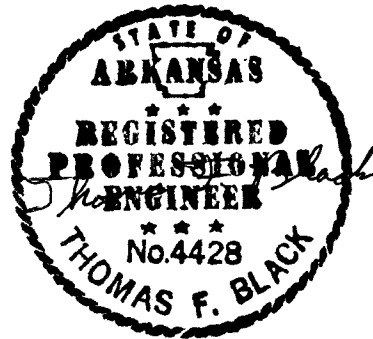
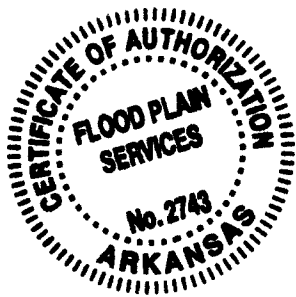


County Road Needs Report

County Judges' Association of Arkansas 2017 Annual Winter Meeting

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9/15/2017



Flood Plain Services (FPS) is retained by the County Judges' Association of Arkansas to make a determination of the approximate cost necessary for the replacement of obsolete and deficient county road bridges throughout the State of Arkansas, and to estimate annual maintenance cost for all County Road Bridges. Additionally, FPS has also been retained to investigate and make estimates regarding the costs associated with maintaining county roads throughout the state of Arkansas.

Introduction: On January 8, 2016 Thomas F. Black met with the County Judges' Association of Arkansas (CJAA) Executive Board, Subcommittee on roads and bridges, to discuss the statewide needs for the replacement of functionally obsolete (FO) and structurally deficient (SD) County road bridges. By the end of the meeting FPS was retained to address three items as follows:

1. The replacement costs for FO or SD county road bridges based upon the Arkansas State Department of Transportation (ARDOT) bridge inspection data.
2. The Projected annual maintenance cost to maintain County bridges.
3. To address school bus safety issues from County road bridges by determining the number of obsolete or deficient bridges statewide with 15 ton or less posted weight capacity.

Additionally this year, FPS has also been retained to investigate and estimate operating cost of various types of County road pavements throughout the state of Arkansas. The roads are to be categorized on the basis of the materials from which they are constructed, including gravel, chip seal, and asphalt pavements. Originally it was intended that FPS would also develop cost estimates for the maintenance and operation of the roads on an annual basis using information to be derived from the MAP-21 project. This project, being developed by the Arkansas Department of Transportation and the State GIS Store, includes City and County Road mapping information that will allow the development of roadway data on a countywide basis. Unfortunately, the MAP-21 project will not be able to provide this data until later this year or early in 2018, therefore, this study will only be able to develop approximate information from material suppliers in the state of Arkansas that will allow the estimation of annual operating cost for various types of roadway pavements.

Bridge Replacement: Last year the Bridge data obtained from the Arkansas State Department of Transportation (ARDOT) listed 1,196 FO or SD bridges on County roads. Functionally Obsolete (FO) bridges are those that do not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic, or those that may be flooded occasionally. Structurally Deficient (SD) bridges are those that have been restricted to light vehicles, closed to traffic, or require rehabilitation. In Arkansas counties these include 778 FO and 418 SD County road bridges. This year updated bridge data information from the ARDOT indicated 1,174 SD and FO bridges on county roads throughout the State of Arkansas. These included 362 SD and 812 FO bridges.

Although it has been one year since the completion of the first report on County road bridges, not a sufficient duration of time has passed to show any trend regarding obsolete or deficient county road bridges throughout the state of Arkansas. These numbers do indicate, however, some progress being made in the short term. The total number of bridges on the list did not drop significantly from that in 2016; however, the number of SD bridges did drop by over 13%, which indicates a slight improvement over that from the previous year.

In order to determine the costs associated with replacing obsolete and deficient county road bridges listed in the bridge inventory for 2017, the same considerations were taken into account as in 2016. These

considerations include the planning and design, existing structure removal, and replacement costs for each bridge. In order to provide a more detailed estimate of replacement costs in this year's report, smaller bridges were broken down into three size classifications. The overall replacement costs were then tabulated for all obsolete and deficient bridges located on County roads. Several sources of information were used for the determination of item costs used in this analysis, including data from the ARDOT bridge inventory.

The cost of replacing the 812 FO county road bridges is calculated to be \$332,385,847 and the cost of replacing the 362 SD county road bridges is calculated to be \$158,841,376, for a total of \$491,227,223.

Bridge Maintenance: Bridge maintenance for the 4,307 County road bridges from the ARDOT bridge inventory is much less predictable than construction costs. The ARDOT bridge maintenance costs vary substantially, and appear to be somewhat higher than county costs because of the higher State road traffic volumes and speeds. One unsubstantiated value for general bridge maintenance mentioned during our research is \$0.16 per square foot per year of bridge area. Using this value for bridges in the County bridge inventory, it is calculated that approximately \$365.12 per year per bridge is needed for bridge maintenance. The calculated statewide value for the 4,307 County road bridges based upon these values is \$1,572,592 per year.

Weight restricted bridges: Since there have never been enough funds available to upgrade all roadways and bridges used by the public weight restricted bridges are always a concern of Counties. County roads used as school bus routes may have a special concern for weight restricted bridges. Since most full size school buses weigh more than 15 tons, any county roads with bridges having weight restrictions below 15 tons may be of a particular concern when used as school bus routes. Inventory data used in this report were inspected to determine the number of FO or SD bridges signed at or below a 15 ton weight limit. In the 2016 this report indicated that 574 [48%] of the 1,196 FO or SD bridges were signed to be at or below a 15 ton weight limit. This year that number fell to 505 [43%] of the 1,174 FO or SD bridges signed to at or less than 15 tons. Although these numbers do show an improvement in the condition of weight restricted bridges on County roads, this still means that 12% of the 4,307 County road bridges contained in the ARDOT bridge inventory for County roads are SD and weight restricted at a level less *than the* weight of a loaded school bus.

County Roads in Arkansas: County roads throughout Arkansas are composed of both gravel roads and paved roads. This report is intended to address the operating costs of roads across the state. Last year the Polk County produced a report that estimated the cost of maintaining gravel roads throughout Polk County at \$2,564.35 per year per mile. This year it was intended for us to estimate the cost per year per mile for maintaining paved roads in counties throughout Arkansas. Generally speaking, paved roads are constructed with both rigid and flexible pavements. Rigid pavements are constructed of concrete and are predominantly located on state highways and city streets. Very few rigid pavements are maintained in County road systems throughout the state. Most paved County roads are constructed of flexible pavements. For the purposes of this report we will separate the types of these flexible pavements into those composed of hot mix asphalt and chip seal surfaces. We will address these two types of pavements separately in order to address the

differences in initial capital improvement costs, and in the projected annual maintenance costs for each type of pavement.

Initially it was intended for us to estimate the operating costs of existing County roads statewide. However, information regarding the cumulative lengths of each type of County road pavement was not readily available from existing information. Therefore, it was decided that we would address estimated operating and maintenance costs for each type of pavement on a per year per mile basis. Information for use in this report was obtained from interviews with Mr. Darrell Gardner with Ergon Asphalt and Emulsions, Inc., and Mr. Michael Morgan with the Greenberg-Farrow Company. Mr. Gardner provided us information on capital improvements and maintenance costs of flexible pavements in Arkansas counties, and Mr. Morgan provided us information on pavement inspection and condition.

Capital Improvement Costs: This report focuses on the cost of maintaining and operating paved roads in Arkansas counties. Since this report focuses on operating costs of county roads, it was decided to address the capital improvement costs separate from the maintenance costs of county roads. Certain capital improvement costs associated with the construction of pavements throughout the state are similar regardless of what type of pavement you are constructing. The initial drainage work, road embankment construction, and roadway base are essentially the same for all pavements. The cost of the materials, equipment, and labor for the final paving of the roadway surface vary between hot mix asphalt and chip seal pavements. The estimate of the initial construction costs for hot mix asphalt pavements is \$140,000, not including the cost of the drainage improvements, road embankment, and subgrade. In addition to these initial construction costs it is anticipated that additional capital improvement costs should also include an estimated \$135,000 for a mill and fill operation during the life of a hot mix asphalt pavement. The estimate of the construction costs for chip seal pavements is \$65,000 per year per mile, not including the cost of drainage improvements road embankments and subgrade.

Maintenance Costs: The separate maintenance cost for hot mix asphalt pavement averages approximately \$6,500 per year per mile. It is anticipated that periodic maintenance will be needed on these types of pavements approximately every 5 to 6 years. The average annual costs for these individual maintenance operations range from \$1,600-\$14,000 per year per mile over the service life of this type of pavement.

The separate maintenance cost for chip seal pavements averages approximately \$4,500 per year per mile. It is anticipated that periodic maintenance will be needed on these types of pavement every 5 to 6 years during their service life. The average annual cost for these individual maintenance operations ranges from \$1,600- \$6,800 per year over the service life of this type of pavement.

Pavement Management Program: In many cases the need and application of pavement management maintenance to existing county roads is triggered by public complaints regarding the roughness of the roads and pavement failures developing through the pavement and into the roadbed. The problem with this is that by the time these complaints are received the deterioration of the road and roadbed may have advanced past

the point of reasonable maintenance, necessitating the reconstruction of the roadbed and pavement. Once the subgrade and roadbed have been affected by deterioration even the application of maintenance procedures to the pavement may only provide you an additional 1 to 2 years of service life. Whereas, the application of the same maintenance operations to the same roadbed at the proper time may give you an additional 5 to 7 years of service life before the next maintenance operation is needed.

When pavement monitoring is performed on the paved roads within any county the condition of the roads may be broken down into several categories. These may include good condition, maintenance needed, and extreme deterioration. If the proper maintenance procedure is performed on a pavement when maintenance is needed the required maintenance may not be required for another 5 to 7 years. Additionally, over successive maintenance operations performed at the proper time, some pavements have shown increased durability and longevity resulting in better quality pavements with extended periods between maintenance operations. This means that within your pavement management program, if proper maintenance is performed as needed rather than waiting for public complaints, the overall quality and cost of maintaining paved roads within the county may be improved over time. For hot mix asphalt pavements the cost of a maintenance treatment can run from \$8,000-\$35,000, depending upon the degree of pavement deterioration, whereas, the cost of materials alone for repaving of a deteriorated pavement can be as much as \$140,000. For chip seal pavements the cost of a maintenance treatment can run from \$8,000-\$26,000, depending upon the degree of pavement deterioration, whereas, the cost of materials alone for repaving of a deteriorated pavement can be as much as \$65,000. It is apparent from these figures that in the long run is more cost-effective to perform maintenance on flexible pavements when it is determined that they need maintenance rather than to wait for them to develop extreme deterioration.

Therefore, it is apparent that the effectiveness of a pavement management system across counties throughout the state depends upon periodic monitoring of the paved roads to ascertain their condition and determine which ones are approaching the point that they need maintenance operations performed. Also, keeping records of the maintenance activities performed on paved roads including the dates of maintenance and the cost of each maintenance operation, will provide necessary information for planning and budgeting roadway management practices in the future, and provide successive administrations with historical data and background as information needed for proper roadway management practices within the existing budgets of the counties.

Roadway Management Benefits: Therefore, several benefits to be achieved with the use of maintenance cost data and pavement conditioning monitoring can be listed as follows:

1. This data can be used as a planning tool for budgeting existing revenues for roadway maintenance.
2. Pavement management data can provide an organized plan for documenting maintenance operations and guiding and predicting future maintenance needs.
3. Pavement management data will provide a historical record that can be used by succeeding County administrations and personnel to guide in continuing an effective pavement management program.

4. The effective application of pavement management practices may provide the additional benefit of extending pavement life and lengthening the time between successive pavement management operations.
5. This will provide valuable information regarding the practices and costs of maintaining high quality pavements throughout the county which can be used to determine the size of the pavement program that can be supported by existing and projected revenue.

This report addresses the level of statewide funding needed to deal with the currently recognized County bridges that are described as FO or SD in the ARDOT bridge inventory. The bridge characteristics summarized in this bridge inventory relate both the functionality and safety of each structure. The report also addresses the annual costs associated with the operation and maintenance of paved county roads throughout Arkansas. Upon completion of the Map-21 Project it is planned to obtain an estimate of the total miles of county maintained roads statewide and the respective miles of gravel, hot mix asphalt, and chip seal roads. These mileages will then be used to create an estimate, of the annual cost of maintaining the county road systems statewide, as a supplement to this report.

This report is being respectfully submitted to the County Judge's Association of Arkansas for each County's information. Flood Plain Services is responsible for the content of this report, and will be available to answer any questions or respond to any comments regarding the report's content.

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