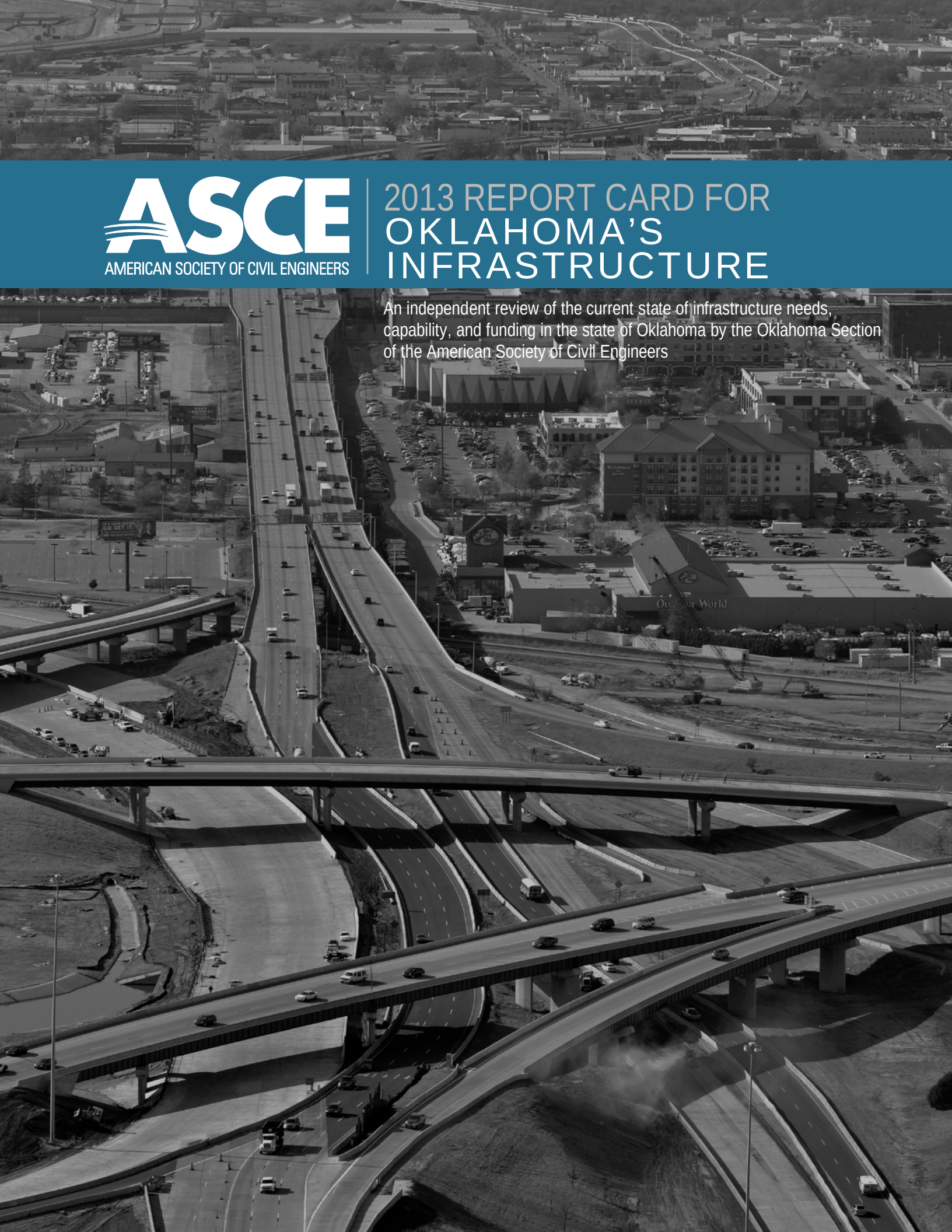

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

2013 REPORT CARD FOR OKLAHOMA'S INFRASTRUCTURE

An independent review of the current state of infrastructure needs, capability, and funding in the state of Oklahoma by the Oklahoma Section of the American Society of Civil Engineers

ABOUT THE REPORT CARD

Oklahoma's infrastructure is in need of immediate attention. This is the conclusion of the 2013 *Report Card for Oklahoma's Infrastructure*, the first-ever report from the Oklahoma Section of the American Society of Civil Engineers (ASCE). The report card exists to communicate the overall performance of infrastructure. An expert team of more than twenty civil engineers researched the major components of Oklahoma's infrastructure for more than 18 months to arrive at the Report Card's grades. The technical reports which support the grades were peer-reviewed by independent experts and scrutinized by ASCE's Advisory Council and conclude that our infrastructure is poorly maintained, inadequately funded and not designed to meet future demands.

The purpose of the Report Card is for the public to easily understand how their state's infrastructure is being maintained. As civil engineers, we understand the intricate details of infrastructure. We plan, design, build, maintain, and operate roads, bridges, dams, levees, and we provide the public with safe and clean drinking water. The Oklahoma Section of ASCE believes that this responsibility also carries an obligation to inform the public what we know about the state of our infrastructure. In this sense, we present this Report Card as a fulfillment of our public duty as designers and builders of public facilities.

ASCE first reported on the state of the nation's infrastructure in 1995. The most current report card, published in 2009, gave the nation's infrastructure a grade of "D." This first-ever *Report Card for Oklahoma's Infrastructure* is an objective report prepared by civil engineer volunteers through the collaboration of private companies and public agencies. We urge our leaders to consider these recommendations, take actions to improve our infrastructure, and secure a better future for all Oklahoma citizens.

As a citizen, we hope you find this *Report Card for Oklahoma's Infrastructure* both interesting and informative because this Report Card is about the future of your community and ours.

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EXECUTIVE SUMMARY

Oklahoma Report Card Committee
ASCE Oklahoma Section

The American Society of Civil Engineers (ASCE) was founded in 1852, and is America's oldest national engineering society. Our mission is to provide value to our members and partners, advance civil engineering and serve the public good. To carry out that mission, ASCE advances technology, encourages lifelong learning, promotes professionalism and the profession, develops civil engineers, leaders and advocates infrastructure and environmental stewardship. The Oklahoma Section of ASCE was founded in 1920, and has more than 850 members in two branches: Oklahoma City and Tulsa. The Oklahoma Section of ASCE joins 37 other states that have developed a state-specific report card to complement the well-known national *Report Card for America's Infrastructure*.

Aviation, Bridges, Dams, Levees, Rail, Roads, Transit, and Water/Wastewater are all civil infrastructure. As a society, we invest in civil infrastructure to support an elevated quality of life; we expect this infrastructure to be here tomorrow and anticipate that it will be even better in the future.

A large number of public, private and nonprofit groups routinely collect data on the state's infrastructure. This data is often spread out and coded for the specific use of a particular group. Rarely is the data gathered across multiple infrastructure areas and presented to the public in an easy-to-understand format. The Oklahoma Section of ASCE has developed this fact-based assessment because its members believe the public has a right to know exactly what the condition is of our infrastructure. By assigning a letter grade to each infrastructure area, the public can gauge the relative strengths and weaknesses of each area and call on our leaders to make the appropriate decisions.

The Report Card for Oklahoma's Infrastructure has been developed by ASCE volunteers. More than twenty professionals, primarily civil engineers, from across the state were involved in the effort. Volunteers from public agencies, private firms and nonprofit groups worked diligently for more than 18 months to develop the report card. The committee was tasked with data gathering, developing grading criteria, grading the infrastructure and offering targeted recommendations. activities. The mixture of public, private and nonprofit volunteers, along with the peer review process provides an unbiased and neutral opinion.

The committees assessed data reaching as far back as 10 years and follows grading guidance developed by ASCE national for the *Report Card for America's Infrastructure*. The seven fundamental grading components that were considered (if available) are:

- Capacity
- Condition
- Funding
- Future Need
- Operations and Maintenance
- Public Safety
- Resilience

It is important that these terms are clearly defined, as they will be discussed in each of the infrastructure sections:

Capacity: A measure of how much reserve remains in the system.

Condition: A measure of ability of the system to perform as it was designed.

Funding: A measure of the past, current and predicted future investment in the system.

Future Need: A measure of the projected demand and projected importance of the system.

Operations and Maintenance: A measure of the past, current and predicted future ability to preserve the system.

Public Safety: A measure of the danger posed by an ineffective system.

Resilience: A measure of the ability for a system to withstand occasional overloads.

The Report Card utilized a 10-point grading scale, similar to what is done in developing a traditional school report card. Each of the seven fundamental grading components was assigned a weighting factor by the committees and was graded for each infrastructure category.

- 90-100 = A Exceptionally Performing
- 80-89 = B Satisfactorily Performing
- 70-79 = C Marginally Performing
- 60-69 = D Poorly Performing
- 59 or Below = F Failing Infrastructure

The Report Card for Oklahoma's Infrastructure is a practical, yet powerful tool. Where infrastructure is marginally performing, poorly maintained, or failing, immediate action should be taken by the public and our elected leaders to reverse the trend and to improve the grade. Each category that was reviewed contains specific recommendations by infrastructure experts so our leaders will have a clear course of action.

The Oklahoma Section of ASCE plans to update *The Report Card for Oklahoma's Infrastructure* every four years to inform the public and our elected leaders on where we have improved and where we should commit more resources. Our primary goal for this project is to share our knowledge and expertise with the public to help make Oklahoma a stronger, safer, healthier and more prosperous community that serves all of its citizens' needs.

OKLAHOMA'S REPORT CARD

Each category was evaluated on the basis of capacity, condition, funding, future need, operation and maintenance, public safety and resilience.

C+ AVIATION
D+ BRIDGES
D DAMS
D- LEVEES
B RAIL
D ROADS
D+ TRANSIT
D+ WATER / WASTEWATER

C+ AVIATION

SUMMARY

The Oklahoma airport system includes 114 publicly owned airports. Tulsa International Airport, Oklahoma City Will Rogers World Airport, and Lawton-Fort Sill Regional Airport are the three primary commercial service airports in the state. The remainder are general aviation airports that include 49 regional business airports, 43 of which are jet capable. Oklahoma's aviation and aerospace industry employees approximately 144,000 people making it the state's largest employer.

The Oklahoma Aeronautics Commission expends 68 percent of its annual revenues on airport infrastructure. The three-year capital improvements program approved by the OAC on November 10, 2010, for fiscal years 2011-2013, identified approximately $43.2 million in funded projects, $14 million for FY 2012.

CONDITION

The largest capital investment and maintenance cost at an airport is in the pavement. Pavements deteriorate over time due to environmental conditions and traffic. Cracks and other pavement distresses must be repaired or eventually the pavement has to be reconstructed.

A common way to monitor this deterioration is with a Pavement Condition Index (PCI). The PCI measures the type, extent, and severity of pavement distresses like cracking, rutting, and spalling. The PCI also measures how smooth or rough it feels to drive over the pavement. PCI's are accepted as an excellent method to monitor the pavement condition over time. The PCI provides a numerical rating for the condition of the pavement at the airport. A rating of 0 is worst and 100 is best.

- 100 to 86 = Excellent
- 85 to 71 = Very Good
- 70 to 61 = Good
- 60 to 41 = Fair
- 40 to 0 = Poor

The PCI for each airport was forecasted for 2012 and weighted for each runway and taxiway. The average PCI value recorded for 83 of Oklahoma's airfield pavements for 2012 is approximately 66, or good condition. It has been observed that the PCI drops about 3 points per year if the pavement is not properly maintained. This means that in less than 10 years these pavements, without proper maintenance, will deteriorate to a poor condition and need to be reconstructed. It has been shown that for every $1 spent on pavement repair and maintenance when the PCI is above 60 will save $4 or $5 spent on major pavement repair or reconstruction later when the PCI drops below 40. Therefore, airports must spend the money necessary to maintain and protect their pavements in order to greatly lower the costs that will be incurred in the future without proper pavement maintenance.

CAPACITY

The capacity of the airport system in Oklahoma is adequate to accommodate the number of take-offs and landings on the existing runways at the Oklahoma's airports. However from polling airport managers at general aviation airports, there is a waiting list for hangar space to store aircraft safely out of Oklahoma's sun, wind, rain, hail, ice, and snow.

FUTURE NEED

In addition to more hangar space, current and future needs at airports include improving runway safety areas to meet FAA criteria, automated weather observation systems, electrical, lighting and navigational aid (NAVAID) maintenance and improvements, and pavement maintenance.

A Runway Safety Area (RSA) is a defined surface surrounding the runway prepared or suitable for reducing the risk or damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. Because this is an important safety issue for the flying public, the airports that do not meet the FAA's RSA criteria should be addressed. This is typically a matter of earthwork grading along the edges and ends of the runway.
An Automated Weather Observation System (AWOS) is a surface weather reporting station that allows pilots to obtain weather conditions prior to takeoff and during flight to a destination airport. The installation of AWOS at all regional business airports is a goal of the OAC and five regional airports still need an AWOS to achieve all weather capability at those airports.

Electrical systems that operate runway and taxiway edge lights, lighted airfield signs, and NAVAIDs are critical to pilots in poor visibility conditions and for night flying. Many of these systems are in need of maintenance and operational improvement. Older direct buried circuits have deteriorated over time and should be replaced with new cables in conduits. In addition, new LED lighting systems have been developed that should be used as older systems are replaced because these new systems require much less electrical power and maintenance to operate.

FUNDING

The three primary commercial service airports receive funding from the federal Airport Improvement Program based on the number of enplaned passengers, tons of cargo enplaned, and passenger facility charges. The general aviation airports receive funding from federal Non-Primary Entitlement program, federal state apportionment, federal discretionary funds, and state funds. Both primary commercial service and general aviation airports must also match the funding with a percentage, ranging from 5% to 50% of federal and state funding. Most projects require a 10% match.

The OAC expends 68% of annual revenues on general aviation airport infrastructure. The three-year capital improvements program approved by the OAC on November 15, 2012 for fiscal years 2013-2015 identifies a total of approximately $42.9 million in funded projects and approximately $20.8 million for fiscal year 2013.

Oklahoma airports are anticipated to receive approximately $25.2 million in 2013 for infrastructure improvements:

- $1.5 million: State Funding from Oklahoma Aeronautics Commission
- $3.4 million: State Apportionment from FAA
- $3.0 million: Federal Discretionary from FAA
- $15.0 million: Federal Non-Primary Entitlement from FAA
- $2.3 million: Local Airports

KEY TERMS

Following is a general description of terms associated with this report card:

- **Oklahoma Aeronautical Commission (OAC)** – The Oklahoma Aeronautics Commission (OAC) promotes the aerospace and aviation industry through critical planning and development for the state's public airport system. The OAC fosters partnerships between various public entities to act as airport sponsors, and encourages public-private

partnerships to grow the aerospace industry.

- **Pavement Condition Index (PCI)** – A numerical rating scale from 0-100 used to indicate the condition of a pavement. It provides a measurement of the present condition of the pavement based on the distresses observed on the surface which indicate structural integrity and surface operational condition. The PCI is used to establish a rate of deterioration and as a rational basis to prioritize maintenance and repair needs.

RECOMMENDATIONS FOR ACTION

The ASCE Oklahoma Section recommends the following measures be considered:

1. Increase funding for preventative maintenance in order to preserve the pavements now, in return saving many more dollars later when major repair or reconstruction will be required.

2. Examine Runway Safety Areas and those that do not meet the FAA's criteria should be improved to meet FAA standards and improve safety for the flying public.

3. Improve navigational aids including AWOS, approach light systems, airfield edge lighting and airfield signage needed to enhance airport safety and allow airports to be operated in weather conditions that currently close some airports.

4. Provide new hangars needed to meet current capacity needs. They will also support economic activity and usage of Oklahoma's airports throughout the state. Additional hangars are needed to protect aircraft in Oklahoma's sometimes severe weather conditions.

SOURCES

FY 2010 Annual Report, Oklahoma Aeronautics Commission

Three Year Capital Improvement Program: FY 2013-2015, Oklahoma Aeronautics Commission

A Strategic Future for Oklahoma's Aerospace Industry, September 2009, Prepared by Iron Wolf Community Resources, Simply Strategy, RTI International, and Scruggs & Associates

FY02-10 Report Card, Oklahoma Aeronautics Commission

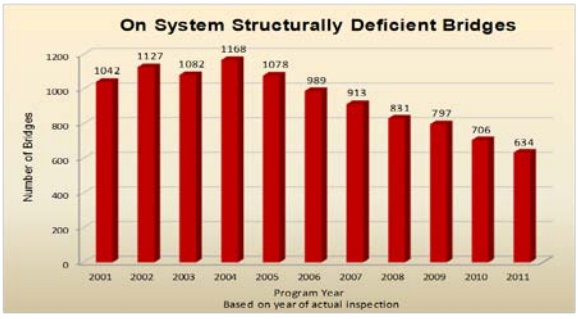
D+ BRIDGES

SUMMARY

Approximately one in five bridges that Oklahoma motorists cross each day used to be structurally-deficient or deteriorating to some degree. In recent years, the state of Oklahoma has consistently ranked at or near the bottom of multiple lists as having the worst bridges in the nation. Poorly maintained transportation infrastructure and deficient bridges have a detrimental impact on Oklahoma commerce, job creation and economic growth, but most importantly endangers our citizens. Structurally-deficient bridges require significant maintenance, rehabilitation, and reconstruction costs that increase as these bridges exceed their lifespan.

As a result of the bold and visionary plan of Oklahoma's Governor the structurally-deficient bridge numbers are expected to drop to near zero by the end of the decade. Oklahoma's focus and progress is evident with the 2011 annual bridge inspection reports revealing that the 706 structurally-deficient bridges recorded in 2010 has been reduced to 634 of the recorded 6,812 bridges or to 9.3% of the total.

Table 1: On System Structurally Deficient Bridges



Oklahoma has been working to address these needs with increased funding in the recent years. Phase 1 of the referenced Governor's *Bridge Improvement and Turnpike Modernization Plan* included the improvement of 126 previously unfunded bridges added to the Oklahoma Department of Transportation's (ODOT) 2012-2019 Eight-Year Construction Work Plan (CWP). Phase 2 was addressed by legislation passed during the 2012 session that enhanced the Rebuilding Oklahoma Access and Driver Safety (ROADS) fund beginning in 2014. With the passage of this legislation, the remaining 167 structurally-deficient bridges were added to the 2013-2020 ODOT Eight-Year CWP.

CONDITION AND CAPACITY

As of 2010, Oklahoma had 23,680 highway bridges: 6,812 of them owned by the state; 15,996 owned by local counties, cities and towns; and 872 owned by other entities, such as private business and federal agencies. Ownership of a particular bridge matters because it often determines which jurisdiction is responsible for maintenance and repair. Table 2 shows the number and average annual daily traffic on Oklahoma's bridges.

Table 2: Overview of Oklahoma Bridge Statistics

	# of Bridges	Bridge Average Annual Daily Traffic
State System	6,812	51,208,756
Local System	15,996	9,180,554
Other	872	7,518,351
Total	23,680	67,907,691

Rural bridges often provide crucial access to jobs and medical services for residents in sparsely populated areas. Urban bridges, on the other hand, carry high volumes of traffic to and within regional economic centers.

Of the 6,812 bridges on the state highway system, 1,207 are either too narrow to support today's traffic or have structural deficiencies, or both.

FUNDING AND FUTURE NEED

As of 2011, ODOT has a backlog of $4.2 billion in bridge construction needs. In 20 years, additional accrual costs of bridge construction will be $4.4 billion. The total annual costs for bridge construction over a 20-year period equates to $434 million.

Preventative maintenance over a 20-year period is estimated at $241 million or $12 million annually. Normal maintenance of both roads and bridges requires $327 million per year. This does not include engineering and administration costs.

ODOT maintains an annual budget of $1 billion for the state highway program consisting of funds from the Federal Highway Trust Fund, the State Transportation Fund, and the state's Rebuilding Oklahoma Access and Driver safety (ROADS) Fund. The total transportation needs including bridges is $1.7 billion annually.

While these efforts exemplify the wise investment of the available resources, today ODOT recognizes an additional 144 bridges that are narrow, have low sufficiency, or both, that are not in the current 2013-2020 CWP that are in need of complete rehabilitation or replacement. Also, we must consider that continuing long term annual bridge replacement commitments will be required to keep pace with the projected aging and deterioration rates of our current bridge inventory.

OPERATIONS AND MAINTENANCE

Federal law requires states to inspect all bridges 20 feet or longer at least every two years. Some bridges with recognized and documented conditional issues may require even more frequent inspections.

The current 2013-2020 ODOT 8-Year CWP includes the replacement or major rehabilitation of 951 bridges. ODOT has always envisioned the development of an aggressive bridge rehabilitation program formulated to effect badly needed improvements on marginal bridges, but never possessed the resources required to launch a meaningful initiative. ODOT has instituted a bridge specific program designed to be flexible and somewhat reactive. This bridge rehabilitation program allows ODOT to stretch scarce regular maintenance dollars farther. At the same time, the program has proven effective in slowing or stemming further deterioration or functional decline of borderline bridge infrastructure and enhances the ability to manage these transportation assets in a manner that maximizes their life cycle. The annual investment for bridge rehabilitations is $40 million.

PUBLIC SAFETY

Tulsa, Oklahoma in 2010 was ranked #1 for the highest percentage of structurally-deficient bridges for metropolitan areas with a population of 500,000 to 1 million people. Tulsa currently has 27.5% or 783 bridges rated as structurally-deficient. Approximately 44 drivers in Tulsa cross a deficient bridge every second.

The average age of bridges in the United States is 42 years old. The average age of Oklahoma bridges is 44.6 years old. Most bridges are designed to last 50 years. As of 2010, 10,922 of Oklahoma's bridges are over 50 years old.

Oklahoma City, Oklahoma in 2010 was ranked #1 for the highest percentage of structurally-deficient bridges for metropolitan areas with a population of 1 to 2 million people. Oklahoma City has 19.8% or 685 bridges rated as structural-deficient. Approximately 22 drivers in Oklahoma City cross a deficient bridge every second.

RECOMMENDATIONS FOR ACTION

"We cannot continue to ignore our transportation network's vital maintenance needs. The costs of current practices are well known, as roads and bridges continue to display the effects of wear and age, suffering the results of underinvestment.

Without a change in both spending levels and overall priorities, Oklahoma will need $480 from each driver to fix all of the structurally-deficient bridges. As our bridges continue to age – more than 60% of all bridges will be past their useful life in 2030 – this figure will only grow."[4]

The ASCE Oklahoma Section recommends the following measures be considered:

1. Deliver the Governor's program to decrease the number of structurally-deficient bridges in Oklahoma.

2. Develop plan to address non-state highway system bridges that are structurally deficient.

SOURCES

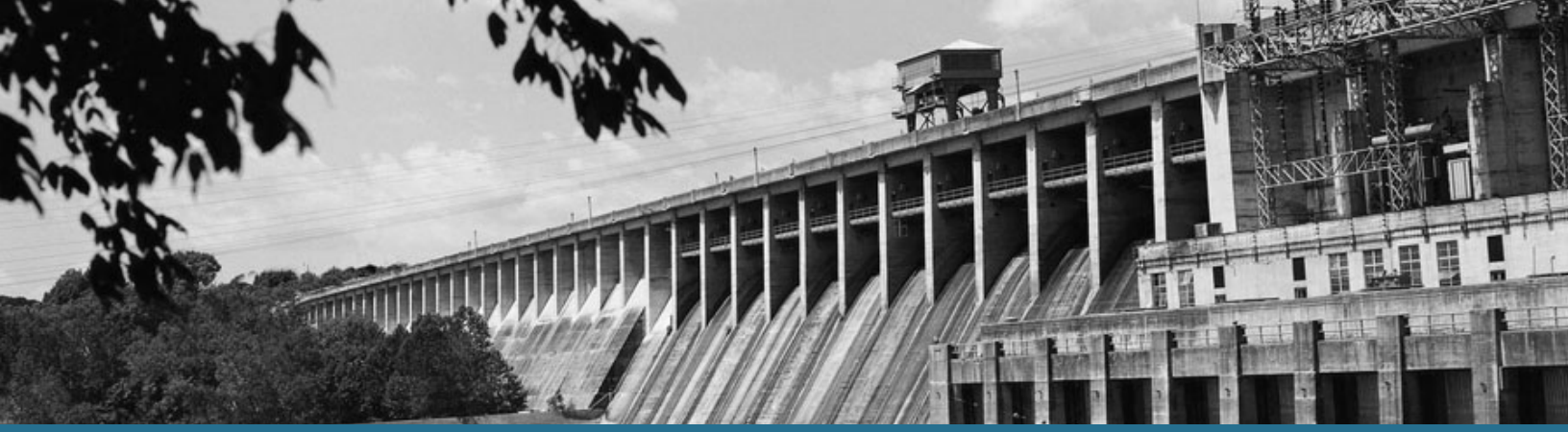
1. *Needs Study and Sufficiency Rating Report: 2011, Volume 1,* Oklahoma Department of Transportation

2. *Bridge Improvement & Turnpike Modernization Plan 2011-2019,* Mary Fallin, Oklahoma State Governor

3. *The Fix We're In For: The State of Our Nation's Bridges,* Transportation for America. (http://t4america.org/resources/bridges/states/)

4. *The Fix We're In For: The State of Oklahoma's Bridges,* Transportation for America (http://t4america.org/docs/bridgereport/states/bridgereport-ok.pdf)

5. Interviews and Input from Bridge Division Staff, Oklahoma Department of Transportation



D DAMS

SUMMARY

For citizens who live near a dam, they are often unaware of the risks their proximity to this critical infrastructure presents. The Oklahoma Water Resources Board (OWRB) defines a dam as any artificial barrier, together with appurtenant works, which does or may impound or divert water. The purposes of dams are to serve, protect, and save people and infrastructure annually from the adverse impacts of floods, drought, and wildfires. Dams also form the foundation for community development by providing required water resources conveniently placed for human use as a renewable resource. As the backbone of Oklahoma's water resources infrastructure, dams make development, growth, and habitability possible throughout the state.

The OWRB is the regulatory agency responsible for regulating all non-exempt dams constructed and operated in Oklahoma. Dams exempt from OWRB oversight include federally constructed and operated dams, and/or state river basin statutory authority with federal-nexus purview as long as they remain under the supervision of the federal agency. Exempted dams are inspected and maintained by federal or locally contracted dam safety professionals. Dams which no longer qualify for exemption status have more direct oversight by OWRB's dam safety permitting program.

There are an estimated 4,702 dams in Oklahoma, the fourth largest number of state regulated dams in the country. Of these regulated dams, 53% are private, state or local government dams, and 44% are conservation dams supported and administered by the United States Department of Agriculture–Natural Resources Conservation Services (USDA-NRCS) and Oklahoma Conservation Commission (OCC) The remaining 3% are not regulated by the OWRB but are federally-owned and either federally, or locally operated; with five (5) dams related to hydroelectric facilities operated by the Grand River Dam Authority (GRDA) under federal jurisdiction.

Dams evaluated for this report card included those reported in the OWRB 2011 Dam Safety Database (DSDB) in the following sectors: public utilities, local-municipal, local-county/ conservation (NRCS), state, federal, and private. Regulated dams include all dams except those in the federal and conservation (NRCS) sectors. Evaluation used seven criteria to investigate for determining a grade: condition & performance, capacity, funding, future need, operation and maintenance (O&M), public safety, and resilience.

Oklahoma's Duel Classification of Dams

Size classification includes height limits and storage capacity of the impounded reservoir as follows:

- Small (height <50-feet and storage capacity < 10,000 acre-feet)
- Intermediate (height between 50 and 100 feet and storage between 10,000 to 50,000 acres-feet)

- Large (height over 100-feet and storage over 50,000 acres-feet)

Hazard-potential classification is defined depending on the extent of potential downstream development losses regarding human life and economic losses (property). Three potential hazard categories are recognized:

- High hazard potential includes one or more habitable structures with potential for loss of life and excessive property loss (to community, industrial, or agricultural infrastructure).
- Significant hazard potential includes no loss of life and appreciable property loss (notable agricultural, industrial, or structural damage).
- Low hazard potential includes no loss of life and minimal economic losses (undeveloped to occasional structure or agriculture properties).

CAPACITY

Oklahoma has the fourth largest number of state regulated dams in the country. Most of Oklahoma's dams are of earthen (compacted soil) construction and range from 7 to 325-feet in height with an overall average height of 31-feet. Breakout by sector includes:

- 48% Privately-Owned
- 0.2% Public Utilities
- 3% Local Municipal
- 44% Local County Conservation District (NRCS)
- 1% State-Owned
- 3% Federal-Owned

The average age of an Oklahoma dam is 46 years with more than 38% of the dams older than 50 years and almost 73% older than 40 years. Dams between 41 and 50 years old constitute almost 35% of all dams in Oklahoma and 23% of all dams are between 51 and 60 years old. The average age of permitted dams in Oklahoma is 48 years and the average age of conservation or NRCS dams is 44.5 years. These typically have 50-year contracts with owners for inspection, operations and maintenance support activities which expire after this time period. The oldest dam in Oklahoma is 110 years. The OWRB estimates 26% of low hazard-potential dams need to be reclassified to a higher classification, whereas high and significant hazard-potential dams comprise 12% of the dams in Oklahoma. Many low hazard-potential dams have experienced increasing urbanized land use growth and development below them and should be reclassified.

CONDITION

Public Utilities sector dams (~0.2%): Dams and reservoirs owned and operated by the public utility companies are in acceptable condition. The facilities are considered an asset and contribute to the company's goals of producing product for sale and generating income. Failure of these facilities is considered unacceptable. This sector has the highest proportion of dams with high and significant hazard-potential.

Private sector dams (~48%): Private dams contribute to the state's economy and store a vital life-sustaining resource: water. They add land value to the privately-owned real estate and increase property taxes. Private dams create jobs in the water supply business for usage in the domestic, agricultural, industrial, manufacturing, recreation, flood control, erosion control, and raw/potable water supply areas of Oklahoma's economy. All risk, maintenance, and liability costs associated with private dams are borne and paid for by the owner. OWRB dam safety compliance is generally poor for most private dams in Oklahoma and this sector has the lowest proportion of high and significant hazard – potential dams.

Municipal sector dams (~3.5%): Dams in the municipal sector with ages older than 40 years were found to be in satisfactory condition. However, many are near their end-of-life and have funding needs for repair and improvement. This sector has the second highest (along with the Federal sector) proportion of high and significant hazard-potential dams.

County and Conservation (NRCS) sector dams (~44%): This sector has the most high-

hazard-potential dams. Approximately 87% have increased in hazard-potential and are not in compliance with OWRB dam safety criteria. Most of these dams are near their end-of-life and have funding needs for repair and improvement.

State sector dams (~1%): Like other sectors, many of these dams are near their end-of-life sediment storage and their age requires increased maintenance attention with related costs.

Federal sector dams (~3%): Three subsectors were recognized in the grading of this sector:

- Department of Defense (DoD)
- Department of the Interior (DOI)
- Other Agency (OA)

This sector has the second highest (along with the Municipal sector) proportion of high and significant hazard-potential dams, as well as the largest reservoirs of any sector.

Federal DoD dams: An estimated 30% of these dams have hydraulic deficiencies, 15% have noted seepage concerns, and about 35% have their hydraulic structure in need of repair or replacement. More than $70 million in stimulus funds were spent in FY09 and FY10 to maintain this infrastructure.

Federal DOI dams: All dams in this subsector meet federal inspection guidelines. The average age of the high hazard-potential dams is 50% of the 100 year design life, which is considered favorable. Risk management practices are in place to identify and avert safety concerns. The average dam height and normal reservoir storage capacity of Bureau of Reclamation dams is above the state average. Dam failure potential impact is a concern.

Federal OA dams: Most dams in this subsector are similar to those in the private and conservation (NRCS) sectors in size and reservoir capacity. The condition of these dams is the least known and local sponsor users have a greater impact regarding their condition, operations, maintenance, and any improvements they may require.

Assessment was applied in each sector based on the number and overall condition of dams in that sector, proportion of sector with high and significant hazard-potential dams, dam size, and normal pool reservoir capacity. Each sector contributed to the overall grade of D based on infrastructure age, condition, need for moderate growth in capacity, future capacity deficiencies, shortage of operations and maintenance funding, lack of private funding to perform major repairs and maintain standards, and the increased number of dams requiring reclassification due to downstream development (community safety and resilience issues).

FUNDING

Increases in funding are necessary to keep pace with the increasing responsibilities dam safety requires in growth areas throughout the state. Public utilities dams and reservoirs have a constant yearly maintenance budget and capital improvement projects that are planned, designed, and constructed with proper funding sources. Their value is acknowledged and a benefit by the owner. The average expenditure by private dam owners in Oklahoma is $4,400 per year. These dams add more than an estimated $10 million annually to Oklahoma's economy. Current funding needs for the high-hazard dams in the conservation sector (NRCS) are estimated to be $430 million which will bring them into compliance with OWRB criteria. Funding needs for operations and maintenance costs for other dams in this sector are estimated at $22 million for immediate upkeep to comply with dam safety standards. This is above a provided steady funding level of $2 million annually. Low and significant hazard-potential dams in this sector meet OWRB criteria, but sediment storage is an increasing concern. The management approach taken by the NRCS in this sector is conducive for the dams in this sector being resilient.

FUTURE NEED

The total number of dams in Oklahoma change throughout the year. This happens as a result of new dams being built or identified by inspectors, dams being decommissioned, dams being added due to loss of exemption status, and dams added

or removed by applying the definition of a dam to waterway structures.

In 2010, the OWRB enacted new and expanded rules and procedures related to the reclassification of dams due to downstream development. There are an increasing number of dams in need of reclassification due to increases in population, changes in land-use zoning, and attendant downstream development. OWRB staffing efforts to identify dams with downstream development to make dam owners aware of the need to reclassify the hazard-potential of a dam is an ongoing effort and has increased since 2009. Specific rules exist for dam owners to reclassify their dams particularly in those cases where an increase in hazard potential is warranted due to increased life and/or property safety concerns since the original construction of the dam. In response to development changes, the OWRB has implemented a prioritized reclassification system which involves continuous review of a dam's classification in light of new downstream development on a three–to–five-year cycle for significant to low-hazard potential dams. High hazard-potential dams are reviewed and inspected annually by owners with reports submitted to the OWRB. Reclassification will increase the number of high hazard-potential and significant hazard-potential dams in the future. Approximately 84% of high-hazard dams have Emergency Action Plans (EAP's and 9% of significant-hazard dams have EAP's, although significant-hazard dams require no EAP in Oklahoma (EAP data source: USACE NID 2010 database).

OPERATIONS AND MAINTENANCE

Through funding from the Federal Emergency Management Agency (FEMA), the OWRB has increased the professional development opportunities for inspectors and owners through improvement of publications and seminars on dam inspection, maintenance, control of woody vegetation, and preparation of EAP's for high hazard-potential dams. In 2011, the OWRB issued new publications on hydrologic and hydraulic guidelines for dams, and issued improved hazard-potential classification guidelines, as well as a Dam Safety Guidance Manual for dams throughout Oklahoma.

RECOMMENDATIONS FOR ACTION

ASCE concurs with the recommendations within the Oklahoma Comprehensive Water Plan (OCWP). The plan includes investigating the potential for establishing a financial assistance program for the State Dam Safety Program and making low-interest loans to dam owners to meet mandated. In addition, government incentives should be considered to provide tax credits or revenue return mechanisms to encourage private owner initiatives in meeting operational and maintenance challenges for reclassified dam sites and associated communities.

ASCE agrees with the OCWP's call for state funding of $250,000 per year for ten years to perform dam breach inundation mapping, emergency action planning, and education and outreach efforts that support the State Dam Safety Program.

The ASCE Oklahoma Section recommends the following measures be considered:

1. Develop a low interest loan program for high-hazard dam owners to achieve compliance with mandated changes, as well as funding to perform dam breach inundation mapping and to develop EAP's for both NRCS and non-NRCS dams.

2. Investigate possible methods to discourage development downstream in a dam breach inundation area.

3. Continue and expand public awareness regarding the purpose of dams and dam safety.

4. Improve the coordination of dam safety issues and homeland security concerns regarding critical infrastructure.

5. Provide for the means of moderate, steady, and dependable funding of dam site repair and rehabilitation of infrastructure.

6. Consider being a state partner in the federal Silver Jacket Program (http://www.nfrmp.us/state/)

7. Expand OCWP dam safety recommendations by considering means to increase funding mechanisms and economic incentives for private and non-federal dam owner requirements to restore, effect major repairs to, or decommission dam sites.

SOURCES

Oklahoma Comprehensive Water Plan (OCWP) Water Policy Recommendations – 2012 Update, Joint Legislative Water Committee Meeting, September 21, 2011, 107p: (http://www.owrb.ok.gov/supply/ocwp/pdf ocwp/WaterPlanUpdate/joint_committee?JLWCSeptember2011 RECS.pdf)

Oklahoma Comprehensive Water Plan Executive Report, Final draft, September 2011, 163p: (http://www.owrb.ok.gov/supply/ocwp/pdf ocwp/WaterPlanUpdate/draftreports/OCWP%20Executive%20Rpt%20FINAL.pdf)

Oklahoma Water Resources Board, Dam Safety Program, 2011: (http://www.owrb.ok.gov/hazard/dam/dams.php)

OWRB Dam Safety Fact Sheet, 2010: (http://www.owrb.ok.gov/about/about pdf/Fact-DamSafety.pdf)

Dam Safety Guidance Manual, May 2011, 125p: (http://www.owrb.ok.gov/hazard/dam/pdf dam/DamSafetyGuidanceManual2011.pdf)

Hazard-Potential Classification Guidelines for Dams in Oklahoma, May 2011, 6p: (http://www.owrb.ok.gov/hazard/dam/pdf dam/Hazard-PotentialClassificationofDams.pdf)

Hydrologic and Hydraulic Guidelines for Dams in Oklahoma, August 2011, 24p: (http://www.owrb.ok.gov/hazard/dam/pdf dam/HydrologicAndHydraulicGuidelinesforDamsInOK.pdf)

Dam Inspection Guidelines, September 2010, 12P: (http://www.owrb.ok.gov/hazard/dam/pdf dam/DamInspectionGuidelines.pdf)

Dam Maintenance Guidelines, September 2010, 16p: (http://www.owrb.ok.gov/hazard/dam/pdf dam/DamMaintenanceGuidelines.pdf)

Control of Woody Vegetation, September 2010, 2p: (http://www.owrb.ok.gov/hazard/dam/pdf dam/ControlOfWoodyVegetation.pdf)

EAP Guidelines for High Hazard-Potential Dams, September 2010, 4p: (http://www.owrb.ok.gov/hazard/dam/pdf dam/EAPGuide_HighHazardDams.pdf)

OWRB Dam Reclassification webpage, 2011: (http://www.owrb.ok.gov/hazard/dam/reclassificationOfYourDam.php)

OWRB Rules 2010 website: (http://www.owrb.ok.gov/util/rules/rules.php)

OWRB Dams Safety Database (DSDB), July 2011, Oklahoma Water Resources Board, Oklahoma City, Oklahoma (computer files)

United States Army Corps of Engineers (USACE), National Inventory of Dams (NID), 2010: (http://www.usace.army.mil/Library/Maps/Pages/NationalInventoryofDams.aspx)

D- LEVEES

SUMMARY

Oklahoma has 402 recorded private, state, and federally constructed levees. Two sectors were recognized for grading purposes, federal and private. The overwhelming majority of levees - approximately 97% - in Oklahoma were privately constructed. There are likely several hundred more privately constructed levees that are unrecorded or unknown.

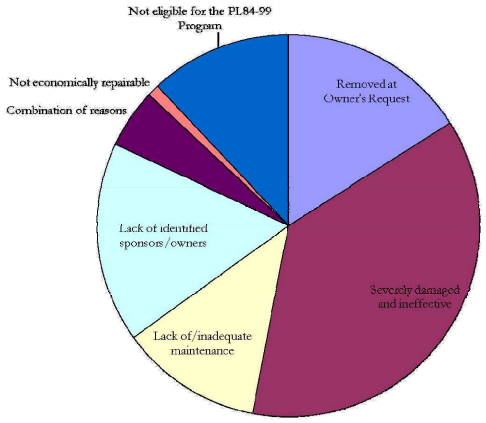
A levee system comprises one or more components which collectively provide flood damage reduction to a defined area. The levee system includes all the interconnected components necessary to ensure protection of the floodplain area: levee and floodwall sections, closure, structures, pumping stations, culverts, and interior drainage works.

According to the National Committee on Levee Safety, there are levees in all 50 states; however the total number, location, and condition of many of the nation's levees as well as the population and property they protect and the individuals responsible for their operation and maintenance remains unknown. Oklahoma is no exception, and does not have any regulatory authority over levees. There is not a comprehensive levee safety program and the majority of levees in Oklahoma are privately constructed, therefore no formal inspection, repair, or rehabilitation program is in place.

A historical database of more than 400 privately constructed levees (formerly part of the PL84-99 Program) is maintained by the United States Army Corps of Engineers (USACE), Tulsa District. This database contains very limited information on a total of 382 levees in the state that were actually verified as functioning as a levee. Table 1 below shows why all 382 levees were deemed ineligible for inclusion in the USACE PL84-99 Program due to various reasons:

Table 1: USACE PL84-99 Program

Reason	%
Removed at Owner's Request	16%
Severe Damage and Ineffective	37%
Lack of/Inadequate Maintenance	12%
Lack of Identified Sponsor/Owner	17%
Combination of Reasons	5%
Not Economically Repairable	1%
*Not Eligible for the PL84-99	12%



*12% of Levees in Oklahoma were not eligible for the PL84-99 program but were possibly eligible for other federal assistance.

The 12 federally authorized and constructed levees in Oklahoma are inspected on a routine basis by the USACE under their levee and dam safety programs. The inspections assure that flood risk management structure and facilities are continually maintained and operated in a manner to obtain the maximum benefits. Inspections are also conducted to determine eligibility for repair assistance after floods under the authority of Federal Public Law No. 84-99.

The USACE Inspection Program provides annual inspections of federally built projects to ensure they are maintained by their sponsors to the strict USACE standards. One of the benefits of the Inspection of Completed Works (ICW) program is that damages caused by floods to the levee are repaired by the USACE at 100 percent federal cost providing certain criteria are met. Most levees in the Tulsa District's inspection program are federally built and locally maintained. Non-federal projects or privately constructed levees may be incorporated into the Rehabilitation Inspection Program (RIP) at the request of a local community or sponsor.

There are three types of inspections under the USACE Levee Safety Program including:

1. Initial Eligibility Inspections (IEI): IEI's are conducted to determine if privately constructed flood risk management systems meet the minimum criteria and standards set forth by the USACE for initial inclusion into the RIP.

2. Routine Continuing Eligibility Inspections (CEI): Routine inspections are intended to verify proper maintenance, owner preparedness, and component operations. CEIs are generally done every year. Public Inspection (PI): Generally done every five years, PI's are intended to verify proper maintenance and component operation, and to evaluate operational adequacy, structural stability, and safety of the system by evaluating the levees original design criteria vs. current design criteria.

CONDITION

Despite the USACE routine RIP and the fact that an effective levee safety program is in existence at the federal level a very limited number of levees are evaluated routinely in Oklahoma. Due to a majority of levees identified are unrated or poorly maintained private levees, an overall grade of D- was assigned to Oklahoma's levee infrastructure. This grade reflects the advanced age of the levee systems, the relatively unknown condition of the privately maintained and operated levees, the residual flood risk inherent in flood damage reduction projects designed to the current flood protection standard, the population at risk, and the threat to public safety resulting from a catastrophic levee failure.

Nine of the twelve federally authorized and constructed levee systems in Oklahoma are generally rated by federal standards as minimally acceptable condition with varying degrees of minor deficiencies. The remaining 3 levee systems which are locally operated and maintained were considered to be in unacceptable condition. The most common deficiencies noted in inspection reports were improper vegetation, animal burrows, encroachments, lack of adequate maintenance records, and poorly maintained seepage control systems. Vegetation issues were the dominant deficiency noted in inspections.

The State of Oklahoma does not have an inspection program for private levees; therefore, the assessment of private levees was based on past inspection conditions for those known levees inspected by federal (USACE) inspectors (circa 1980s). Approximately 80% of the known private levees were not rated when last inspected. Of the remaining 20%, about 7% were in good to excellent condition, 2% in fair condition, 9% in poor, ineffective, or damaged condition; and 2% were in unknown condition because they were difficult to inspect due to excessive vegetation and/or poor site access.

OPERATIONS AND MAINTENANCE

The Federal Emergency Management Agency (FEMA) continuously updates the National Flood Insurance Program (NFIP) flood insurance rate maps. Before a levee system can be shown as

providing protection on the flood insurance rate maps, the levee owner must provide data and documentation to FEMA to certify that the levee system meets NFIP criteria. If it does, FEMA will revise the map to show the impacted area. If it does not, FEMA will revise the map to show the impacted area as a high risk depending on the type of study performed. Gathering the data and documentation takes time. FEMA is allowing owners of certain eligible levee systems up to 24 months to provide the required data and documentation. Being accredited does not guarantee protection. For all levee systems, the flood maps will carry notes informing officials and citizens that overtopping or failure is possible and purchasing flood insurance projection, adhering to evacuation procedures, flood-proofing, and other protective measures should be considered.

PUBLIC SAFETY

There are currently no state programs to deal with levee safety or private or non-federally constructed government levees within Oklahoma. Until one is established, the safety of levees to protect the public is at risk due to critical aspects of levee safety including inspection, correction of deficiencies or improvement of their flood protection capabilities are being ignored. An adaption of suitable definitions for the federally-recognized type of levee designations is necessary, along with an identifiable inventory mechanism to complement the federal process as determined by the National Committee on Levee Safety in their 2009 Report to Congress. Securing the future of a levee safety program involves immediate and short-term measures, as well as long term structural and non-structural measures. Other aspects include a comprehensive and consistent national leadership, strong levee safety programs in all states, and alignment with existing federal programs.

RECOMMENDATIONS FOR ACTION

The ASCE Oklahoma Section recommends the following measures be considered:

1. Establish a strong state program, including the creation of a Levee Safety Grant Program to assist in state and local community developments Oklahoma will be maintaining the institutional capacity, necessary expertise, and program framework to quickly initiate and maintain levee safety program activities and requirements.

2. A Levee Rehabilitation, Improvement and Flood Mitigation (RIFM) fund should also be established to aid in restoration or removal of aging or deficient levee infrastructures.

3. Established a balanced statewide levee safety program to inventory and inspect private and state levees. The term "balanced" refers to a considerate framework respecting private claims and meeting levee safety objectives while minimizing governmental disincentives and maximizing private incentives.

4. Establish a fund for repair and upgrading of all deficient levees in the state.

5. Provide funding or funding mechanisms for new flood damage reduction measures. For example, Levee Safety Grant Program, National Levee RIFM Fund, or various forms of public-private partnering agreements.

6. Encourage the purchase of flood insurance for homeowners and businesses behind levees and within floodplains.

7. Strengthen floodplain management programs and effective enforcement.

8. Assist communities with flood emergency planning for effective warning, evacuation, flood proofing, and other protective measures.

9. Consider being a State partner in the federal program like the Silver Jacket Program. (http://www.nfmp.us/state/)

SOURCES

Federal Emergency Management Agency (FEMA), 2011, Levee System Construction and Restoration Projects: (http://www.fema.gov/plan/prevent/fhm/ly_intro.shtm)

United States Army Corps of Engineers 2010: (http://www.nfmp.us/guidance.cfm)

Federal Emergency Management Agency (FEMA) Disaster Assistance Policy (DAP9524.3), February 25, 2009: Rehabilitation Assistance for Levees and other Flood Control Works: (http://www.fema.gov/pdf/government/grant/pa/9524._3.pdf)

National Committee on Levee Safety, 2009 Draft Recommendations for a National Levee Safety Program, Sec 9003, Water Resources Development Act of 2007, 98p: (http://leveesafety.org/)

"So You Live Behind a Levee," 2010, ASCE, Washington D.C., 17p. (http://content.asce.org/ASCELeveeGuide.html)

B RAIL

SUMMARY

Oklahoma is a crossroads for freight and passenger rail in the United States. Oklahoma maintains nearly 4,000 miles of freight rail lines. The three major railroads serving Oklahoma are the Burlington Northern Santa Fe (BNSF), Union Pacific Railroad (UPRR), and the Kansas City Southern Railways (KCS). These Class I railroads average 183,238 carloads of freight, terminating 323,442 carloads of freight in Oklahoma in 2010.

Passenger rail service is provided by Amtrak's *Heartland Flyer* running a daily round trip service between Oklahoma City and Fort Worth, Texas. The service commenced in 1999, following a 20 year absence of passenger service in Oklahoma. The *Heartland Flyer* makes station stops in Norman, Purcell, Pauls Valley, Ardmore and Gainsville, Texas, in addition to Oklahoma City and Fort Worth. Connections may also be made in Fort Worth to Amtrak's Texas Eagle, which operates between Chicago and Los Angeles via San Antonio.

Overall, the Oklahoma rail industry is responsible for and capable of maintaining its basic infrastructure. Rural Oklahoma has a need for funding to allow for expansion and improvement of its network. Additionally, emerging and new rail-served business will require additional capital expenditures and funding mechanisms for the required rail infrastructure.

The *Heartland Flyer* carried more than 81,000 riders in 2010, an 11 percent increase over 2009. Ridership continued to grow in 2011. The *Heartland Flyer* operates on tracks owned by the BNSF. In 2010, the *Heartland Flyer* won Amtrak's President's Award, and consistently ranks as Amtrak's top-rated passenger rail service for the entire country.

The Heartland Flyer passenger rail operation is funded by a 50/50 split between Oklahoma and Texas. Oklahoma has an annual line item state appropriation drawn from the Oklahoma Passenger Rail and Tourism Revolving Fund, and Texas has a dedicated public transit revolving fund.

CAPACITY AND CONDITION

There are 3 classes of railroads as defined by the Association of American Railroads (AAR):

- Class I: Any railroad company in the U.S. and Mexico that has annual operating revenue of more than $319.3 million.
- Class II: Any freight railroad company with revenue more than $20.5 million and less than $277.7 million for at least 3 consecutive years. These are typically regional railroads.
- Class III: Railroads with annual operating revenue that is less than $10 million for 3 consecutive years. The Class II railroads are normally short line rail that serve a limited area.

The existing Class I railroad infrastructure in Oklahoma has sufficient capacity to meet current

demands. However, the Class III capacity is not optimal. Segments of the short line network cannot accommodate the desirable high capacity freight cars common to Class I railroads which limits ability to interchange between the two classes.

The rail infrastructure in Oklahoma is expected to meet future demands with some exceptions. Both the BNSF and UPRR have or are planning to invest in the state's north-south corridors to accommodate expected growth. If short-line (Class III) networks are upgraded to accommodate larger freight cars, capacity is expected to be adequate except where extraordinary growth is anticipated. Those short-lines involved in serving the energy sector will require line and yard capacity investments, the extent of which has yet to be fully determined.

While the major railroads conduct routine capacity studies, the Class III railroads typically do not invest in such analysis. Therefore, it is difficult to address the capacity needs on certain portions of Oklahoma's rail system. Typically, rail companies have to react to the appearance of new business opportunities which makes it difficult to plan in advance to meet future capacity.

Oklahoma rail lines are in a condition commensurate with the market segments they currently serve, or will be in that condition following anticipated upgrades. Investment by the Class I railroads permit them to efficiently serve the long-haul, high volume markets. Similarly, the Class III infrastructure will meet its market needs if known deficiencies can be addressed.

FUNDING AND FUTURE NEED

Overall the Oklahoma rail industry is capable of maintaining its basic infrastructure. While the Class I rail companies have significant resources available, the Class III industry, which serves the majority of rural Oklahoma, has a need for funding to allow for expansion and improvement of its network. Additionally, emerging and new rail-served business creation will require additional capital expenditures and funding mechanisms for the required rail infrastructure. As rail continues to expand across the country, it will be important that the funding and investments needed to meet this increasing demand be made available.

All indicators point to rail being on a long-term positive growth trend in Oklahoma. As such, there is a need to rethink current investment and capital expenditures programs at all levels. The rail industry has had a remarkable revitalization over the last decade, and current volumes are exceeding all previous estimates and expectations.

OPERATIONS AND MAINTENANCE

The railroad operators in Oklahoma maintain an impressive operation history with no significant system or operations issues. Class I railroads have sufficient financial capacity to operate and maintain future needs, with the possible exception of major initiatives such as new container terminals or classification yards though none are currently planned. The Class III railroads have resources to maintain basic operations, however, as the system continues to age and standards for the Class I industry are expected to escalate, additional maintenance and upkeep on portions of Oklahoma's rural rail system will require increasingly higher funding to maintain current operations standards.

The passenger rail operation will also require new equipment and additional maintenance as a result of recent changes in the laws concerning passenger rail (PRIIA 2008). Any passenger rail enhancements or expansions will need extensive capital investment to achieve such goals.

PUBLIC SAFETY

Oklahoma's nearly 4,000 at-grade public railroad crossings are overseen by the Oklahoma Corporation Commission (OCC). ODOT Rail Programs Division Safety Section works with OCC and railroad operators across the state to carry out an annual rail crossing improvement program. A private non-profit organization known as Operation Lifesaver works across Oklahoma to carry out public safety education campaigns. Most recently, the federal government stepped up its efforts to assure public rail crossing safety by passing the *2008 Rail Safety Improvement Act*.

RESILIENCE

As with any transportation system, there are always risks due to unforeseen failures or threats. These risks are not preventable, but proper operations and maintenance help to minimize them. The rail industry is continually improving its procedures, and recent analysis shows that multiple layers of emergency response and security systems make rail one of the safest transportation modes in our state.

The Class I railroads and Amtrak both maintain their own safety and security forces, and have the means to reconstitute infrastructure in a timely manner. However, as with previous discussions, extensive system failure would require capital investment and expenditure which is not currently in place for many of Oklahoma's smaller railroad operators. While they practice and maintain high safety and security practices, one natural or man-made disaster could be problematic financially to rebuild the system.

RECOMMENDATIONS FOR ACTION

The ASCE Oklahoma Section recommends the following measures be considered:

1. With the expiration of the federal SAFETEA-LU transportation bill, a new federal Rail Title should address the growing needs of America's expanding freight and passenger rail sectors with new dedicated sources of funding.

2. Oklahoma currently funds state rail-related activities by way of a dedicated freight car tax, as well as annual lease and operations payments made to the State by rail operators leasing and operating the approximate 400 miles of state-owned rail.

3. Currently, Oklahoma has made tremendous use of new federal infrastructure grant programs such as ARRA, TIGER, and HSIPR to improve both freight and passenger rail across Oklahoma. Continue to utilize these funding opportunities to support freight and passenger rail.

SOURCES

Oklahoma Department of Transportation, "Oklahoma Statewide Freight and Passenger Rail Plan," May 2012

D ROADS

SUMMARY

The condition of road infrastructure is always a hot topic and one that draws much attention from the public. A substandard roadway is usually the most visible component of our nation's infrastructure. Improvements to our roadways are always a key point for candidates who are running for local public offices, and with good reason. Oklahoma currently has 12,265 state highway miles and 84,767 county highway miles. In fact, 4,536 miles of the county system includes city streets in 493 cities. When Tulsa passed the Fix Our Streets Program in 2008, it included over $450 million dollars in street improvements. The City of Sapulpa passed a half cent sales tax in 2004 which generates about $1.4 million per year in funds dedicated to street improvements. Generally, people want good roads and are willing to pay for them. When a program is passed to raise revenues to improve the roads, the people rightly expect to see results. What most people do not understand is the amount of wear and tear that the road system is expected to endure and the high cost of maintaining the current level of service, not to mention the cost to upgrade the system to meet the growing demands of the traveling public.

CONDITION

Each entity or municipality has its own method of tracking the condition of its pavement. Larger entities, including major metropolitan areas, have rigid programs including regular statistical evaluations resulting in a numerical rating of the Pavement Condition Index (PCI). Smaller municipalities rely on comparative evaluations based on visual ratings together with relative qualitative ratings of smoothness. Communities that have been able to afford to quantitatively measure pavement conditions on an annual basis have found this to be an invaluable tool in their pavement management program.

The following table shows average PCI values for various entities which contributed to this study. These values include the most current data available.

Table 1: Average PCI

Entity	Average PCI
Oklahoma Turnpike Authority	84.8
City of Oklahoma City:	
Non-Arterial Streets	60
Arterial Streets	63
City of Tulsa	
Non-Arterial Streets	60
Arterial Streets	61
City of Owasso	75
City of Bartlesville	65

Typically larger municipalities such as Tulsa and Oklahoma City have lower PCI values due to the large extents of the roadway network necessary to maintain. In addition, cities that have experienced significant growth, such as Owasso, which grew from 19,000 to 29,000 in the last 10 years, have larger PCI averages because of the high percentage of new streets in their system along with capital improvement transportation projects and their annual street rehab program.

The degradation of the Oklahoma turnpike system is evident in the table below that shows a decrease in average PCI ratings from 2006-2012.

Table 2: PCI Ratings (2006-2012)

Year	Average PCI
2006	90.2
2007	90.0
2008	89.7
2009	87.6
2010	86.2
2011	85.2
2012	84.8

FUNDING

Oklahomans pay approximately $1.2 billion to the state in road taxes and fees including motor vehicle license and tag fees and state fuel taxes and fees. More than 70% of motor vehicle fees are diverted to non-transportation purposes. County roads receive approximately 17% of motor vehicle revenue and 90% of fuel taxes and fees. In addition to individual municipal local funds, additional revenue sources for our state's infrastructure include the Federal Surface Transportation Program (STP), and the County Improvements for Roads and Bridges (CIRB).

FUTURE NEED

The pavement evaluation data allows entities to track the condition of individual streets, to identify streets that require attention, and help determine what type of action is warranted. This helps establish priorities in the rehabilitation schedule and allows the entities to budget the funds necessary for the desired improvements. Unfortunately, this often reveals the fact that the available budget for the desired improvements is well below the estimated cost of the improvements. This information, of course, is essential to the planning and maintenance of the infrastructure.

For example, the City of Tulsa has a goal to maintain an overall PCI of 65 or higher. To attain these goals will require a higher commitment in rehabilitation investment. The following chart depicts required investment to obtain a desired PCI for the cty.

Table 3: Investment to Obtain Desired PCI

Street System	PCI	Required Funds (per year)
Arterial	65	$39 million
Arterial	70	$60 million
Non-Arterial	65	$55 million
Non-Arterial	70	$74 million

According to City Engineer Dwayne Henderson of Owasso, they would like to have a street maintenance budget of $1.6 million per year. Currently they average $629,000.

OPERATIONS AND MAINTENANCE

Settlement in the state of Oklahoma began about 100 years ago as the original towns were platted and streets constructed many with brick pavers. Of course, most of these original streets have since been reconstructed with asphalt or concrete pavement. Many of the existing pavements were not designed for the current traffic conditions and have been in use much longer than their intended design life. The obvious result is deterioration from use and exposure to damaging weather elements. Poor drainage can lead to wet subgrade conditions which can cause loss of support for the pavement and premature failure. It is not uncommon for minor leaks within the city water supply system to contribute to wet subgrade conditions. Improvements to the street system often require replacement of storm sewer pipes and waterlines within the existing right of way, which adds cost to the project and diminishes the impact of the funds established for street rehabilitation programs. The following chart shows some typical operations and maintenance budgets for various entities.

Table 4: Annual Operations and Maintenance Budget

Entity	Budget
Oklahoma Turnpike Authority	$81.5 Million
City of Oklahoma City	$14 Million
City of Bartlesville	$750,000 - $1 Million
City of Owasso	$629,000

PUBLIC SAFETY

The safety of the traveling public tops the list of priorities when addressing our infrastructure needs. ODOT has been working diligently on our state highway system to address several safety concerns. Currently, 4,600 miles of the 12,265 miles of Oklahoma highway consist of two-lane roadways without paved shoulders. Not only does this pose a safety concern, but these roadways present undesirable driving conditions to motorists. In fact, 617 miles of these roads are identified for improvements in the ODOT 8-Year Work Plan.

By the end of 2007, cross-over collisions on our state highways accounted for 39 fatalities. In 2001, ODOT began a program to install cable median barriers to prevent these cross-over collisions. Since the program began, 480 miles of cable median barrier have either been constructed or are currently under construction. By the end of 2010, fatalities were reduced by 82%

Despite these improvements, 3,859 miles of state highway (or 31%) rate as critical or inadequate for safety. Elements that contribute to this statistic include:

- Lack of passing opportunities
- Inadequate sight distances
- Unpaved shoulders
- Insufficient vertical and horizontal curves
- Lack of recovery areas

3,160 miles of inadequate highways are not addressed in the 8-Year Work Plan and thus are not scheduled for improvements.

RECOMMENDATIONS FOR ACTION

According to *TRUST, Transportation Revenue Used Strictly for Transportation, "without better roads and bridges, Oklahoma's commerce and economic development will be stifled. There will be limited access in rural communities to emergency responders, an increased loss of life and a poor state image. Additionally, we will saddle future generations with an ever-growing tax burden to fund repairs that grow more costly the longer we delay."

*TRUST is a legislative advocacy organization committed to creating a culture with Oklahoma state government that values transportation as a key function and priority of state government.

The ASCE Oklahoma Section recommends the following measures be considered:

1. Continue to utilize state funds set aside for transportation to finance transportation improvements.

2. Address the currently needed repairs and maintenance ODOT already has on the books.

3. Further invest in public safety measures such as paved shoulders and cable median barriers.

SOURCES

Update on Oklahoma Bridges and Highways, Oklahoma Department of Transportation, Nov. 7, 2011.

Oklahoma Highway and Bridge Facts, Transportation Revenues Used Strictly for Transportation (TRUST) website, www.restoretrust.org

Oklahoma Road Funding, Taxes and Fees, Transportation Revenues Used Strictly for Transportation (TRUST) website, www.restoretrust.org

Oklahoma County Roads and Bridge Facts, Transportation Revenues Used Strictly for Transportation (TRUST) website, www.restoretrust.org

Indian Nations Council of Governments (INCOG) Community and Economic Development
http://www.incog.org/Community_Economic_**Development/commdev_cip.html**

Context Sensitive Solutions, US Department of Transportation, Federal Highway Administration
http://contextsensitivesolutions.org/content/reading/design-traffic/

Interviews and Input from City Staff from the Cities of Oklahoma, City, Bartlesville, Tulsa, Sapulpa, Owasso, Jenks, and Coweta and from INCOG staff.

Interviews and Input from Oklahoma Turnpike Authority staff.

D+ TRANSIT

SUMMARY

Oklahoma's Public Transit systems are primarily confined to the larger metropolitan areas within Oklahoma. As growth in these areas continues, demands for transit will increase. Oklahoma is one of a few states where large metro areas lack dedicated funding sources for transit capital and operations expenses.

SYSTEM OVERVIEW

The major transit systems are in Tulsa, Oklahoma City, Lawton, Enid, Edmond and Norman within the State of Oklahoma. Tulsa and Oklahoma City are the two major transit centers in Oklahoma that contain transit hubs in the Central Business District (CBD) areas to carry passengers throughout the systems. Edmond and Norman have commuter routes that tie into the Metro System in Oklahoma City as well as buses that serve local universities. The Lawton Area Transit System (LATS) was started in 2002 and serves Lawton and Fort Sill.

Transit operations are composed mostly of bus systems with one interstate passenger rail system, the Heartland Flyer that travels from Oklahoma City to Fort Worth, Texas. The rail system is similar to AMTRAK, however, it is operated and funded by the State. It runs a 418 mile round trip between Oklahoma City and Fort Worth on a daily basis. Annual ridership is estimated at 82,000 per year.

Fixed-route bus service in the State is provided by two main regional transit authorities; Metro Transit in Oklahoma City and Tulsa Transit in Tulsa. They have most of the transit ridership in the State and serve a combined 500 square miles within the metro areas. The transit systems operate a total fleet over 250 buses and carry approximately 6 million passengers per year. Metro Transit has 74 peak-hour in service vehicles on 21 fixed routes that carry over 3.8 million passengers per year. Tulsa Transit has 122 peak-hour in service vehicles on 18 fixed routes with 2.6 million passengers per year. The Tulsa Transit and Metro Transit total operating budgets are $18 million and $15 million, respectively. The Lawton Transit System has 14 buses on five routes and carries 237,000 passengers annually with an operating budget of $850,000.

Park-and-ride service and facilities are a fundamental component of the regional transit systems, especially with the ability to extend services beyond the urban core in the major metropolitan areas. Currently, there are five major park and ride lots serving these areas. The park-and-ride lots require operating capital to maintain their facilities and parking similar to transit buses and rail systems.

Both metropolitan areas have plans for future expansion of the existing transit services to include additional transportation hubs, commuter rail lines, street cars and park-and-ride lots. The future expansions will be funded with federal and local funds, either sales tax, property tax or

gasoline tax revenues. Most of these future improvements are currently not funded, with the exception of the Oklahoma City CBD transportation hub and modern street car system.

CONDITION

Public transportation systems have operated within the State metropolitan areas for over 70 years. During this time period, ridership and funding for transit has consistently been reduced, however, current trends show that transit ridership is increasing due to increased fuel cost, parking cost and traffic congestion.

The current condition of transit systems in Oklahoma can only be rated as fair. This is based upon a recent survey of public transit agencies and citizens within the State. They rate the service and condition of our transit systems as needing repair. The citizens would also like to see more frequent service and better condition of vehicles and facilities. The transit systems are underfunded based upon survey results and comparisons of similar transit systems in other states. There is an aging fleet of buses that are slowly being retired, however, due to funding limitations and the average cost of a bus being $400,000 or greater, many of these vehicles must remain in service beyond their normal life of typically 12 years. The fare box recovery is less than 20% of service costs for the transit systems, however, most systems in the State operate transit on about one-fourth the local funds typical of similar regions in other states.

CONCLUSION

Reductions in federal funding of transit will necessitate the need for future local funding in the form of sales tax or fare increases just to maintain the existing service levels. In addition to buses, trollies and street cars, other amenities such as sidewalks, bus benches, bus shelters, and other pedestrian infrastructure are important to the transit systems around the State. These features are in need of capital expenditures for future expansion and operating funds for maintenance and repair of the existing infrastructure.

Planning of future transit services must take into account future ridership levels, high impact corridors, economic incentives and public-private partnerships. Future commuters will value their time more as traffic congestions increases. A comfortable, convenience option with high tech innovations will attract commuters from their single occupant vehicles into commuter rail or modern rapid transit alternatives.

RECOMMENDATIONS FOR ACTION

The ASCE Oklahoma Section recommends the following measures be considered:

1. Through continued educational efforts, provide federal, state and local officials with information about the importance of transit's roll in the solution of traffic congestion and energy conservation.

2. Place greater emphasis on connecting metropolitan urban and suburban centers with transit in order to ease congestion, assist citizens with limited mobility, and develop local economies.

3. Provide creative funding alternatives for transit using federal, state, local and private funds together such as public-private partnerships, economic development incentives, tax increment financing and local option sales tax.

SOURCES

ACOG 2035 Encompass Plan, ACOG, April 2012.

Streetcar Alternative Analysis Plan Report for Greater Downtown Oklahoma City, February 2012.

Tulsa Area "Fast Forward" Region Wide Transit Plan, October 2011.

ACOG Regional Transportation Plan, ACOG, 2010.

Tulsa Area's "Coordinated Human Service Transit Plan", INCOG, 2009 Update

Central Oklahoma Transportation & Parking Authority Fixed Guideway Study, Carter-Burgess, 2009.

2030 Long Range Transportation Plan, Lawton Metropolitan Planning Organization, January 2008.

OKC Area's "Coordinated Human Service Transit Plan," Metro Transit, August 2007

Tulsa Transit "New System Design," September, 2003.

COTPA *Long Range Region Wide Transit Plan,* 2001.

D+ WATER / WASTEWATER

SUMMARY

Water provides an integral societal benefit to all Oklahomans. Municipal and rural residents alike rely heavily on water reliability and sustainability. In addition to providing drinking water supply and recreation, water drives Oklahoma's agricultural market, produces oil and gas, supplies our industrial and mining operations, and helps generate power.

Wastewater infrastructure is vital to maintaining sanitary conditions, public health, and sustainable aquatic environments. Properly operating wastewater treatment facilities and wastewater collection systems play an important role in protecting community health and local water quality. Oklahomans expect high quality wastewater treatment and collection infrastructure to accomplish this goal.

The Water and Wastewater infrastructure category included the evaluation of distribution, transmission, treatment, and storage components for small, medium, and large water systems, as well as collection, pumping, and treatment components for small, medium, and large wastewater systems.

Oklahoma has an abundance of water, but many citizens lack access to dependable water sources due to the distance of supplies, insufficient infrastructure or storage, water quality constraints, and other limiting factors. Increasing water use, coupled with growth and development, pose water quality challenges throughout the state. In addition, like most states, a majority of the existing water infrastructure has aged beyond its useful life and more stringent water quality requirements are imminent. This translates into a significant financial burden facing Oklahoma's water systems. Unless programmatic changes are made within the existing funding mechanisms for water systems, Oklahoma's access to a safe and abundant water supply will be seriously jeopardized.

CONDITION

The water and wastewater infrastructure category was graded based on the evaluation of deficiencies identified within existing state water and wastewater system infrastructures. These deficiencies were identified within the 2012 Oklahoma Comprehensive Water Plan (OCWP), developed by the Oklahoma Water Resources Board (OWRB), for purposes of preparing cost estimates for renewal, replacement, or expansion. Grades were then assigned to these results based on the burden of costs to small, medium, and large water and wastewater systems. The costs were documented within the 2012 OCWP and are presented herein. The water and wastewater infrastructure categories received a D+. This grade is primarily based on a lack of access to adequate funding to meet the infrastructure needs.

FUNDING

Oklahoma water infrastructure funding is limited and generally available from a small group of financial resources. The following list of funding programs provides a majority of the state's

municipal and rural water infrastructure financing. These funding programs include:

- Revenue Bond Loan Programs
- Rural Economic Action Plan (REAP) Grants
- Emergency Grants
- Drinking Water State Revolving Fund Loan (DWSRF)
- Clean Water State Revolving Fund Loan (CWSRF)
- United States Department of Agriculture (USDA) – Rural Development Loan/Grant
- Community Development Block Grant Program (CDBG)

Revenue Bond Loan Program

Eligibility for a revenue bond loan program is related to water and/or sewer system improvements, or the refinancing of existing debt obligation incurred by communities for projects such as water supply reservoirs, water rights acquisition, storage tanks, water storage rights acquisition, water supply and distribution lines, land acquisition for source water protection, water treatment systems, land acquisition for water treatment systems, wastewater treatment systems, land acquisition for wastewater treatment systems, wastewater collection systems, or combined storm water sewer system overflow correction.

This program has provided approximately $744,680,000 in financial assistance since 1985.

Rural Economic Action Plan (REAP) Grants

The REAP Grant Priority Evaluation Policy is used to distribute REAP grant funds. Applications that receive 40 or more points are placed on the REAP grant priority list. REAP Grants are recommended for approval to the Board when all other funding sources are secured and adequate REAP grant funds are available for obligation. Statutory restrictions for use of the grant funds include:

- Funds available for cities or towns with a population of 7,000 or less
- Any city or town with a population less than 1,750 has higher priority
- Rural water districts with less than 525 non-pasture customers.

This program has provided approximately $50,447, 000 in financial assistance since 1996.

Emergency Grants

A Grant Priority Evaluation Policy is used to distribute emergency grant funds. Applications that receive 60 or more points are placed on the grant priority list. Grants are then recommended for approval to the OWRB when all other funding sources are secured and adequate grant funds are available for obligation. Statutory restrictions for use of the grant funds include:

- $100,000 maximum per project, per applicant during any fiscal year
- An emergency situation is defined as a life, health, or property threatening situation where the Applicant cannot reasonably finance the project without assistance from the OWRB.

This program has provided approximately $33,666,000 in financial assistance since 1983.

Drinking Water State Revolving Fund Loan (DWSRF)

DWSRF is funded by Environmental Protection Agency (EPA) capitalization grants, state matching funds, loan repayments, investment earnings, and bonds. Eligible entities include public trusts of towns and municipalities with proper legal authority, and rural water districts established under Title 82 of the Oklahoma Statutes. Eligible projects include drinking water treatment, new intake/raw water lines, major distribution/storage system rehabilitation, new storage, engineering, and new transmission or distribution systems.

This program has provided nearly $743,650,000 in financial assistance since 1997.

Clean Water State Revolving Fund Loan (CWSRF)

The CWSRF is funded by EPA capitalization grants, state matching funds, and bonds. Eligible projects must be listed on the CWSRF Project Priority List and current Intended Use Plan maintained by the OWRB. Projects that are ready

to proceed will receive a higher priority. An engineering report is mandatory by the OWRB, including a cost-effective analysis to access CWSRF funds. Eligible entities must meet sufficient economic and environmental information for the OWRB to issue an environmental decision regarding project impacts.

Eligible entities include cities, towns, counties, the State of Oklahoma and any rural sewer district, public trust, master conservancy district, any other political subdivision, or any combination thereof established under Title 82 of Oklahoma Statutes.

Eligible projects include wastewater treatment, collection, storage, disposal infrastructure or equipment (new construction or rehabilitation), urban stormwater activities, brownfields assessment/remediation, watershed management /non-point source pollution control activities (capital improvements, equipment, environmental cleanup, land acquisition, or implementation of management practices to protect and improve surface or groundwater), and wastewater system security.

This program has provided nearly $1,047,922,000 in financial assistance since 1990.

United States Department of Agriculture (USDA) Rural Development Loan/Grant

The USDA Water and Environmental Programs (WEP) provides loans, grants, and loan guarantees for drinking water, sanitary sewer, solid waste, and storm drainage facilities in rural areas, cities, and towns of 10,000 or less. Public bodies, non-profit organizations and recognized Indian tribes may qualify for assistance. WEP also makes grants to nonprofit organizations to provide technical assistance and training to assist rural communities with their water, wastewater, and solid waste problems. The loans and grants for the Rural Communities Program is provided in many ways, including direct or guaranteed loans, grants, technical assistance, research, and educational materials.

Community Development Block Grant Program (CDBG)

The CDBG program is a flexible program that provides communities with resources to address a wide range of unique community development needs including water and sewer funding assistance.

Over a one, two, or three year period, as selected by the grantee, no less than 70% of CDBG funds must be used for activities that benefit low and moderate income persons. In addition, each activity must meet one of the following national objectives for the program: benefit low and moderate income persons, prevent or eliminate slums or blight, or address community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community for which other funding is not available.

Although these resources have provided the majority of funding avenues in the past, there are other infrastructure financing options. These resources have assisted with the water and wastewater infrastructure needs of Oklahomans for many years. However these programs have not allowed the type of investment and improvements necessary to keep up with current infrastructure deterioration and meeting the needs of new regulatory requirements.

FUTURE NEED

The OWCP estimates approximately $37 billion (in 2007 dollars) will be required to meet the drinking water infrastructure needs for the next 50 years. The needs are distributed across a wide range of Oklahoma communities. Small utility providers have the largest overall water infrastructure costs comprising of approximately 47 percent of the entire state's need.

Small utility systems are defined as those utility providers that provide water for service populations of less than 3,300. Medium systems range in size from 3,301 to 100,000 in service population. Large systems have water service populations greater than 100,000.

Table 1: 50-year Financial Burden for Oklahoma Water Systems (based on 2007 dollars)

Small	Medium	Large
$17,300,000,000	$14,660,000,000	$4,670,000,000

The OCWP developed a forecast of water infrastructure needs phased throughout three future planning horizons or funding cycles. Oklahomans have an immediate need of more than $10 billion in water infrastructure funding.

As indicated previously, current OWRB loan fund balances for water-only projects is approximately $90 million. This substantial shortfall is cause for significant concern. Existing utility providers will not be able to maintain Oklahoma's aging wastewater infrastructure and meet current and future regulatory requirements between now and 2020.

The wastewater system evaluation and subsequent funding needs were developed through evaluation of multiple wastewater infrastructure categories as reflected in the table below:

Table 2: Wastewater Infrastructure Categories

CWNS	Infrastructure Description
I	Secondary Wastewater Treatment
II	Advanced Wastewater Treatment
III	Existing Wastewater Collection Systems
IV	New Wastewater Collection Systems

The OWCP estimates approximately $43 billion (in 2007 dollars) will be required to meet the wastewater infrastructure needs for the next 50 years. These needs are distributed across a wide range of communities within Oklahoma. Medium utility providers have the largest overall wastewater infrastructure costs comprising of approximately 64% of the entire state's need.

Table 3: Financial Burden for Oklahoma Wastewater Systems (2007 dollars)

Small	Medium	Large
$10,300,000,000	$27,750,000,000	$5,430,000,000

The OCWP also developed a forecast of wastewater infrastructure needs phased throughout three future planning horizons or funding cycles. Oklahomans have an immediate need of approximately $12 billion in wastewater infrastructure funding. With the current OWRB loan fund balance for wastewater only projects at approximately $141 million this substantial shortfall is cause for significant concern. Existing utility providers will not be able to maintain Oklahoma's aging wastewater infrastructure and meet current or future regulatory requirements between now and 2020.

Clearly, additional financial resources will be required given the immediate and future water and wastewater infrastructure needs. New and innovative financing methods must be developed at the local, state, and federal level in order to meet the ongoing deterioration of existing utility systems.

Water and wastewater infrastructure investment is critical to sustain and increase Oklahoma's economic growth and quality of life. Inadequate and poorly functioning water and wastewater systems contribute to increased health risks, poverty, and rising energy costs. Investment in rehabilitation and expansion of these systems not only provides utility sustainability, but also has a positive impact on local economies. The OWRB reports that every $1 of construction activity creates 25 jobs within Oklahoma communities.

PUBLIC SAFETY

High quality wastewater discharge and prevention of untreated sanitary sewer overflows are primary objectives for all wastewater utility providers. The OWRB and the Oklahoma Department of environmental Quality (ODEQ) work together to monitor Oklahoma's lakes and streams and to regulate wastewater discharges. Primary objects of monitoring and regulating are to detect and quantify long-term water quality trends, document and quantify impairments of assigned beneficial uses, and identify pollution problems before they become a crisis. It is imperative that adequate wastewater treatment occurs in order to limit the impacts of turbidity, oxygen demanding, and high nutrient waste on Oklahoma lakes and streams.

RECOMMENDATIONS FOR ACTION

Clearly, additional financial resources will be required given the immediate and future water and wastewater infrastructure needs. New and innovative financing methods must be developed at the local, state, and federal level in order to meet the ongoing deterioration of existing utility

systems. Federal legislation should be developed to create grant programs and loan subsidies to encourage water and wastewater infrastructure construction.

New and innovative financing methods should be developed at the state level. The OWRB should convene a team of financial and water/wastewater infrastructure professionals, led by the OWRB, to investigate the development of a more robust state funding program to meet the state's projected water and wastewater infrastructure needs between now and 2060. Other recommendations to assist in meeting the funding shortfall include:

- Additional state investments
- Maintain gross production tax revenue
- Develop new methods to encourage regionalization
- Explore new alternative funding sources
- Creation of new or restructured Financial Assistance Program (FAP)
- Creation of a small loan initiative

In November 2012, Oklahoma residents voted in favor of Oklahoma State Question 764, which amended the Oklahoma Constitution and expands the OWRB's programs that lend money to local governments. Section 39A was added to Article 10 allowing OWRB to issue general obligation bonds for critical infrastructure improvements such as drinking water, sewage and the storm runoff systems. The bonds will only be sold if the borrowing towns default on their loans and a series of other breakers fail.

Up to $300 million worth of bonds can be issued, if needed, resulting in an additional $3 billion in lending. For small cities, this gives access to capital they could not otherwise obtain and for larger cities the program's AAA credit rating means lower interest rates on infrastructure borrowing.

Although this program change will provide substantial benefits, it is still a long way from meeting the unfunded needs. With over $80 billion needed over the next 50 years, sufficient funding to adequately sustain statewide water and wastewater infrastructure must continue to be a priority.

SOURCES

2012 Oklahoma Water Resource Board (OWRB) Status Report (http://www.owrb.ok.gov/about/about_pdf/2012-OWRB-Status.pdf)

2012 Oklahoma Comprehensive Water Plan (OCWP) (http://www.owrb.ok.gov/supply/ocwp/ocwp.php)

OWRB Financial Assessment of the OCWP (http://www.owrb.ok.gov/news/news2/pdf_news2/conference/2011_GWC_Presentations/Freeman_OCWP_Finance.pdf)

2009 Drinking Water Needs Survey and Assessment (http://water.epa.gov/infrastructure/drinkingwater/dwns/index.cfm)

2011 Drinking Water Needs Survey and Assessment (http://www.dwneeds.com/)

2008 Clean Water Needs Survey and Assessment (http://water.epa.gov/scitech/datait/databases/cwns/upload/cwns2008rtc.pdf)

United States Department of Agriculture, Rural Development (http://www.rurdev.usda.gov/UWEP_HomePage.html)

United States Department of Housing and Urban Development (http://portal.hud.gov/portal/page/portal/HUD)

ACKNOWLEDGEMENTS

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