

**COMPETITIVE HIGHWAY BRIDGE PROGRAM
MISSOURI DEPARTMENT OF TRANSPORTATION
CFDA NUMBER(S): 20.205 -- HIGHWAY PLANNING AND CONSTRUCTION**

| | |
|---|---|
| Project Name: | FARM Bridge Program: Fixing Access to Rural Missouri |
| State Priority Ranking: | #1 of 3 |
| Previously Incurred Project Eligible Costs: | \$0 |
| Future Eligible Project Costs: | \$35,684,957 |
| Program Grant Request Amount: | \$28,547,966 |
| Federal (DOT) Funding including Program Funds Requested: | \$28,547,966 |



FARM BRIDGE PROGRAM: Fixing Access to Rural Missouri

TABLE OF CONTENTS

| | |
|---|----|
| Overview | 3 |
| Project Description | 4 |
| Project Location | 6 |
| Project Parties | 9 |
| Grant Funds | 9 |
| Innovation | 9 |
| Support for Economic Vitality | 10 |
| Life Cycle Costs and State of Good Repair | 12 |
| Project Readiness | 13 |
| *Benefit Cost Analysis | 14 |

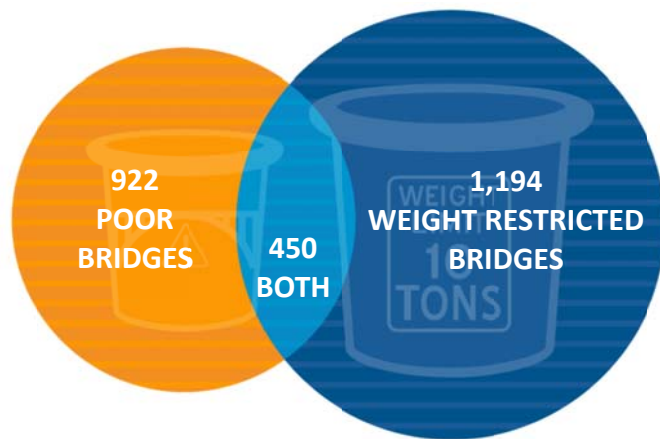
**Detailed discussion of Benefit Cost Analysis, including all calculations, are included in a separate attachment.*

Overview

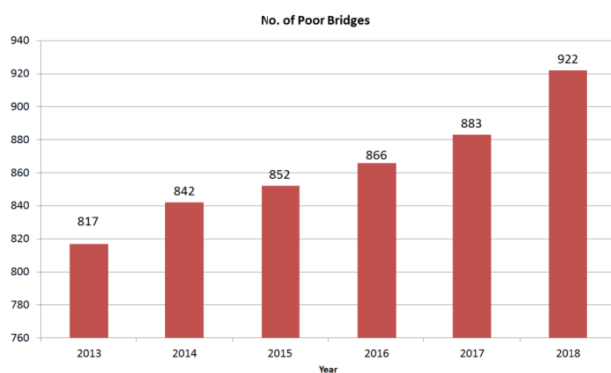
Missouri has the nation's seventh largest state highway system with 33,859 miles and 10,385 bridges, yet Missouri ranks 48th nationally in transportation revenue per mile. That disparity creates a challenge for the Missouri Department of Transportation just to keep the system in the condition in which it is in today, much less improve it.

The problem is especially acute when it comes to bridges. There are 922 bridges in poor condition on the state system and 1,194 that are weight restricted; 450 are on both lists.

In the last two years, MoDOT spent nearly \$400 million on bridge repairs and replacements and yet the number of poor bridges on the system continues to rise. In Fiscal Year 2019, MoDOT plans to invest \$200 million to replace 75 bridges, re-deck another 25, and rehabilitate or perform minor repairs on 75 more, but it's expected the number of poor bridges will increase yet again.



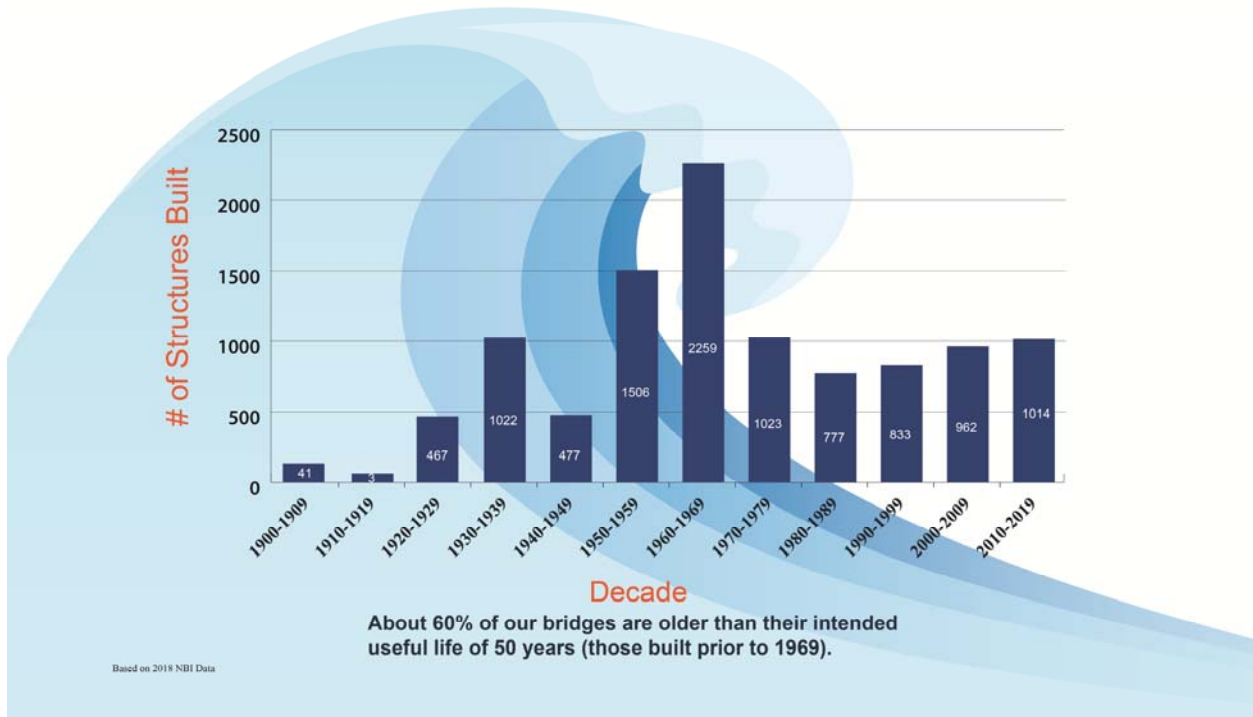
From 2009-2013, MoDOT completed the Safe & Sound Bridge Improvement Program that replaced or repaired more than 800 of the state's poorest bridges. That program drove the number of poor bridges down to the 817 figure shown in the chart. Even with additional



significant investments in bridges in the MoDOT construction program since that statewide program ended, the trend on poor bridges has reversed itself.

The reason is age. About 60 percent of state bridges are older than their intended useful life of 50 years, with the average bridge age being 47.6 years. The wave of bridges built in the 1950's and 1960's, which accounts for 36 percent of MoDOT's bridge inventory, are reaching the end of their service lives.

Distribution by Decade



Project Description

The Missouri Department of Transportation (MoDOT) is seeking \$28,547,966 in Competitive Highway Bridge Program grant funding to supplement \$7,136,991 in state funds to replace 41 bridges that are all:

- In poor condition,
- Weight-restricted,
- Supported by timber pile, and
- One lane but carry two-way traffic.

The FARM Bridge Program (Fixing Access to Rural Missouri) would eliminate all of the state-owned bridges in Missouri located north of the Missouri River that currently meet the criteria above. Additionally, it should be noted that 14 of these structures are currently considered scour critical.

All of these bridges would be replaced with new bridges meeting the appropriate current AASHTO design standards for bridges as well as current safety standards for the roadways on which the bridges are located.

On average, the bridges in this bundled project are 77 years old and many of them are deteriorating rapidly, which is common when timber pile reach this age range in Missouri. It's

estimated that more than half of the 41 targeted structures could need to be closed in eight years or less if not replaced.

These bridges are an impediment to the efficient movement of agricultural equipment, agricultural commodities, forest products, other manufacturing goods and impact emergency response times. They also affect school bus routing and economic development in northern Missouri. MoDOT's local planning partners consistently identify the replacement of rural one-lane bridges as a priority for their area of the state.



Further weight restrictions on these bridges would effectively close them to truck traffic. If that were to occur, increased shipping and travel costs will be experienced by the current users of these bridges because of the detours. Some of the traffic may detour on roads that are not meant for heavier truck traffic and would lead to unnecessary deterioration of these other roads.

School buses that are too heavy to cross bridges would need to travel additional miles, increasing cost to schools, and increasing time spent on the bus and risk of exposure to students. Emergency response times will climb if a load posting is very low or a bridge is closed.

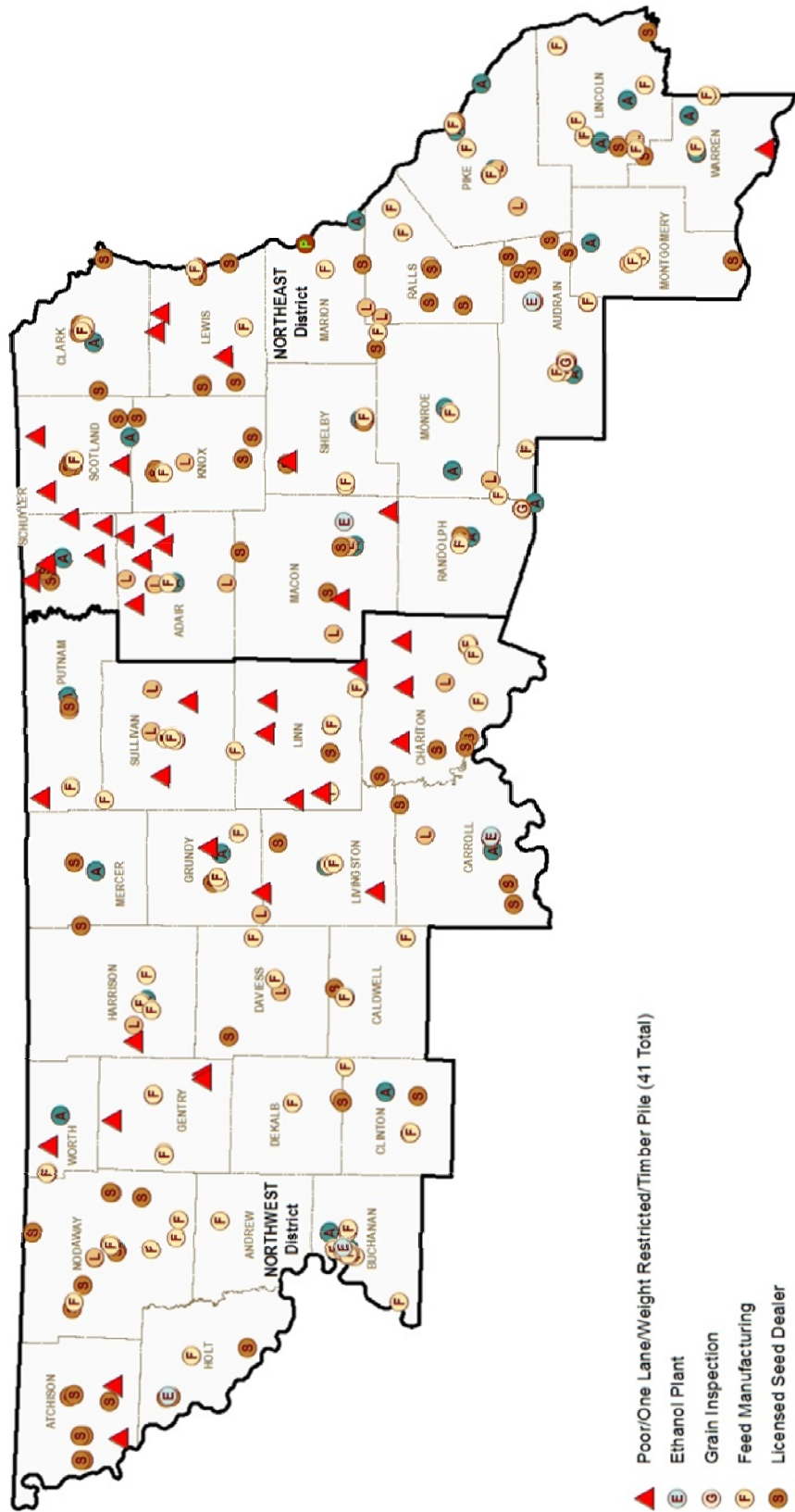
MoDOT maintenance efforts would also be compromised; snow plows that are too heavy to cross load-posted bridges affect our ability to clean roadways during winter operations and other pieces of heavy equipment, like stripers, would incur additional costs by having to detour.

| MODOT DIST | COUNTY | ROUTE & FEATURE INTERSECTED | FED ID | CONDITION RATING | LOAD POSTED | ADT | PCT. TRUCKS |
|------------|------------|---|--------|------------------|-------------|-------|-------------|
| NE | Adair | Rt. B over Hazel Creek | 7489 | 3-5-5 Poor | Yes | 90 | 13 |
| NE | Adair | Rt. T over N. Fork Salt River | 7675 | 3-7-5 Poor | Yes | 248 | 11 |
| NE | Adair | MO Rt. 11 S. over Floyd Creek | 8763 | 4-5-5 Poor | Yes | 709 | 24 |
| NE | Adair | MO Rt. 11 S. over S. Fork S. Fabius River | 8854 | 4-5-5 Poor | Yes | 1075 | 11 |
| NE | Adair | Rt. A over N. Fork S. Fabius River | 9328 | 3-6-5 Poor | Yes | 358 | 11 |
| NE | Lewis | Rt. E over Sugar Creek | 7556 | 4-6-5 Poor | Yes | 203 | 12 |
| NE | Lewis | Rt. E over Derrahs Branch | 7584 | 3-5-6 Poor | Yes | 203 | 12 |
| NE | Lewis | Rt. J over Big Grassy Creek | 9799 | 3-6-5 Poor | Yes | 194 | 5 |
| NE | Macon | Rt. Y over Hoover Creek | 7612 | 3-6-5 Poor | Yes | 367 | 5 |
| NE | Macon | Rt. UU over BNSF Railroad | 9453 | 5-3-5 Poor | Yes | 122 | 10 |
| NE | Schuyler | Rt. C over N. Fork Middle Fabius River | 7570 | 3-6-5 Poor | Yes | 257 | 12 |
| NE | Schuyler | Rt. M over S. Fork N. Fabius River | 7658 | 3-5-5 Poor | Yes | 50 | 8 |
| NE | Schuyler | Rt. A over Brushy Creek | 8901 | 4-5-5 Poor | Yes | 294 | 11 |
| NE | Schuyler | Rt. E over N. Fork S. Fabius River | 9331 | 4-5-5 Poor | Yes | 119 | 10 |
| NE | Schuyler | Rt. A over N. Fork Middle Fabius River | 9529 | 3-6-5 Poor | Yes | 412 | 11 |
| NE | Scotland | Rt. W over Tobin Creek | 8688 | 3-5-5 Poor | Yes | 131 | 11 |
| NE | Scotland | Rt. H over N. Fork N. Wyaconda River | 9574 | 3-6-5 Poor | Yes | 302 | 11 |
| NE | Scotland | Rt. B over N. Fork N. Fabius River | 9585 | 3-6-5 Poor | Yes | 302 | 11 |
| NE | Shelby | Rt. M over Black Creek | 9111 | 4-5-5 Poor | Yes | 268 | 11 |
| NE | Warren | Rt. 94 over Treloar Creek | 9593 | 4-5-5 Poor | Yes | 1,199 | 7 |
| NW | Atchison | Rt. 46 over Little Tarkio Creek | 8991 | 4-6-4 Poor | Yes | 573 | 9 |
| NW | Atchison | Rt. 111 over Pike Creek Drainage Ditch | 9570 | 3-5-4 Poor | Yes | 202 | 12 |
| NW | Chariton | Rt. CC over Yellow Creek | 7711 | 4-6-4 Poor | Yes | 254 | 26 |
| NW | Chariton | Rt. D over Clark Creek | 9150 | 4-5-5 Poor | Yes | 201 | 26 |
| NW | Chariton | Rt. D over E. Fork Bee Branch | 9154 | 4-6-6 Poor | Yes | 158 | 23 |
| NW | Gentry | Rt. YY over Bear Creek | 5032 | 3-4-5 Poor | Yes | 218 | 10 |
| NW | Gentry | Rt. T over Brushy Creek | 8676 | 3-5-5 Poor | Yes | 36 | 11 |
| NW | Gentry | Rt. T over Fitzgerald Branch | 8677 | 3-5-4 Poor | Yes | 36 | 11 |
| NW | Grundy | Rt. W over Gees Creek | 7553 | 3-6-5 Poor | Yes | 223 | 18 |
| NW | Grundy | Rt. N over No Creek | 8768 | 3-6-5 Poor | Yes | 170 | 11 |
| NW | Harrison | Rt. D over Ames Creek | 8649 | 3-5-4 Poor | Yes | 64 | 13 |
| NW | Linn | Rt. B over Smokey Branch | 7724 | 4-4-5 Poor | Yes | 99 | 12 |
| NW | Linn | Rt. C over Long Branch | 8566 | 5-4-4 Poor | Yes | 372 | 11 |
| NW | Linn | Rt. C over W. Yellow Creek | 8730 | 4-6-5 Poor | Yes | 132 | 11 |
| NW | Linn | Rt. 139 over Lewis Creek | 8836 | 6-6-4 Poor | Yes | 265 | 12 |
| NW | Linn | Rt. WW over Van Dorsen Creek | 9293 | 3-5-4 Poor | Yes | 216 | 13 |
| NW | Livingston | Rt. C over Shoal Creek | 9102 | 4-5-5 Poor | Yes | 273 | 11 |
| NW | Putnam | Rt. M over Medicine Creek Fork | 7645 | 3-5-5 Poor | Yes | 56 | 12 |
| NW | Sullivan | Rt. C over Yellow Creek | 7563 | 4-6-5 Poor | Yes | 288 | 12 |
| NW | Sullivan | Rt. E over W. Locust Creek | 9167 | 4-6-5 Poor | Yes | 402 | 11 |
| NW | Worth | Rt. A over Branch | 8571 | 4-5-5 Poor | Yes | 52 | 12 |

Project Location

Located in 17 counties within MoDOT's Northwest (21 bridges) and Northeast (20 bridges) Districts.

FARM Bridge Program Fixing Access to Rural Missouri



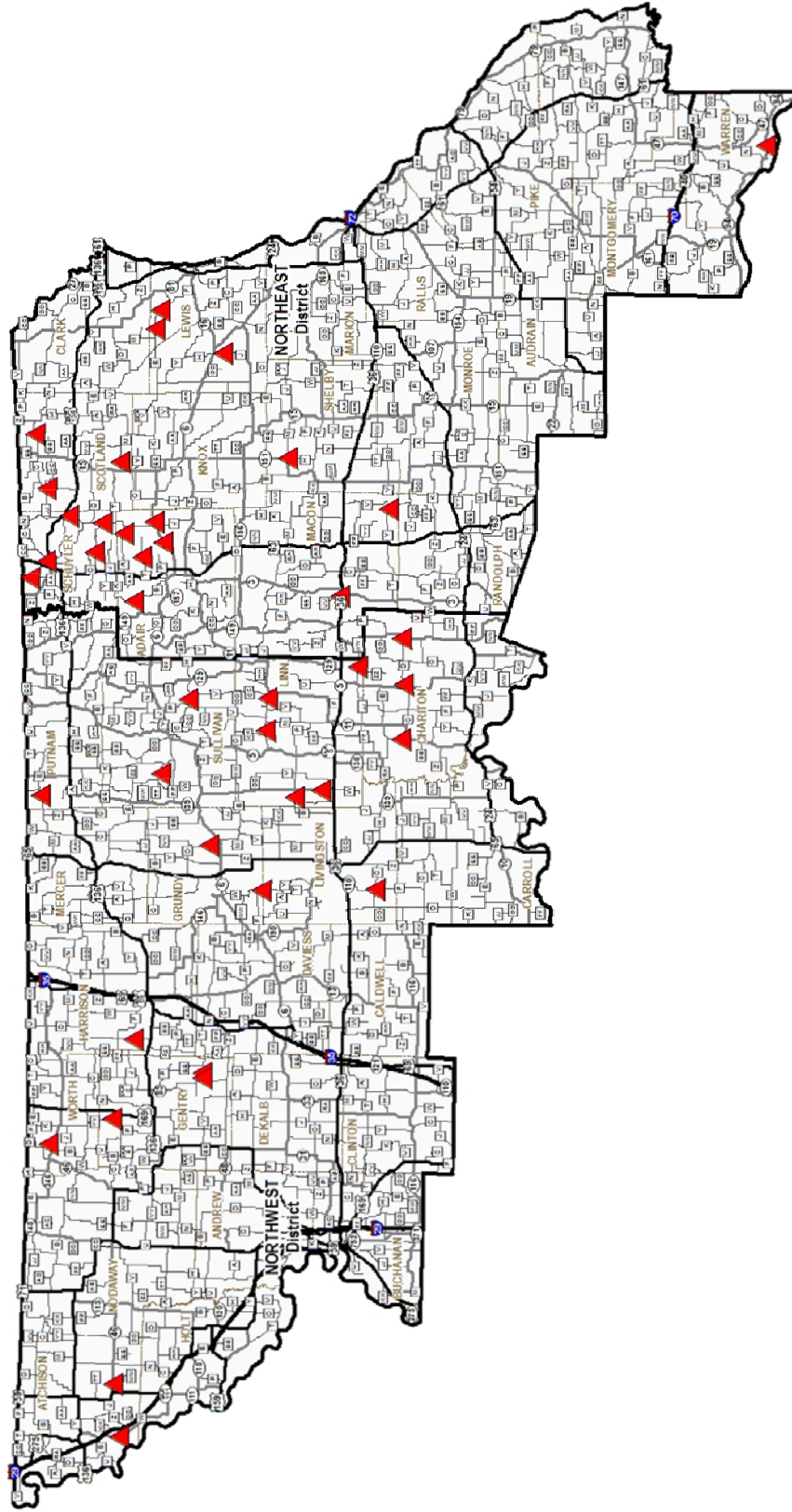
- ▲ Poor/One Lane/Weight Restricted/Timber Pile (41 Total)
- Ethanol Plant
- Grain Inspection
- Feed Manufacturing
- Licensed Seed Dealer
- Livestock Market
- Farmers Market
- Port



Missouri Department of Transportation
 Transportation Planning
 1-888-ASK-MODOT
 WWW.MODOT.ORG
 November 7, 2018



FARM Bridge Program Fixing Access to Rural Missouri



Missouri Department of Transportation
Transportation Planning
1-888-ASK-MODOT
WWW.MODOT.ORG



▲ Poor/One Lane/Weight Restricted/Timber Pile (41 Total)

Project Parties

Missouri Department of Transportation

Grant Funds

The Missouri Department of Transportation plans to replace these 41 bridges with the award of one design-build contract for a total cost of \$35.7 million. The team awarded the contract will be responsible for not only the design and construction of the 41 bridges, but also the purchase of any right-of-way and adjustment of utilities.

Project inspection will be done by in-house employees as part of their other assigned duties.

MoDOT expects to fund the project with 80 percent (\$28,547,966) from a Competitive Highway Bridge grant, and 20 percent (\$7,136,991) from matching state funds.

| Project | Total Cost | Fed. Grant Funding | State Funds |
|--|--------------|--------------------|-------------|
| FARM Bridge Program (Fixing Access to Rural Missouri) | \$35,684,957 | \$28,547,966 | \$7,136,991 |

Innovation

MoDOT has had great success with design-build projects since 2005, having completed 10 projects, with two others currently under construction and two more in the procurement phase. As recent experience has shown, design-build opens the door for innovation and promotes accelerated construction and added value on projects. Collectively, MoDOT's design-build projects have been completed \$275 million under budget and 86 months ahead of schedule. Nationally, design-build projects are completed 33 percent faster and six percent cheaper than conventional design-bid-build projects.

MoDOT also has experience with bridge bundling – on both large and small scales. From 2009-2013, MoDOT delivered the Safe & Sound Bridge Improvement Program which replaced or repaired 802 of the state's poorest bridges. A single design-build contract with KTU Constructors was utilized to replace 554 bridges and was awarded in May 2009. Construction of the design-build portion of this contract was completed in late 2012, which was 14 months ahead of the original schedule submitted by KTU Constructors during procurement.

A series of 72 smaller bundles through the normal design-bid-build process was utilized for the other 248 bridges in the program. Bridge bundles were grouped by type, size or location. The tremendous success of this program resulted in the project winning the People's Choice Award

as the top national project in AASHTO’s America’s Transportation Awards competition. The approach with this program is now being utilized by other states for dealing with a large number of bridges needs over a short period of time.

MoDOT also recently bundled six mainline Interstate 70 bridges in Columbia, Missouri in an \$18 million design-build project that was completed in one year, while maintaining four lanes of traffic throughout the construction of the project.

Currently, MoDOT has a \$36.1 million bridge bundling design-build project in procurement that will replace or rehabilitate as many as 31 bridges along the Interstate 44 corridor in southwest Missouri.

MoDOT’s past experience demonstrates it is very capable of delivering this proposed bridge replacement project using the innovative design-build project delivery method on time and within budget. Additionally, past experience on design-build projects demonstrate that MoDOT gives the design-build teams the flexibility to use accelerated bridge construction techniques to speed up the delivery of the project, and is open to the use of innovative new technologies by the teams to deliver a project that meets or exceeds the expectations of MoDOT as well as the citizens of Missouri.

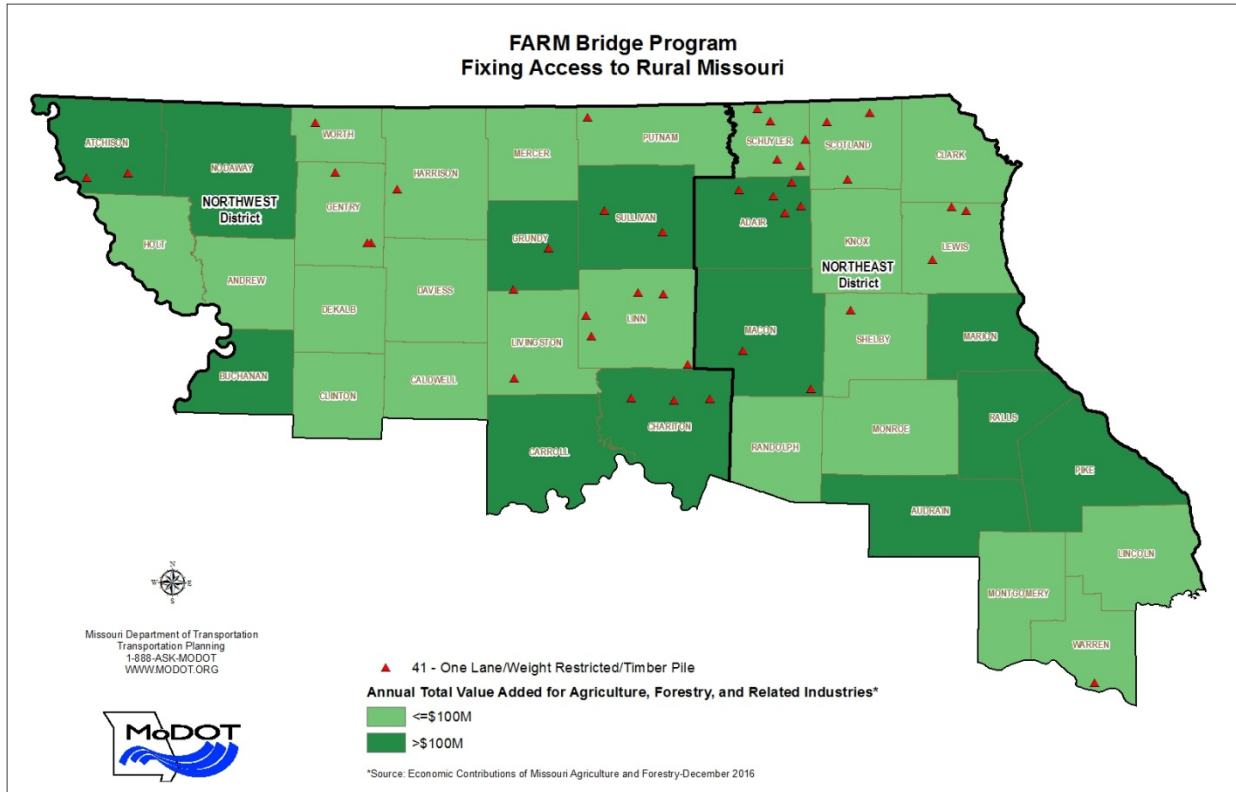
Support for Economic Vitality

Missouri’s agricultural economy is an \$88 billion industry, and the corn, soybeans and livestock produced in northern Missouri are big reasons why. Missouri is within 600 miles of 51 percent of all U.S. households and America’s fastest growing metro areas – San Antonio, Austin, Nashville, Atlanta, Dallas and Houston. Missouri can get products to market faster and cheaper.

Missouri’s farm-to-market roads are critical connections to Missouri’s highways, railways and waterways, enabling farmers to compete in the global marketplace. The bridges in MoDOT’s FARM Bridge Program pose obstacles, though, to that connectivity.

Weight restrictions and narrow dimensions limit the ability for large pieces of farm machinery and heavy shipments of fertilizer, grain and livestock to cross bridges – causing detours for travel and increasing shipping costs.

| AGRICULTURAL FACILITIES IN NORTHERN MISSOURI | |
|---|-----|
| Ethanol Plants _____ | 5 |
| Grain Inspection _____ | 2 |
| Feed Manufacturing _____ | 99 |
| Licensed Seed Dealer _____ | 147 |
| Livestock Market _____ | 33 |
| Farmers Market _____ | 39 |
| Ports _____ | 4 |



Northern Missouri also has a burgeoning wind energy industry. Several large wind farms have already been constructed within MoDOT’s Northwest District. Now, Terra-Gen will be developing the largest wind farm in the state of Missouri, within the Northeast District’s Adair and Schuyler counties – 175 turbines spread across 70,000 acres. It is projected to power 120,000 homes.

Ameren Missouri will acquire the 400-megawatt wind farm after construction. It is estimated that construction will require 11 superloads per turbine, requiring 1,925 Over Dimensional/Over Weight permits. Construction is tentatively set to begin in the summer of 2019, with completion by the end of 2020. Ten of the bridges in this application are located within those two counties.

While much of the existing development of Missouri wind energy has been concentrated in the northwest part of the state, improvements in wind turbine technology are now making projects feasible in new areas, including northeast Missouri.

Installing and operating the farm’s more-than-450-foot turbines is expected to support 450 to 500 construction jobs. The project will also generate local tax revenue and provide annual lease payments to landowners for at least a 30-year lifespan.

Five miles north of Milan in Sullivan County, which has two bridges in the FARM Program, the North Central Missouri Regional Water Commission, the U.S. Department of Agriculture and the state of Missouri are developing the 2,350-acre East Locust Creek Reservoir. Along with 2,000 acres of vegetated buffer, once completed the lake will provide the area with an efficient and reliable source of affordable, quality drinking water, recreational opportunities and flood control. This project also has economic development implications.

Replacing these bridges is important to the economic vitality of northern Missouri. If these bridges further deteriorate, requiring additional load postings, or eventual closure, the alternatives are long detours or heavy loads utilizing county roads that aren't built to sustain heavy truck traffic.

Life-Cycle Costs and State of Good Repair

With an average age of 77 years, these 41 bridges have far exceeded their expected 50-year design life. All of them are in poor condition, weight-restricted, rest on timber pile and are one lane but carry two-way traffic.

Bundling these bridges into a single design-build contract allows for economies of scale in both the design and construction of these structures. Designs may be standardized and the fabrication, delivery and installation of pre-fabricated bridge members, will speed the construction process.

The Missouri Department of Transportation is a nationally recognized leader in using bridge bundling to save money. The Federal Highway Administration's Center for Innovative Finance Support includes MoDOT's Safe & Sound Bridge Improvement Program as a Case Study on how to save money through bundling:

https://www.fhwa.dot.gov/ipd/alternative_project_delivery/defined/bundled_facilities/case_studies.aspx

FHWA has also been developing a "Bridge Bundling Guide" and MoDOT will be featured in Chapter 11, Appendix 2 of this yet-to-be-published document.

For the proposed FARM Bridge Program, MoDOT expects savings of 15-25 percent on the design side and 10- 20 percent on the construction side for a total project savings of 20 percent. Since this will be a smaller design/build project with relatively simple bridges, multiple design/build teams are expected to compete which will drive down costs even further. This project should also be attractive to small and medium sized consultants and contractors because without a large required bonding capacity, they will be able to compete.

Additionally, encouraging the design-build teams to utilize Accelerated Bridge Construction (ABC) techniques to minimize road closure durations would allow for replacement of all 41 bridges in two-and-a-half years, rather than the 10-or-more years it would take through conventional means and with existing funding constraints.

Project Readiness

MoDOT has an excellent track record of quickly delivering projects once authorized. In fact, MoDOT has regularly accelerated the delivery of projects when additional funding opportunities have been presented. For example, when Congress passed the FAST Act, MoDOT proactively responded by increasing the state’s construction program by \$500 million per year because of the stability in federal funding provided by the legislation. Likewise, when a TIGER grant was awarded for the U.S. Route 54 Champ Clark Bridge over the Mississippi River in Louisiana, Missouri, MoDOT moved quickly to procure delivery of the project through the design-build process. Similarly, MoDOT stands ready to deliver the proposed FARM Bridge Program upon award.

Upon award of the grant, MoDOT will take an amendment to the Statewide Transportation Improvement Program (STIP) to the Missouri Highways and Transportation Commission for approval, and authorization to utilize the design-build project delivery method.

It is anticipated that the design-build procurement process would take six months, during which time MoDOT will prepare and submit the required federal and state-related environment documents for the project.

No significant issues were revealed during a preliminary review by MoDOT’s Environmental and Historic Preservation Section of the 41 bridges included in this grant proposal. It is expected they would fall under a Programmatic Categorical Exclusion from the Federal Highway Administration and would be permitted with a U.S. Army Corps of Engineers nationwide permit.

Following selection of a design-build contractor, MoDOT anticipates that design and construction would be completed in two and a half years.

| 2019 | | 2020 | 2021 |
|---------------------------------|--------|------------------------------------|------------------------------------|
| D-B Procurement & Environmental | Design | Construction in Northwest District | Construction in Northeast District |

MoDOT has significant experience in the development and implementation of large and complex transportation capital projects. In addition, MoDOT plans, designs, constructs and maintains 33,859 miles of highways and 10,385 bridges – the nation’s seventh largest state highway system, with more miles than Iowa, Nebraska and Kansas combined. Missouri also has

53 major river bridges, the most of any state. From 2008-2017, MoDOT delivered 4,405 projects worth \$12.1 billion 7.1 percent (\$921 million) under budget and 94 percent on-time or early.

Benefit Cost Analysis

The expected benefits of the FARM Bridge Program include:

- Eliminating detours (for currently weight-restricted bridges) and preventing detours in the future (from future weight restrictions and closings due to lack of replacement),
- Safety improvements as a result of reduced exposure to crashes from avoided detours and from replacing one-lane bridges with two-lane structures that meet current design guidelines,
- Long-term savings in operations and maintenance costs, including consideration of higher maintenance costs for poor condition bridges, as well as inspections costs for fracture-critical bridges, and
- Additional non-quantifiable benefits associated with economic development or improvements to the existing human and natural environments. These include eliminating impediments to the movement of agricultural equipment and negative effects on emergency response times, school bus routing and regional economic development.

When compared to total project costs, including reductions in operating and maintenance costs over the analysis period, the **combined benefits of all 41 bridge replacements exceed costs by a ratio of 23.7, yielding a project net present value of \$639 million.**

The complete Benefit Cost Analysis, including all calculations, is attached as an appendix to the project narrative file.