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# EXECUTIVE SUMMARY

## INTRODUCTION

Through the Kansas Department of Transportation (KDOT) T-WORKS program, a local consultation process was developed to seek regional input. The City of Leavenworth proposed that the replacement for the Centennial Bridge be developed with the investigation of tolling as a potential funding source, similar to the financing of the Centennial Bridge in the 1950s.

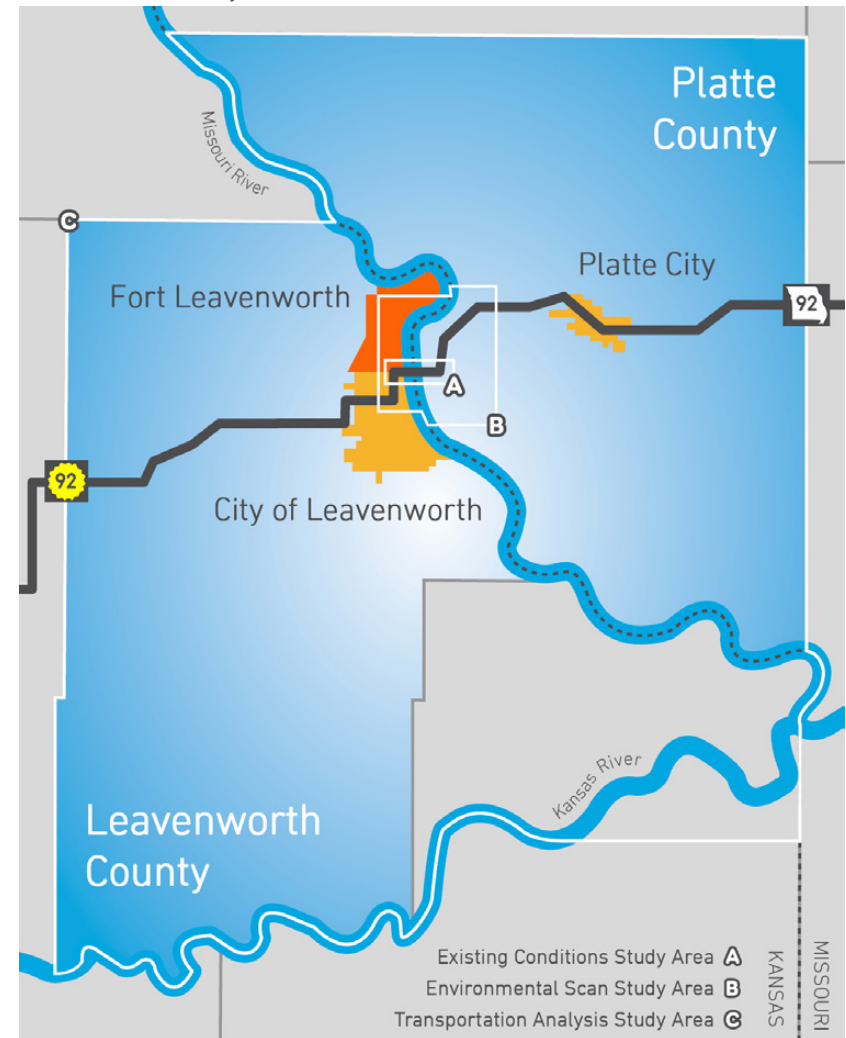
Therefore, KDOT conducted an Advanced Preliminary Engineering study to replace the functionally obsolete Centennial Bridge (Bridge No. 92-52-18.48 (026)) over the Missouri River connecting Leavenworth County, Kansas and Platte County, Missouri. The general purpose of the Advanced Preliminary Engineering study is to provide a feasible solution for a replacement bridge including:

- Bridge type, size, and location
- Probable costs
- Potential funding mechanisms
- Preliminary environmental review

The study also has a Tolling & Revenue (Level 2) component to continue the exploration of potential tolling for the replacement bridge. The Level 2 analysis places an emphasis on determining the appropriate revenue stream to offset associated construction costs as well as Operation & Maintenance (O&M) costs.

The study area for the Route 92 Centennial Bridge Study places an emphasis on three boundaries (existing conditions study area, environmental scan study area, and transportation analysis study area) as shown in Exhibit E.1.

Exhibit E.1 | Study Area



The Route 92 Centennial Bridge Study outlines existing conditions, forecasted conditions, corridor selection process, Tolling & Revenue study, and next steps. Key public involvement activities included the engagement of an Advisory Committee and three Public Open House meetings conducted throughout the study. Meetings were held in Leavenworth, Kansas and Platte City, Missouri. The study schedule is displayed in Exhibit E.2.

## EXISTING CONDITIONS

The Existing Conditions phase examined the following elements:

- Multimodal transportation network
- Traffic characteristics
- Bridge conditions
- Environmental features

The existing Centennial Bridge is a two-lane roadway with limited shoulder. The traffic characteristics of the east-west Highway 92

corridor are influenced by intersecting arterials and Interstate routes, which is an important consideration when assessing competitive routes under future conditions as well as potential diversion associated with the option for tolling. These regional connecting roadways include US-73/K-7, Spur 45, Route 45, and Route 273. Consideration is also given to bicycle and pedestrian transportation as the existing Centennial Bridge does not provide a dedicated means of travel for either mode.

Traffic data was collected to support capacity analysis on existing facilities and calibration of a travel demand model. Traffic counts indicate that the Centennial Bridge carries approximately 14,000 vehicles per day with pronounced peaking characteristics westbound in the morning and eastbound in the evening. The peaking characteristics influence the level of service experienced on roadway segments and intersections within the study area. Fort Leavenworth is a major traffic generator.

Exhibit E.2 | Study Schedule

Advanced Preliminary Engineering	2014		2015				2016	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Assess Existing Conditions	★							
Evaluate Alternatives			★					
Conduct Tolling & Revenue Study (Level 2)	★							
Develop Recommendations	★ Public Meeting						★	

Based on the 2015 inspection of the Centennial Bridge, the superstructure is in satisfactory condition and the deck and substructure are in good condition. Therefore, the bridge does not meet federal guidelines to be classified as structurally deficient. However, the bridge is identified as fracture critical (a steel member in tension, or with a tension element, whose failure would cause a portion of or the entire bridge to collapse) and functionally obsolete (built to outdated standards). Per KDOT, the estimated additional service life for the existing bridge is twenty to thirty years. As the bridge ages, there is generally an increase in maintenance and repairs, particularly due to steel deterioration.

The study area was also evaluated for environmental features such as known noise, archaeological resources, floodplains, wetlands, streams, wildlife, hazardous waste, farmland, historic resources, and public parks. These elements influence future decisions regarding corridor selection, bridge and roadway alignment, and bridge design.

*Public Input: The focus of public involvement at this phase was to explain the study process and discuss existing conditions along the corridor and their potential influence upon the study. Most comments were related to tolling, bicycle and pedestrian access, and design (aesthetic treatments) of the bridge and roadway approaches.*

## **FORECASTED CONDITIONS**

The Forecasted Conditions phase examined the following elements:

- Committed developments
- Committed transportation projects
- Future traffic volumes

Physical and operational developments at Fort Leavenworth, the Bureau of Prisons, and the National Guard were incorporated into the study in an effort to reflect future traffic conditions. These

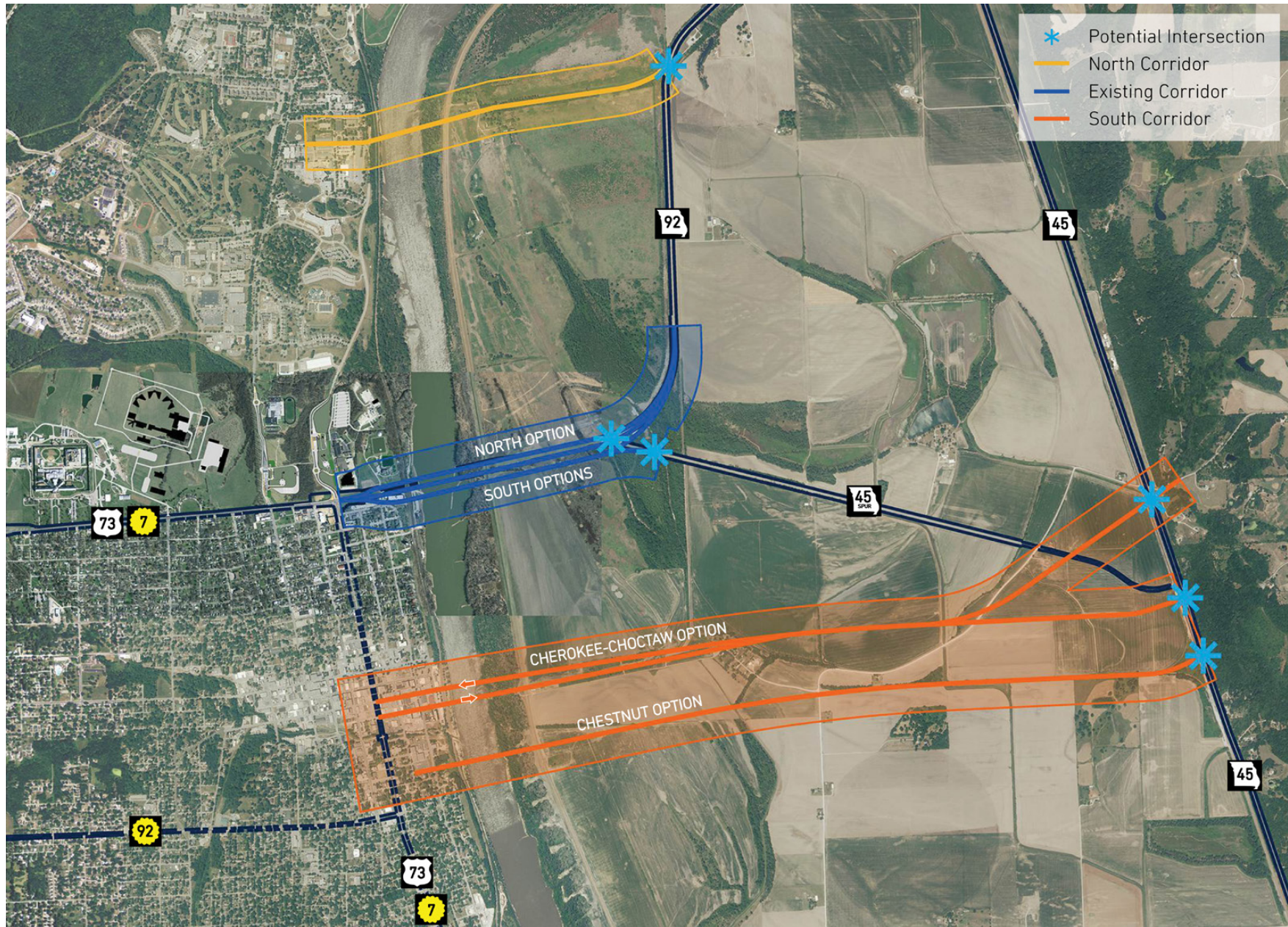
developments will also influence the future traffic analysis of access points along Metropolitan Avenue.

Several roadway projects are also proposed over the next few decades. Projects of significance in Missouri are in response to socio-economic growth indicative of potential increases in trip exchanges with the City of Leavenworth via the Centennial Bridge. In Kansas, the most significant project is the ring road concept of improvements to K-5 and McIntyre Expressway from two to four lanes coupled with the West Leavenworth/Lansing K-7 Bypass from McIntyre Road to a connection near 20th Street and Metropolitan Avenue at the west edge of the City of Leavenworth. While potentially constructed in phases, the ring road concept can be considered an alternate route for trips. Consequently, the review of future year forecasts are conducted with a sensitivity test with and without these improvements to assess any effect it could have on the Centennial Bridge replacement.

Three scenarios were developed to forecast future traffic volume in 2040, the final year in the Travel Demand Model: No-Build, Build + No Tolling, and Build + Tolling. Similar to the Level of Service analysis conducted for the existing conditions, a Level of Service analysis was also conducted for roadway segments and intersections under the three scenarios.

In general, the level of service between the bridge and Spur 45 significantly improved under the Build + No Tolling and the Build + Tolling scenarios. Increased traffic volumes under the current configuration at Route 92 and Spur 45 exacerbate operations. Therefore, the analysis warranted improvements for both capacity and safety reasons at the intersection. Analysis of the intersection along Metropolitan Avenue also indicate the need for some improvements and monitoring of conditions. The results from the analysis were used in the next phase of the study to consider options to improve capacity and safety along the corridor.

Exhibit E.3 | Corridors Considered



## CORRIDOR SELECTION

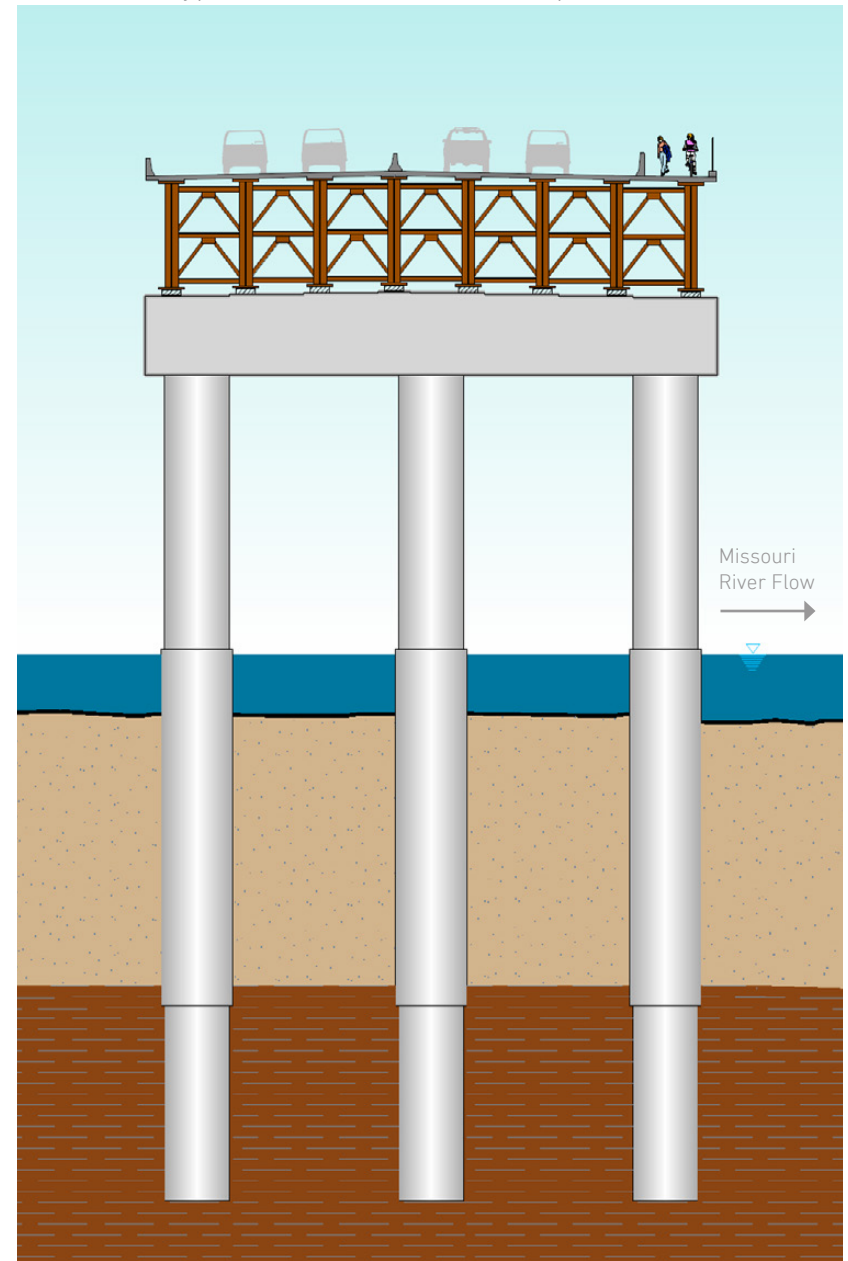
The Corridor Selection phase examined the following elements:

- Bridge coordination elements
- Bridge and roadway approaches
- Corridor recommendations
- Cost estimates for the selected alignment.

The corridor selection process considered possible structure types and estimated cost to select a preferred option. Elements including navigation clearance, hydraulics, levee system, railroad, aviation, utilities, shared-use path, and aesthetics were assessed to identify constraints and/or requirements. As displayed in Exhibit E.3, three corridors (north, existing, and south) were considered to screen alternatives before selecting a specific corridor. A comparative assessment of environmental, traffic, and financial elements suggested that only the existing corridor be advanced. An alignment north of the existing bridge was selected for further advancement to reduce direct impacts to the historic Abernathy Furniture Complex and other environmental concerns.

The recommended replacement of the Centennial Bridge is a new three structure unit bridge (2,348 feet), crossing the Missouri River upstream of the existing bridge. The bridge alignment has been set based upon the offset necessary to construct new bridge piers without interfering with the existing bridge piers or its foundation system. The new bridge deck cross section includes four 12-foot traffic lanes, two 4-foot inside shoulders, and two 8-foot outside shoulders. Eastbound and westbound traffic is separated by a median barrier. The replacement configuration includes a 10-foot wide shared-use path. The main span consists of a haunched steel plate girder structure with horizontal clearance for the Missouri River's navigational channel. The design incorporates a shift in the navigational sailing line, which has been coordinated with the U.S. Coast Guard. The typical cross section of the main span is shown in Exhibit E.4.

Exhibit E.4 | Typical Cross Section of Main Span



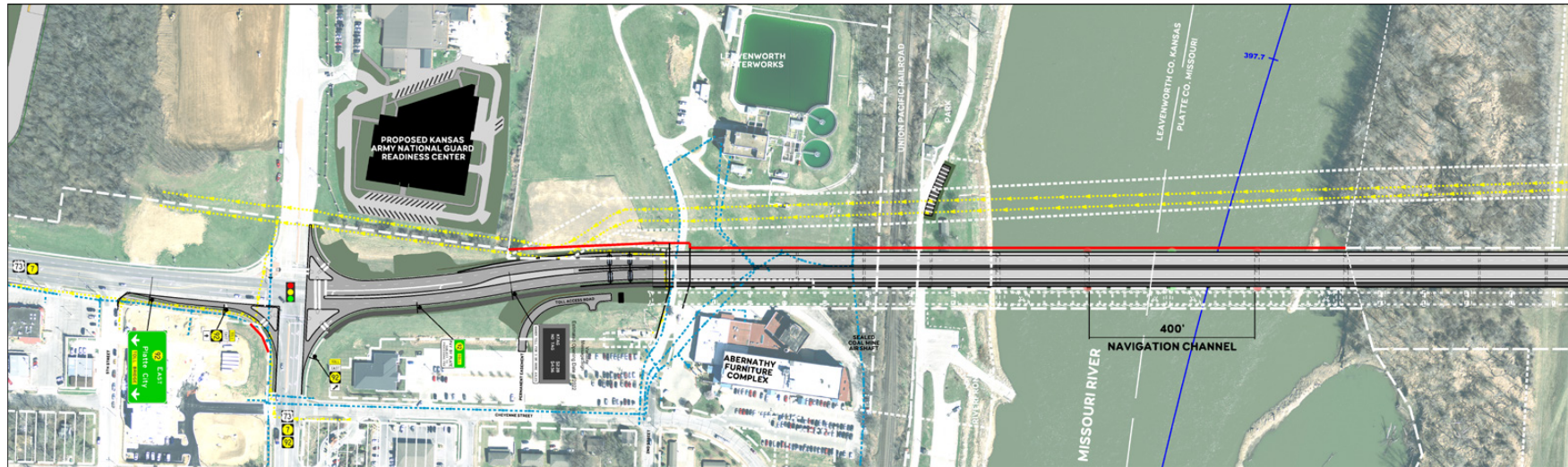
The approach roadways were also designed to transition back into the existing roadway network. A range of intersection improvement concepts at Route 92 and Spur 45 were explored including a roundabout, traffic signal, or grade separation. Continued coordination is also needed to monitor traffic operations on Metropolitan Avenue at the 4th Street and 7th Street signalized intersections with particular attention to the extent of queuing vehicles traveling in the westbound direction in the AM peak period. The potential toll collection system is envisioned to use All Electronic Tolling collection. Therefore, conceptual signing and improvements to accommodate the tolling collection system were also considered. A strip map of the bridge and roadway approach alignment is shown in Exhibit E.5.

Cost estimates are provided for construction activities as well as programming elements such as design, construction engineering, and right-of-way. The project assumes the removal

of the existing bridge and roadway approaches and construction of the replacement bridge, associated roadway approaches, and tolling facilities. The construction cost estimate, when rounded to the nearest \$5 million, is \$80 million (FY 2016). While funding associated with aesthetics has not yet been negotiated, the rounding of costs allows for the inclusion of aesthetic treatments yet to be determined.

After accounting for programming costs, the total project cost is approximately \$90 million (FY 2016). Bridge costs are expected to be shared evenly by each state while roadway approaches and other line items are expected to be the responsibility of the respective state. Because of the Tolling & Revenue component of the study, operations and maintenance costs for a 40-year period were also developed. The costs for the bridge, roadway, and tolling equipment apply periodic maintenance and/or repair followed by replacement at the end of the equipment life cycle.

Exhibit E.5 | Bridge and Roadway Approach Alignment (Part 1 of 2)



Disclaimer: These concepts depict potential improvements to Route 92 and the roadway network. The exact location, design, and right-of-way for this project cannot be determined from these concepts and could be different from that shown. Preliminary design will need to be completed to refine the improvements and right-of-way requirements.

*Public Input:* The focus of public involvement at this phase was to explain the process of developing and evaluating alternatives while providing a direction for recommended location, type, and cost of the replacement bridge. Detailed survey information was collected regarding demographic information, frequency of travel, reasons for travel, location of a replacement bridge, bicycle and pedestrian accommodations, and aesthetic treatments. The most popular choice expressed for the location of a replacement bridge was adjacent to the current bridge, and bicycle and pedestrian access was deemed important.

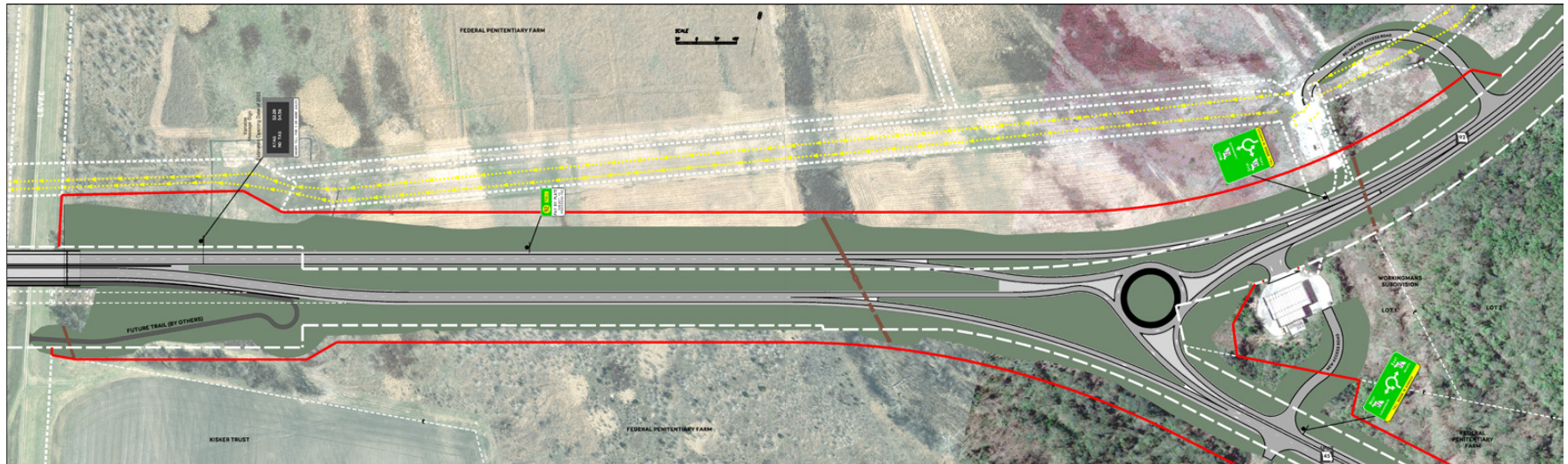
## TOLLING & REVENUE STUDY

Tolling & Revenue studies are typically conducted at three levels. Level 1 is a high-level feasibility study with generic assumptions and limited data collection. If the project passes Level 1, it proceeds to a more detailed study at Level 2 that utilizes a travel demand model and establishes specific assumptions regarding

costs and revenue. The investment-grade Level 3 analysis is only performed when a project is ready to be financed with tolling and seeking a bond rating from banks. Without the use of tolling as a supplemental funding source, and in consideration of the current structural condition of the Centennial Bridge, a replacement bridge through traditional funding methods would likely be constructed in the early-to-mid 2030s.

An Intermediate (Level 2) Tolling & Revenue study was conducted for the proposed Centennial Bridge replacement project. The analysis is an ongoing effort to evaluate the financial feasibility of a potential toll bridge through use of travel demand modeling tools and refined traffic and revenue assumptions. Supporting data collection efforts included historical traffic growth, existing traffic counts, an intercept origin-destination survey, a stated preference survey, an AirSage survey (real-time GPS technology to capture the movement of anonymous cell phone data), and a

Exhibit E.5 | Bridge and Roadway Approach Alignment (Part 2 of 2)



Disclaimer: These concepts depict potential improvements to Route 92 and the roadway network. The exact location, design, and right-of-way for this project cannot be determined from these concepts and could be different from that shown. Preliminary design will need to be completed to refine the improvements and right-of-way requirements.



socio-economic review. The analysis is preliminary and subject to changing market conditions; therefore, the Tolling & Revenue analysis is not a guarantee.

A series of assumptions were developed in order to assess financial feasibility. A key assumption is the potential opening date of the facility when tolls could be collected. The earliest opening date is assumed to be 2022. The toll rate for the Tolling & Revenue base scenario was assumed to be \$2.00 (FY 2016). Missouri law excludes the tolling of an existing state highway; therefore, only the bridge cost in Missouri is included for tolling cost coverage in the financial assessment. Missouri statutes may also require the potential for a statewide vote to enact tolling. The assessment considered future characteristics of the transportation network and a toll sensitivity curve that accounts for a portion of travelers that will divert from the toll facility to alternate routes. Toll collection is assumed to be All Electronic Tolling, which utilizes detection equipment to read electronic transponders or record license plates via camera. One of the benefits of All Electronic Tolling is that vehicles do not need to stop or travel at slower speeds to interact with the equipment.

The financial feasibility was assessed for two cases with an opening date of 2022. Using a standard municipal toll road revenue bond (Case 1), the project is only 80 percent feasible with a financing gap of approximately \$15 million. However, with the incremental debt capacity gained by using a federal loan (Case 2), the project is fully feasible.

*Public Input: The focus of public involvement at this phase was to obtain feedback to potential bridge, roadway, and tolling recommendations. Concerns displayed included duration of toll collection, tolling authorities, and project elements covered by tolling revenue. Public involvement activities are displayed in Exhibit E.6 and Exhibit E.7.*

## NEXT STEPS

The replacement of the Route 92 Centennial Bridge is not yet funded for construction. This study process, including Advanced Preliminary Engineering and a Tolling & Revenue (Level 2) study, developed a preferred concept and appropriate costs. Then, if tolling were deemed financially feasible, an implementation plan can be outlined.

Next steps include three intrinsically interrelated elements:

- Design recommendations
- Costs and funding
- Environmental documentation

In an era of reduced transportation investments coupled with increasing transportation needs, exploring alternate means of funding becomes critical to advance projects from study to design to construction. For a project to be feasible, it must be technically feasible, financially feasible, and politically feasible. With the project being located in two states, it is important to be aware of institutional issues associated with tolling and any cost-share agreements between both states.

The design concept is technically feasible and tolling is financially feasible; however, tolling has several political challenges to overcome. There are institutional issues that this study has attempted to address including the process to establish a tolling authority and the types of requirements that may apply.

During the Next Steps phase of the study, input from the series of Advisory Committee meetings and Public Open Houses was reviewed. Since the project concept and funding mechanism was initiated through the local consultation process, KDOT sought direct input from the City of Leavenworth regarding the Advanced Preliminary Engineering and the Tolling & Revenue study process. KDOT presented a summary of findings at a City

of Leavenworth Study Session in June 2016 and asked for a vote of support or non-support on the design and location of the replacement bridge and tolling as a funding mechanism. The City Commission gathered feedback on these matters. In July 2016, the Commission endorsed the general characteristics, design, and location of the bridge. Questions remained about incorporating aesthetic treatments. Regarding the funding mechanism, the City Commission did not support the option of tolling the replacement bridge. The decision was influenced by the remaining useful life of the bridge coupled with the lack of short- or medium-term improvements to highways on the Missouri side of the bridge.

In August 2016, the KDOT Program Review Committee received an overview of the study process, findings, and stakeholder and community feedback. KDOT staff asked the Program Review Committee to provide direction on whether to pursue any legislative action regarding tolling as well as continuing any environmental documentation for the bridge replacement project. The Program Review Committee decided not to pursue legislative authorization for tolling or any environmental documentation at this time. The Program Review Committee did approve the technical engineering concepts of the Advanced Preliminary Engineering study.

With the approval of the general location of the replacement bridge immediately to the north of the existing bridge and associated network improvements, KDOT requests that the local entities having jurisdiction work cooperatively to ensure corridor preservation within and adjacent to the proposed right-of-way as defined through this Advanced Preliminary Engineering effort. Corridor preservation through the less-formal means of intergovernmental cooperation will assist in providing an environmentally-sound and cost-effective approach for avoiding and minimizing impacts when the transportation project is necessary and financially feasible.

Exhibit E.6 | Public Open House in Platte City, Missouri

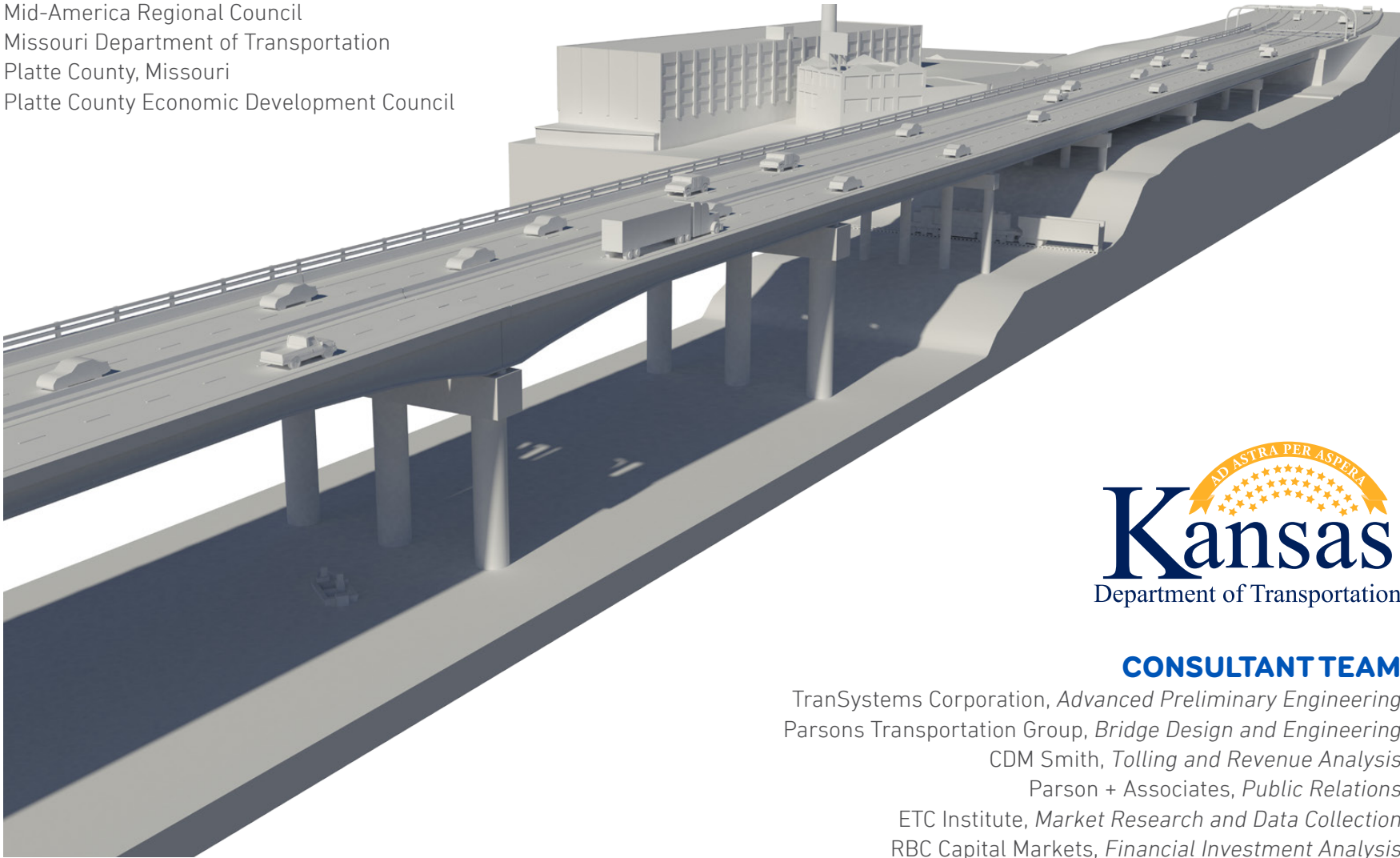


Exhibit E.7 | Public Open House in Leavenworth, Kansas



## ADVISORY COMMITTEE

Kansas Army National Guard - 35th Infantry Division  
City of Leavenworth  
Fort Leavenworth  
Kansas Turnpike Authority  
Leavenworth County Economic Development  
Mid-America Regional Council  
Missouri Department of Transportation  
Platte County, Missouri  
Platte County Economic Development Council



## CONSULTANT TEAM

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Parsons Transportation Group, *Bridge Design and Engineering*  
CDM Smith, *Tolling and Revenue Analysis*  
Parson + Associates, *Public Relations*  
ETC Institute, *Market Research and Data Collection*  
RBC Capital Markets, *Financial Investment Analysis*

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