century network of roads, highways and bridges that can accommodate the mobility demands of a modern society. And to fully rebound from the recent economic downturn, the U.S. and North Carolina will need to modernize the surface transportation system by improving the physical condition of the transportation network and enhancing the system's ability to provide efficient and reliable mobility for motorists and businesses. Making needed improvements to North Carolina's roads, highways and bridges could provide a significant boost to the state's economy by creating jobs in the short term and stimulating long-term economic growth as a result of enhanced mobility and access.

Without a substantial boost in federal, state and local highway funding, numerous projects to improve the condition and expand the capacity of North Carolina's roads, highways and bridges will not be able to proceed, hampering the state's ability to improve the condition of its transportation system and to enhance economic development opportunities in the state.

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## Endnotes

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<sup>1</sup> Bureau of Transportation Statistics (2010), U.S. Department of Transportation. 2007 Commodity Flow Survey, State Summaries. [http://www.bts.gov/publications/commodity\\_flow\\_survey/2007/states/](http://www.bts.gov/publications/commodity_flow_survey/2007/states/)

<sup>2</sup> Ibid.

<sup>3</sup> FHWA estimate based on its analysis of 2006 data. For more information on FHWA's cost-benefit analysis of highway investment, see the 2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance.

<sup>4</sup> Area Development Magazine (Winter, 2012). 26<sup>th</sup> Annual Survey of Corporate Executive Results.

<sup>5</sup> U.S. Census Bureau (2012).

<sup>6</sup> Highway Statistics (2012). Federal Highway Administration. DL-1C

<sup>7</sup> TRIP analysis of Bureau of Economic Analysis data.

<sup>8</sup> Ibid.

<sup>9</sup> U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 1990 and 2012.

<sup>10</sup> TRIP calculation based on U.S. Census and Federal Highway Administration data.

<sup>11</sup> TRIP calculations based on 2012 pavement condition data provided by the Federal Highway Administration.

<sup>12</sup> Ibid.

<sup>13</sup> Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop. Transportation Research Board. 1999. Figure 1.

<sup>14</sup> Federal Highway Administration (2013). Pavement condition data is for 2011.

<sup>15</sup> TRIP estimate.

<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

<sup>19</sup> Highway Development and Management: Volume Seven. Modeling Road User and Environmental Effects in HDM-4. Bennett, C. and Greenwood, I. 2000.

<sup>20</sup> Your Driving Costs. American Automobile Association. 2012.

<sup>21</sup> Federal Highway Administration (2012). National Bridge Inventory

<sup>22</sup> Ibid.

<sup>23</sup> Ibid.

<sup>24</sup> Texas Transportation Institute. 2012 Urban Mobility Report.

<sup>25</sup> Ibid.

<sup>26</sup> Ibid.

<sup>27</sup> TRIP estimated based on FHWA and TTI data (2013).

<sup>28</sup> Ibid.

<sup>29</sup> Ibid.

<sup>30</sup> Ibid.

<sup>31</sup> TRIP estimate based on analysis of FHWA and TTI data.

<sup>32</sup> TRIP analysis of National Highway Traffic Safety Administration data (2013).

<sup>33</sup> TRIP analysis of National Highway Traffic Safety Administration and Federal Highway Administration data (2013).

<sup>34</sup> TRIP analysis of National Highway Traffic Safety Administration and Federal Highway Administration data (2013).

<sup>35</sup> TRIP estimates based on National Highway Traffic Safety Administration (NHTSA) data.

<sup>36</sup> Adding Highway Shoulders, Width, Reduce Crash Numbers and Save Lives (August 9, 2012). Texas Transportation Institute.

<sup>37</sup> [Testimony of Michael Hancock, president of the American Association of State Highway and Transportation Officials, to the Senate Committee on Environment and Public Works.](#) (Fe. 12, 2014).

<sup>38</sup> U.S. Senate Committee on Environment and Public Works (2013).

[http://www.epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore\\_id=cf1dfe4e-8e60-4506-a9e0-205fe809f314](http://www.epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=cf1dfe4e-8e60-4506-a9e0-205fe809f314)

<sup>39</sup> Federal Highway Administration, 2008. Employment Impacts of Highway Infrastructure Investment.