

# Kansas Department of Transportation

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DATE: November 26, 2008

SUBJECT: Potential Impacts to Highways and Bridges Along the  
Kansas River Due to Removal of Bowersock Dam

LOCATION: Highway US-40 over the Kansas River  
Lawrence, Kansas

## **Kansas River Fluvial Geomorphology**

The Kansas River has a sand streambed and sand bars can be seen along much of its length. The river has degraded over time due to several factors including downstream dredging and a long-term lowering of the Missouri River base level. Bowersock Dam has arrested the degradation and kept it from continuing upstream. Removal of the Bowersock Dam would result in further lowering of the bed elevation upstream as the river adjusts. This lowering would impact bridge foundations and berms, channel banks, riparian vegetation, and cropland; not just along the Kansas River, but also along the river's upstream tributaries as they lower to meet the new base level. Kyle Juracek at the US Geologic Survey office in Lawrence should be contacted for more potential impacts to the channel and the fluvial geomorphology of the region. In addition to the previously listed impacts, an increased downstream sediment load could cause water quality problems and the Kansas Department of Health and Environment (KDHE) would need to be contacted to assess the site.

Removal of the dam would expose the bridge pier foundations which could lead to increased local scour around the piers. Upstream riverbank erosion could cause more drift accumulation on the piers due to trees falling into the river. The streambanks at the bridge could see increased erosion and failure in spots. This would likely not have much effect on the bridge abutment berms, but could potentially impact the railroad embankment on the south side of the river. In addition, resulting changes in the streambed profile and river hydraulics could impact the levee system along the river. The U.S. Army Corps of Engineers (USACE) needs to be contacted to evaluate how the levee system could be impacted.

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### **River Crossings**

Highway US-40 crosses the Kansas River immediately upstream of the Bowersock Dam. The ADT is estimated at 12,000 for the crossing which consists of two bridges. Bridge 023-082 carries southbound traffic and is the upstream bridge. Bridge 023-081 carries northbound traffic and is the one closest to Bowersock Dam. Both structures are six-span haunched steel welded plate girder bridges built in 1978 and 1979. Foundation conditions are similar for both bridges. For each bridge, the three south pier foundations are concrete spread footings founded on hard blue-gray shale. The two north piers foundations consist of a 19.5 ft. diameter concrete-filled sheetpiling cofferdam driven about 25 ft. deeper than the spread footing elevations to another hard shale layer.

The Kansas Turnpike Authority (KTA) is currently replacing the I-70 bridges 1.25 miles upstream of the dam. An overall lowering of the Kansas River streambed caused by the removal of the dam could impact the new bridges. The KTA should be contacted for information on the site geology and foundation conditions of the bridges currently under construction.

The next upstream bridge is near the City of Lecompton 12.1 miles upstream of the dam. Channel degradation and streambank erosion could extend upstream to this location. The Douglas County Public Works Department should be contacted for more information. The nearest river crossing downstream is 9.7 miles away near the City of Eudora. Impacts on this bridge would be expected to be minimal, if any.

### **Bridge Scour at Highway 40**

Increased drift on the piers of bridges 023-081 and 023-082, and exposure of the pier footings could lead to increased scour at the bridges. Prior to removal of the dam, detailed information about the overall site geology would be required. Specifically, erodability of the shale near the footings and the underlying geology conditions need to be ascertained.

The streambed elevation just downstream of the dam is estimated at 792.0 ft. from the 1978 construction plans. For bridge 023-082, bottom of footing elevations for the south piers #1, #2, and #3 are 794.55, 789.83, and 791.25 respectively. As the degradation of the streambed progresses upstream, the hard shale layers could become undermined at the south piers and fail. Scour countermeasures for all piers of both bridges would need to be designed and constructed prior to dam removal. Cost estimations are not available, but work in the channel would involve expensive cofferdams and structural countermeasures.

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Sheetpiling for Pier #4 is driven to hard shale described as "light blue gray clayey shale" at elevation 764. Pier #5 is founded at nearly the same elevation. Concern for these piers would be with increased depth of foundation exposure. This significant increase in area would increase the overall potential scour depth at the site.

Removal of the Bowersock Dam could cause significant damage to the nearby Kansas highway bridges as they exist. The Kansas Department of Transportation Bridge Section must be notified well in advance of removal. Scour countermeasures would need to be designed and built prior to dam removal. Survey, geologic investigation, application for environmental permits, design and construction would need to be completed prior to removal of the dam.

#### **Summary**

Removal of Bowersock Dam on the Kansas River in Lawrence could greatly impact not only the adjacent highway bridges but other infrastructure, farmland, natural habitats, the city's water supply, and the levee system which offers flood protection to downtown Lawrence. Impacts to the highway bridges would be significant and KDOT strongly opposes the removal of Bowersock Dam.

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