

FUTURE MOBILITY IN OKLAHOMA:

Meeting the State's Need for Safe and Efficient Mobility

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Founded in 1971, [TRIP](http://www.tripnet.org)® 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, construction and finance; labor unions; and organizations concerned with an efficient and safe surface transportation network.

Executive Summary

Oklahoma's extensive system of roads, highways, bridges and public transit provides the state's residents, visitors and businesses with a high level of mobility. As the backbone that supports the Sooner State, Oklahoma's surface transportation system provides for travel to work and school, visits with family and friends, and trips to tourist and recreation attractions, while simultaneously providing businesses with reliable access for customers, suppliers and employees. Oklahoma must continue to make improvements in its system of roads, highways, bridges and passenger rail to foster economic growth, keep business in the state, and ensure the safe, reliable mobility needed to improve quality of life in Oklahoma.

As Oklahoma looks to rebound from the current recession, the state will need to enhance its surface transportation system by improving the physical condition of its transportation network and enhancing the system's ability to provide efficient and reliable mobility for residents, visitors and businesses. With unemployment in Oklahoma more than doubling from 3.2 percent in February 2008 to 6.5 percent in February 2011, making needed improvements to the state's roads, highways, bridges and transit could provide a significant boost to Oklahoma's economy by creating jobs and stimulating long-term economic growth as a result of enhanced mobility and access.

Approved in February 2009, the American Recovery and Reinvestment Act provided approximately \$464.7 million in stimulus funding for highway and bridge improvements and \$39.2 million for public transit improvements in Oklahoma. This funding has served as a down payment on needed road, highway, bridge and transit improvements, but it is not sufficient to allow the state to proceed with numerous projects needed to modernize its surface transportation system. Meeting Oklahoma's need to modernize and maintain its system of roads, highways, bridges and transit will require a significant, long-term boost in transportation funding at the federal, state or local levels.

Oklahoma has been able to make improvements to its surface transportation system in recent years due to an approximately \$1.8 billion increase in transportation funding over the 2006 to 2015 period as a result of action taken by the state legislature. These additional funds have allowed the Oklahoma Department of Transportation (ODOT) to rehabilitate and reconstruct roadways, improve bridge conditions and add critical safety features to the state's roads. While this funding influx has been helpful, it is imperative that the state maintain the level of funding and continue to make transportation improvements a priority. Recent gains could be lost without continued support for transportation maintenance, improvement and expansion.

At the federal level, Congress is currently deliberating over a long-range federal surface transportation program. The current program, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), originally scheduled to expire on September 30, 2009, now expires on September 30, 2011 following a series of short-term extensions. The level of funding and the provisions of a future federal surface transportation program will have a significant impact on future highway and bridge conditions and safety as well as the level of transit service in Oklahoma, which, in turn, will affect the state's ability to improve its residents' quality of life and enhance economic development opportunities.

In recent years ODOT has been able to accelerate bridge repair and replacement, pavement improvements, and safety upgrades as a result of additional funding provided by the state legislature; however, significant deficiencies still remain. It is imperative that Oklahoma's transportation system continues to be adequately funded in the future if the state is to continue to improve the system and promote economic recovery and growth.

- From 2006 to 2010, an additional \$748 million was made available for road, highway and bridge repairs in Oklahoma as a result of state legislative action taken since 2006.
- An additional \$1.1 billion is anticipated to be provided for roadways in the state from 2011 to 2015 as a result of state legislative decisions – a total of approximately \$1.8 billion from 2006 to 2015.
- ODOT has been able to significantly increase the number of state-maintained bridges rehabilitated or replaced since 2005. Additional transportation funds have allowed the state to decrease the number of structurally deficient, state-maintained bridges by 32 percent, dropping from 1,168 in 2005 to 797 in 2010. By 2015, the number of structurally deficient, state-maintained bridges is projected to decrease to 504, a 57 percent reduction from 2005 levels.
- In 2005, 149 state-maintained bridges were posted or weight restricted. Additional funds have allowed ODOT to decrease that number to 40 bridges in 2010. By 2014, ODOT projects that the number of posted or weight restricted state-maintained bridges will decrease to zero.
- Pavement rehabilitation and reconstruction has been accelerated in recent years, improving the condition of Oklahoma's state-maintained roadways. While 5,935 miles of roadway were in good condition in 2004, that number is projected to increase to 6,272 in 2010 and 6,556 in 2015.
- The number of miles of Oklahoma's state-maintained roadways in poor condition has decreased in recent years and will continue to drop. Since 2004, Oklahoma has experienced a net reduction of more than five percent in the number of miles of roads deemed to be in poor condition, from 2,995 to 2,819. By 2015, the reduction is expected to be nearly 10 percent, with 2,722 miles of state-maintained highway rated in poor condition.
- Between 2006 and 2015, ODOT will have installed 436 total miles of cable-barrier, which will complete planned installations on Oklahoma's Interstate system.
- The American Recovery and Reinvestment Act (ARRA) provided approximately \$464.7 million in stimulus funding for highway and bridge improvements and \$39.2 million for public transit improvements in Oklahoma.
- ARRA funding has served as a down payment on needed road, highway, bridge and transit improvements, but the boost was not sufficient to allow the state to proceed with numerous projects needed to modernize its surface transportation system. Meeting Oklahoma's need to modernize and maintain its system of roads, highways, bridges and transit will require a significant, long-term boost in transportation funding at the federal, state or local levels.

- To ensure that federal funding for highways and bridges in Oklahoma and throughout the nation continues beyond the expiration of SAFETEA-LU, Congress needs to approve a new long-term federal surface transportation program by September 30, 2011.

Despite the recession, population increases and economic growth in Oklahoma over the past two decades have resulted in increased demands on the state's major roads and highways.

- Oklahoma's population reached 3.7 million in 2009, an increase of 17 percent since 1990. The state's population is expected to grow to 3.9 million by 2025.
- Vehicle travel in Oklahoma increased 42 percent from 1990 to 2009 – from 33.1 billion vehicle miles traveled (VMT) in 1990 to 47 billion VMT in 2009.
- By 2025, vehicle travel in Oklahoma is projected to increase by another 35 percent.
- From 1990 to 2009, Oklahoma's gross domestic product, a measure of the state's economic output, increased by 62 percent, when adjusted for inflation, higher than the national average of 52 percent.

In 2008, more than a third of major roads in Oklahoma were in poor or mediocre condition, providing motorists with a rough ride.

- In 2008, 18 percent of Oklahoma's major roads were rated in poor condition and 17 percent were rated in mediocre condition. This includes Interstates, highways, connecting urban arterials and key urban streets that are maintained by state, county or municipal governments.
- 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.
- Roads in need of repair cost each Oklahoma motorist an average of \$425 annually in extra vehicle operating costs – \$978 million statewide. Costs include accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear.
- In the Oklahoma City metropolitan area, where 42 percent of major roads are rated in poor condition and 23 percent are rated in mediocre condition, driving on roads in need of repair costs motorists \$662 each year in extra vehicle operating costs. This is the seventh highest cost per driver among U.S. urban areas with a population of 500,000 or more.
- In the Tulsa metropolitan area, where 36 percent of major roads are rated in poor condition and 26 percent are rated in mediocre condition, driving on roads in need of repair costs motorists \$610 each year in extra vehicle operating costs. This is the twelfth highest cost per driver among U.S. urban areas with a population of 500,000 or more.

- The functional life of Oklahoma's roads is greatly affected by the state's ability to perform timely maintenance and upgrades to ensure that structures last as long as possible. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.

Despite the recent improvement in the condition of state-maintained bridges, Oklahoma ranks second nationally among states with the highest share of its bridges rated structurally deficient. This includes all bridges that are 20 feet or more in length and are maintained by state, local and federal agencies.

- Twenty-two percent of bridges in Oklahoma were structurally deficient in 2010 (twelve percent of state-maintained bridges were rated structurally deficient in 2010). A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. These properties have a major bearing in qualifying a bridge for federal bridge replacement or rehabilitation funds.
- Seven percent of bridges in Oklahoma were functionally obsolete in 2010 (nine percent of state-maintained bridges were functionally obsolete in 2010). Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.
- Bridges that are structurally deficient or functionally obsolete are safe for travel and are monitored on a regular basis by the organizations responsible for maintaining them.

Oklahoma's rural traffic fatality rate is nearly three times higher than the fatality rate on all other roads in the state. Improving safety features on Oklahoma's roads and highways would likely result in a decrease in traffic fatalities in the state. Roadway characteristics are likely a contributing factor in approximately one-third of all fatal and serious traffic accidents.

- Between 2005 and 2009, 3,821 people were killed in traffic accidents in Oklahoma, an average of 764 fatalities per year.
- Oklahoma's traffic fatality rate was 1.57 fatalities per 100 million vehicle miles of travel in 2009, 38 percent higher than the national average of 1.14 fatalities per 100 million vehicle miles of travel.
- The traffic fatality rate in 2009 on Oklahoma's non-Interstate rural roads was 2.71 traffic fatalities per 100 million vehicle miles of travel, which is nearly three times the traffic fatality rate of 0.96 on all other roads and highways in the state.
- A disproportionate share of fatalities takes place on Oklahoma's non-Interstate rural roads. Approximately 60 percent of fatalities take place on rural roads, although they account for only 35 percent of vehicle travel in the state.
- Several factors are associated with vehicle accidents that result in fatalities, including driver behavior, vehicle characteristics and roadway design.

- TRIP estimates that roadway characteristics, such as lane widths, lighting, signage and the presence or absence of guardrails, paved shoulders, traffic lights, rumble strips, obstacle barriers, turn lanes, median barriers and pedestrian or bicycle facilities, are likely a contributing factor in approximately one-third of all fatal and serious traffic crashes.
- Where appropriate, highway improvements can reduce traffic fatalities and accidents while improving traffic flow to help relieve congestion. Such improvements include removing or shielding obstacles; adding or improving medians; adding rumble strips, wider lanes, wider and paved shoulders; upgrading roads from two lanes to four lanes; and better road markings and traffic signals.
- The Federal Highway Administration has found that every \$100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.

Increases in population and vehicle travel in Oklahoma have led to additional traffic congestion in the state's urban areas.

- In 2008, 29 percent of Oklahoma's urban Interstates and other highways or freeways were considered congested, carrying a level of traffic that is likely to result in significant delays during peak travel hours.
- The average rush hour trip in the Oklahoma City metro area takes approximately nine percent longer to complete than during non-rush hour. In the Tulsa area, rush hour trips take seven percent longer to complete than during non-rush hour.
- Drivers in the Oklahoma City area lose \$575 each year due to lost time and wasted fuel as a result of congestion. Each Tulsa area driver loses \$407 per year due to congestion.

The efficiency of Oklahoma'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. Expenditures on highway repairs create a significant number of jobs.

- Annually, \$117 billion in goods are shipped from sites in Oklahoma and another \$135 billion in goods are shipped to sites in Oklahoma, mostly by trucks.
- Eighty percent of the goods shipped annually from sites in Oklahoma are carried by trucks and another six percent are carried by parcel, U.S. Postal Service or courier services, which use trucks for part of the deliveries.
- 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 on the form of reduced vehicle maintenance costs, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.

Sources of information for this report include the Oklahoma Department of Transportation (ODOT), the U.S. Department of Transportation (USDOT), the Bureau of Labor Statistics (BLS), the Federal Highway Administration (FHWA), the U.S. Census, The Bureau of Transportation Statistics (BTS), the National Highway Traffic Safety Administration (NHTSA), the Reason Foundation and the Texas Transportation Institute (TTI). All data used in the report is the latest available.

Introduction

Oklahoma's roads, highways and bridges form vital transportation links for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping and recreation.

With unemployment in Oklahoma more than doubling from 3.2 percent in February 2008 to 6.5 percent in February 2011, the modernization of Oklahoma's surface transportation system is crucial to providing safe and efficient mobility while improving the economic livelihood of the state and accommodating future growth.¹

As the nation looks to rebound from the recession, improving Oklahoma's transportation system could play an important role in boosting the state's economic well-being by providing critically needed jobs in the short term and enhancing the productivity and competitiveness of the state's businesses in the long term.

Oklahoma has been able to improve its surface transportation system in recent years due to an increase in transportation funding approved by the state legislature. These additional funds have allowed the Oklahoma Department of Transportation (ODOT) to rehabilitate and reconstruct roadways, improve bridge conditions and add critical safety features to the state's roads.

However, significant deficiencies still exist throughout the transportation system. While this funding influx has been helpful, it is imperative that the state maintain the level of funding and continue to make transportation funding a priority. Recent gains could be lost without continued support for transportation maintenance, improvement and expansion.

As Oklahoma faces the challenge of preserving and improving its roadways, bridges and transit systems, the future level of local, state and federal highway funding will be a critical factor in whether the state's residents, businesses and visitors continue to enjoy access to a safe and efficient transportation network.

This report examines the condition, use and safety of Oklahoma’s roads, highways, bridges and public transit systems, transportation funding needs in the state, and the future mobility needs in Oklahoma.

Sources of information for this report include the Oklahoma Department of Transportation (ODOT), the U.S. Department of Transportation (USDOT), the Bureau of Labor Statistics (BLS), the Federal Highway Administration (FHWA), the U.S. Census, The Bureau of Transportation Statistics (BTS), the National Highway Traffic Safety Administration (NHTSA), the Reason Foundation and the Texas Transportation Institute (TTI). All data used in the report is the latest available.

Funding Oklahoma’s Surface Transportation System

In recent years ODOT has been able to accelerate bridge repair and replacement, pavement improvements and safety upgrades largely as a result of additional funding. From 2006 to 2010, an additional \$748 million was made available for road, highway and bridge repairs as a result of state legislative action taken since 2006. And an additional \$1.1 billion is anticipated to be provided for roadways in the state from 2011 to 2015 as a result of these legislative decisions – a total of more than \$1.8 billion from 2006 to 2015.² The chart below calculates the amount of state roadway funding made available from 2005 to 2015 as a result of state legislative action.

Chart 1. Total additional Oklahoma road, highway and bridge spending 2005-2015 due to state legislative action.

Year	Spending due to state legislative action
2005	\$4,891,585
2006	\$33,745,178
2007	\$137,012,406
2008	\$78,079,791
2009	\$232,546,181
2010	\$261,873,340
2011	\$125,155,132
2012	\$179,532,325
2013	\$230,729,232
2014	\$267,330,500
2015	\$286,228,925
TOTAL	\$1,837,124,595

Source: ODOT response to TRIP survey.

The additional funding provided by the legislature has allowed Oklahoma to rehabilitate and replace bridges to reduce the number of structurally deficient, functionally obsolete and load posted or weight restricted bridges; rehabilitate or reconstruct thousands of miles of state-maintained roadways; and install hundreds of miles of cable-barriers to improve roadway safety throughout the state.

ODOT's accelerated bridge repair and replacement efforts have significantly reduced the number of deficient bridges in the state in recent years. The chart below details the number of bridges rehabilitated or replaced since 2005 and the number projected to be addressed through 2015.

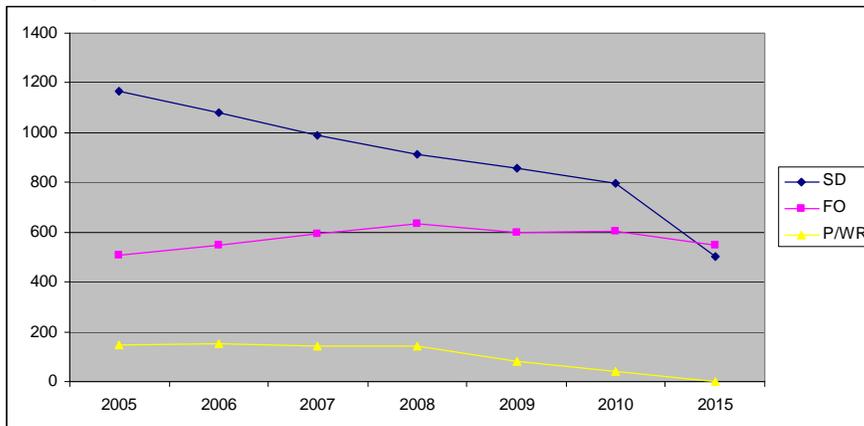
Chart 2. Bridges rehabilitated or replaced, 2005 – 2010. Projected rehabilitation or replacement, 2011 – 2015.

	Rehabilitated	Replaced
2005	2	27
2006	19	34
2007	25	95
2008	24	57
2009	83	56
2010	54	57
2011	47	39
2012	27	49
2013	35	77
2014	40	100
2015	45	49

Source: ODOT response to TRIP survey

Additional transportation funds have allowed the state to reduce the number of state-maintained structurally deficient bridges from 1,168 in 2005 (17 percent of total bridges) to 797 in 2010 (12 percent of total bridges). By 2015, the number of state-maintained structurally deficient bridges is projected to decrease by nearly 60 percent to 504 (seven percent of total bridges).³ In 2005, 149 bridges were posted or weight restricted. Additional funds have allowed ODOT to decrease that number to 40 bridges in 2010. By 2014, ODOT projects that the number of posted or weight restricted bridges will decrease to zero.⁴

Chart 3. Structurally deficient (SD), functionally obsolete (FO) and posted/weight restricted (P/WR) state-maintained bridges in Oklahoma, 2005-2015.



Source: ODOT response to TRIP survey.

Pavement rehabilitation and reconstruction has been accelerated in recent years largely as a result of increased state funding, improving the condition of state maintained roadways. The chart below details the number of miles ODOT has rehabilitated or reconstructed between 2005 and 2010, as well as the number projected from 2011 to 2015.

Chart 4. Miles of roadway rehabilitated or reconstructed, 2005-2015.

	Rehabilitated	Reconstructed
2005	226	41
2006	227	64
2007	262	73
2008	279	45
2009	610	107
2010	577	82
2011	563	90
2012	435	45
2013	408	57
2014	470	102
2015	454	71

Source: ODOT response to TRIP survey.

While 5,935 miles of Oklahoma's state-maintained roadway were in good condition in 2004, that number is projected to increase to 6,272 in 2010 and 6,556 in 2015. The number of miles in poor condition has decreased in recent years and will continue to drop. Since 2004, Oklahoma has experienced a net reduction of more than five percent in the number of miles of roads deemed to be in poor condition, from 2,995 of highway to 2,819. By 2015, the reduction is expected to be nearly 10 percent, with 2,722 miles of state-maintained highway rated in poor condition.⁵

The state has also undertaken numerous safety improvements as a result of increased transportation funding. Between 2006 and 2012, ODOT will have installed a total of 436 miles of cable-barrier, which will complete planned installations on Oklahoma's Interstate system.⁶

Chart 5. Miles of cable-barriers installed, 2006-2012.

Miles	
2006	17
2007	93
2008	88
2009	54
2010	99
2011	54
2012	31

Source: ODOT response to TRIP survey.

While state funding has been critical in allowing needed transportation projects to move forward in Oklahoma, federal funding also plays a critical role. The current long-range federal surface transportation program, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), originally scheduled to expire on September 30, 2009, now expires on September 30, 2011 following a series of short-term extensions. The level of funding and the provisions of a future federal surface transportation program will have a significant impact on future highway and bridge conditions and safety as well as the level of transit service in Oklahoma.

Crafting a new federal highway and transit program is occurring during a time when the nation’s surface transportation program faces numerous challenges, including significant levels of deterioration, increasing traffic congestion, the need to further reduce the number of traffic deaths and a decline in revenues going into the Federal Highway Trust Fund.

Federal stimulus funding has served as a down payment on needed road, highway, bridge and transit improvements, but it is still not sufficient to allow the state to proceed with numerous projects needed to improve and enhance its surface transportation system. The American Recovery and Reinvestment Act provided approximately \$464.7 million in stimulus funding for highway and bridge improvements and \$39.2 million for public transit improvements in Oklahoma, a total of approximately \$503.9 million.

Population, Travel and Economic Trends in Oklahoma

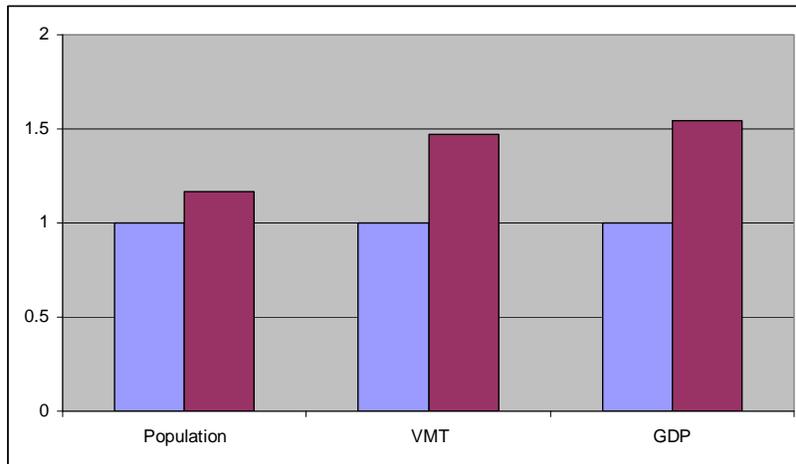
Oklahoma residents and businesses require a high level of personal and commercial mobility. Despite the current recession, population increases and economic growth in the state over the past two decades have resulted in an increase in the demand for mobility, resulting in an increase in vehicle miles of travel (VMT). To foster a high quality of life in Oklahoma, it will be critical that the state provide and preserve a safe and modern transportation system that can accommodate future growth in population and vehicle travel and will foster economic development.

Oklahoma's population grew 17 percent between 1990 and 2009, reaching approximately 3.7 million residents in 2009.⁷ Oklahoma's population is projected to increase to 3.9 million by 2025.⁸

Oklahoma experienced moderate economic growth from 1990 to 2009, when the state's gross domestic product (GDP), a measure of the state's economic output, increased by 62 percent, when adjusted for inflation, higher than the national average of 52 percent.⁹

From 1990 to 2009, annual vehicle miles of travel in Oklahoma increased 42 percent, from 33.1 billion miles traveled annually to 47 billion miles traveled annually.¹⁰ Based on population and other lifestyle trends, TRIP estimates that travel on Oklahoma's roads and highways will increase by 35 percent by 2025, to approximately 65.5 billion miles of travel.¹¹

Chart 6: Oklahoma's population, GDP and Vehicle Travel increase 1990-2009. 1 = 1990 level



Source: TRIP analysis of federal data

Condition of Oklahoma's Roads

The life cycle of Oklahoma'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 is evaluated and classified as being in poor, mediocre, fair or good condition.

In 2008, 35 percent of Oklahoma's major roads were rated in poor or mediocre condition, providing motorists with a rough ride.¹² Eighteen percent of Oklahoma's major roads were rated in poor condition and 17 percent were rated in mediocre condition.¹³ 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 mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition.

A desirable goal for state and local organizations that are responsible for road maintenance is to keep 75 percent of major roads in good condition.¹⁴ In Oklahoma, 40 percent of the state's major roads were in good condition in 2008.¹⁵

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.¹⁶

As Oklahoma's roads and highways continue to age, they will reach a point 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 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. Roads in poor condition – which may include potholes, rutting or rough surfaces – increase the cost to operate and maintain a vehicle. These additional vehicle operating costs include accelerated vehicle depreciation, additional vehicle repairs, increased fuel consumption and increased tire wear. TRIP estimates that additional vehicle operating costs borne by Oklahoma motorists as a result of driving on roads in poor condition is \$978 million annually, or approximately \$425 per motorist each year.¹⁷

In the Oklahoma City metropolitan area, where 42 percent of major roads are rated in poor condition and 23 percent are rated in mediocre condition, driving on roads in need of repair costs

motorists \$662 each year in extra vehicle operating costs -- the seventh highest cost per driver among U.S. cities with a population of 500,000 or more.¹⁸

Thirty-six percent of major roads in the Tulsa area are rated in poor condition and 26 percent are rated in mediocre condition. Driving on roads in need of repair costs each Tulsa motorist \$610 per year in extra vehicle operating costs -- the twelfth highest cost per driver among U.S. cities with a population of 500,000 or more.¹⁹

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.²⁰

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 2010 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.²¹ 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 Oklahoma

Oklahoma'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. In 2010, 29 percent of Oklahoma's bridges were rated as structurally deficient or functionally obsolete.²²

Twenty-two percent of Oklahoma's bridges were rated as structurally deficient in 2010 (twelve percent of Oklahoma's state-maintained bridges were rated as structurally deficient in 2010).²³ A bridge is structurally deficient when the physical condition of any element is lacking, such as 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.

Seven percent of Oklahoma's bridges were rated functionally obsolete in 2010 (nine percent of state-maintained bridges were rated functionally obsolete in 2010).²⁴ 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.

Bridges that are structurally deficient or functionally obsolete are safe for travel and are monitored on a regular basis by the organizations responsible for maintaining them. 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 Oklahoma

Traffic congestion in Oklahoma is a growing burden in key urban areas and threatens to impede the state's economic development. Congestion on Oklahoma's urban highways is growing as a result of increases in vehicle travel and population.

In 2008, 29 percent of Oklahoma's urban Interstates and other highways or freeways were congested, carrying traffic volumes that result in significant rush hour delays.²⁵ Highways that carry high levels of traffic are also more vulnerable to experiencing lengthy traffic delays as a result of traffic accidents or other incidents.

While the increased state funding has allowed Oklahoma to improve its transportation system in recent years, traffic congestion in Oklahoma's largest urban areas is likely to worsen unless the state is able to expand the capacity of its road and transit systems. The average rush hour trip in the Oklahoma City metro area takes approximately nine percent longer to complete than during non-rush hour. In the Tulsa area, rush hour trips take seven percent longer than non-rush hour trips.²⁶

Drivers in the Oklahoma City area lose \$575 each year due to lost time and wasted fuel as a result of congestion. Each Tulsa area driver loses \$407 per year due to congestion.²⁷

Traffic Safety in Oklahoma

A total of 3,821 people were killed in motor vehicle accidents in Oklahoma from 2005 through 2009, an average of 764 fatalities per year.²⁸

Oklahoma's traffic fatality rate was 1.57 fatalities per 100 million vehicle miles of travel in 2009 – higher than the national average of 1.14.²⁹

Chart 7. Traffic fatalities in Oklahoma from 2005 – 2009.

<i>Year</i>	<i>Fatalities</i>
2005	803
2006	765
2007	766
2008	749
2009	738
Total	3,821

Source: National Highway Traffic Safety Administration

Oklahoma's rural, non-Interstate roads have a fatality rate that is nearly three times higher than the rate on all other roads in the state. The traffic fatality rate in 2009 on Oklahoma's non-Interstate rural roads was 2.71 traffic fatalities per 100 million vehicle miles of travel – nearly three times the rate of 0.96 traffic fatalities per 100 million vehicle miles of travel on all other roads and highways in the state.³⁰

Three major factors are associated with fatal vehicle accidents: driver behavior, vehicle characteristics and roadway characteristics. TRIP estimates that roadway characteristics, such as lane widths, lighting, signage and the presence or absence of guardrails, paved shoulders, traffic lights, rumble strips, obstacle barriers, turn lanes, median barriers and pedestrian or bicycle facilities, are likely a contributing factor in approximately one-third of all fatal and serious traffic crashes.³¹

Improving safety on Oklahoma'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.

Where appropriate, 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. The Federal Highway Administration has found that every \$100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.

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

The following chart shows the correlation between specific needed road improvements and the reduction of fatal accident rates nationally.³²

Chart 8. Reduction in fatal accident rates after roadway improvements.

Type of Improvement*	Reduction in Fatal Accident Rates after Improvements
New Traffic Signals	53%
Turning Lanes and Traffic Signalization	47%
Widen or Modify Bridge	49%
Construct Median for Traffic Separation	73%
Realign Roadway	66%
Remove Roadside Obstacles	66%
Widen or Improve Shoulder	22%

Source: TRIP analysis of U.S. Department of Transportation data

Importance of Transportation to Economic Growth

Despite the recession, many industries contributed to boosting Oklahoma’s gross domestic product by 62 percent from 1990 to 2009 (when adjusted for inflation).³³ Oklahoma's businesses are dependent on an efficient, safe, and modern transportation system that will foster continued business

diversification and opportunity throughout the state. 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. The advent of 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 accepting customer orders through the Internet. 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 literally becoming rolling warehouses.

Highways are vitally important to economic development in Oklahoma. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers 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, \$117 billion in goods are shipped from sites in Oklahoma and another \$135 billion in goods are shipped to sites in Oklahoma, mostly by trucks.³⁴ Eighty percent of the goods shipped annually from sites in Oklahoma are carried by trucks and another six percent are carried by parcel, U.S. Postal Service or courier services, which use trucks for part of their deliveries.³⁵

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.³⁶

The cost of road and bridge improvements are more than offset because of 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.³⁷

Conclusion

As it looks to enhance and build a thriving, growing and dynamic state, it will be essential that Oklahoma is able to provide a 21st Century network of roads, highways, bridges and public transit that can accommodate the mobility demands of a modern society.

While Oklahoma has made recent strides in improving its transportation system, the state will need to continue to prioritize the funding of road and bridge improvements, safety enhancements and capacity expansion at the local, state and federal level in order to improve remaining deficiencies and reap the benefits of a modern surface transportation system.

Making needed improvements to Oklahoma's surface transportation network 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.

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Endnotes

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- ¹ United States Department of Labor. Regional and State Employment and Unemployment Summary. <http://www.bls.gov/news.release/laus.nr0.htm> .
- ² ODOT response to TRIP survey, October 2010
- ³ Ibid.
- ⁴ Ibid.
- ⁵ Ibid.
- ⁶ Ibid.
- ⁷ U.S. Census Bureau annual population estimate.
- ⁸ University of Oklahoma -Lincoln. Bureau of Business Research.
- ⁹ TRIP analysis of Bureau of Economic Analysis data
- ¹⁰ U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 1990 and Federal Highway Administration 2009 VMT estimates.
- ¹¹ TRIP calculation based on U.S. Census and Federal Highway Administration data.
- ¹² Federal Highway Administration. TRIP analysis of Highway Statistics 2008. Charts HM-63, HM-64.
- ¹³ Ibid.
- ¹⁴ Why We Must Preserve our Pavements, D. Jackson, J. Mahoney, G. Hicks, 1996 International Symposium on Asphalt Emulsion Technology.
- ¹⁵ Federal Highway Administration. TRIP analysis of Highway Statistics 2008. Charts HM-63, HM-64.
- ¹⁶ Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop. Transportation Research Board. 1999. Figure 1.
- ¹⁷ TRIP estimate based on FHWA and AAA calculations.
- ¹⁸ Hold the Wheel Steady: America's Roughest Rides and Strategies to make our Pavements Smoother. TRIP, September 2010.
- ¹⁹ Ibid.
- ²⁰ Highway Development and Management: Volume Seven. Modeling Road User and Environmental Effects in H DM-4. Bennett, C. and Greenwood, I. 2000.
- ²¹ Your Driving Costs. American Automobile Association. 2010.
- ²² National Bridge Inventory 2010, Federal Highway Administration.
- ²³ FHWA National Bridge Inventory 2010 and ODOT response to TRIP survey.
- ²⁴ Ibid.
- ²⁵ TRIP analysis of Federal Highway Administration data. Highway Statistics 2008, Table HM-61. Interstate and Other Freeways and Expressways with a volume-service flow ratio above .70, which is the standard for mild congestion, are considered congested.
- ²⁶ Texas Transportation Institute (2011), 2010 Urban Mobility Report.
- ²⁷ Ibid.
- ²⁸ U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 2005-2009 www.fhwa.dot.gov and <http://www-fars.nhtsa.dot.gov> .
- ²⁹ TRIP analysis of 2009 NHTSA and FHWA data.
- ³⁰ Ibid.
- ³¹ TRIP estimate based on TRIP analysis of FHWA data.
- ³² Highway Safety Evaluation System; 1996 Annual Report on Highway Safety Improvement Programs; U.S. Department of Transportation
- ³³ Source: TRIP analysis of Bureau of Economic Analysis data
- ³⁴ Bureau of Transportation Statistics, U.S. Department of Transportation. 2007 Commodity Flow Survey, State Summaries. http://www.bts.gov/publications/commodity_flow_survey/2007/states/
- ³⁵ Ibid.
- ³⁶ Federal Highway Administration, 2008. Employment Impacts of Highway Infrastructure Investment.
- ³⁷ 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