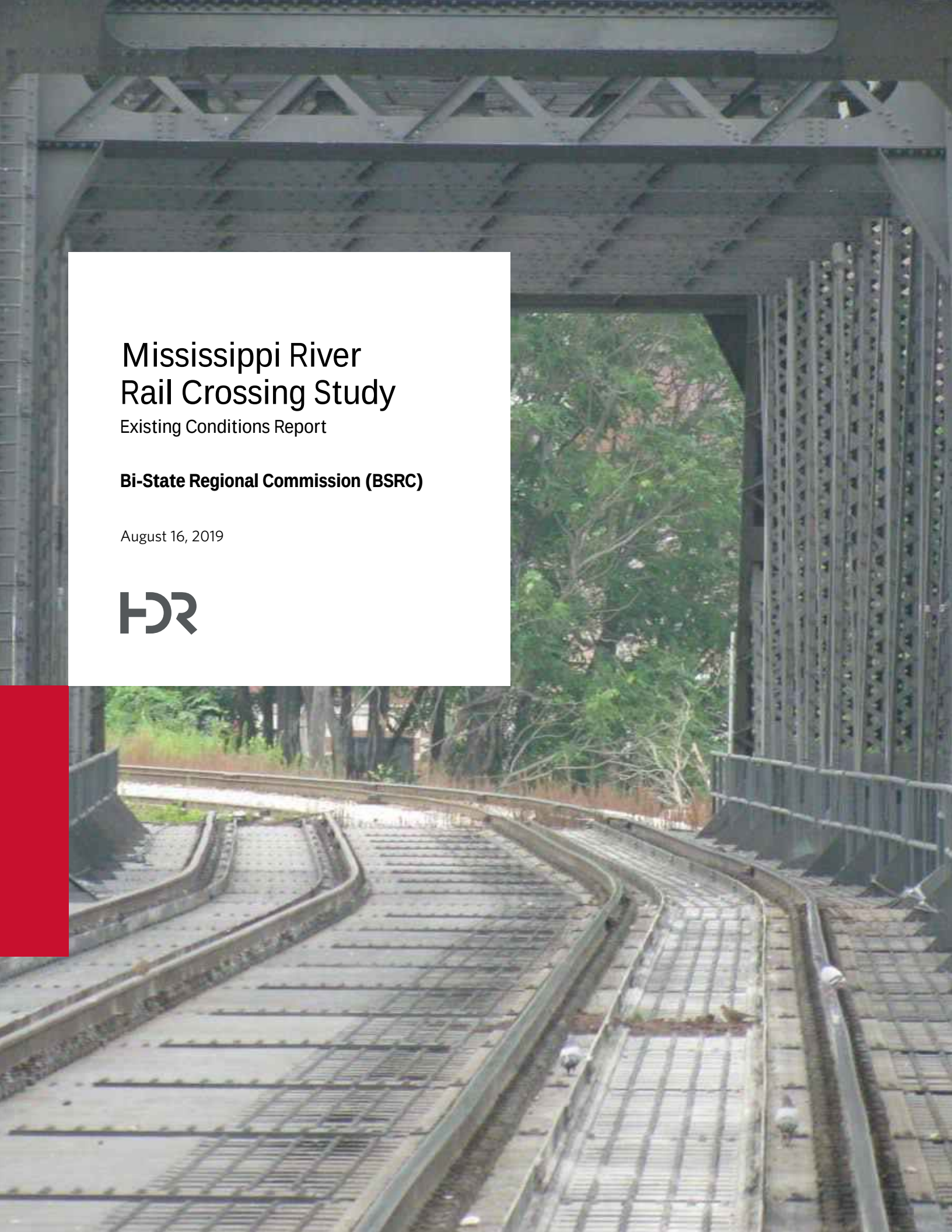


Mississippi River Rail Crossing Study

Existing Conditions Report

Bi-State Regional Commission (BSRC)

August 16, 2019

Introduction

The Bi-State Regional Commission (BSRC) is undertaking a study examining the efficiency, capacity, and connectivity of the regional railroad network centered on the Quad Cities and related Mississippi River rail crossings. This study will analyze the viable options to rehabilitate or replace the two existing Mississippi River rail bridges in the Quad Cities area.

The analysis of potential options will review previous recent planning efforts, report on existing conditions and future demand, define conceptual level alternatives for rehabilitation or replacement, and suggest goals and objectives for freight rail efficiencies related to economic vitality and freight mobility. The conceptual analysis will evaluate viable alternatives based on consideration of engineering concepts, environmental impacts, current and anticipated railroad transportation demand and operations, socioeconomic and community impacts, initial order-of-magnitude capital cost estimates, potential for future public funding, and other criteria. Recommendations will be made that consider one or more preferred alternative(s) that can be considered by BSRC and other stakeholders for future study and potential implementation. The entire process will be supported by inputs at critical project milestones from effective strategic engagement with key public and private stakeholders, including railroads, public agencies, and other entities.

The existing conditions report, contained herein, examines current train operations in the Quad Cities area; describes the two Mississippi River rail bridges, including the current use of both bridges, a history of the bridges, and an assessment of their existing conditions; and summarizes previous studies examining the rail crossings in the Quad Cities area.

Source: HDR

Quad Cities Railroad Operations

The Quad Cities metropolitan area is a multimodal transportation crossroads. This area includes principal and secondary rail lines, as well as classification and industrial yards for the three freight rail carriers serving the area: BNSF Railway (BNSF), Canadian Pacific Railway (CP), and Iowa Interstate Railroad (IAIS). All three railways operate over much of the same network within the Quad Cities.

BNSF Railway

BNSF is one of the largest Class I railroads in the country, operating over 32,000 miles of railway in 28 states and 2 Canadian provinces. BNSF operates a secondary route west of the Quad Cities, the Barstow Subdivision, which connects a major classification yard at Galesburg with routes to the Twin Cities and the Pacific Northwest. The BNSF Quad Cities Industrial Lead connects with the Barstow Subdivision at Barstow and continues west through Moline and Rock Island before crossing the Mississippi River on the Crescent Bridge and connecting to with CP's Davenport Subdivision on the Iowa side of the river.

There are currently no passenger trains serving the Quad Cities, but both the Illinois and Iowa Department of Transportation (DOT) are moving forward with projects that plan to connect the Quad Cities, Chicago, and Iowa City with passenger rail service. The proposed route would operate over the IAIS via the BNSF Industrial Track and the Government Bridge.

Although all three railroads have different routes entering the Quad Cities, a significant part of each railroad's operation involves using the BNSF Industrial Track. The BNSF Industrial Track extends from the BNSF Barstow Subdivision mainline at Barstow across the Mississippi River on the Crescent Bridge to the CP Davenport Subdivision in Davenport. The track is used by all three railroads between 7th Street in East Moline and 44th Street in Rock Island. Train volumes on this segment average between 12 and 14 trains per day.

The different freight traffic flows for the three railroads are identified below:

- BNSF – through trains between the BNSF Barstow Subdivision at Barstow, and Davenport and Clinton; local trains between Barstow and Rock Island, and Davenport and Bettendorf, Iowa.
- CP – local trains between Davenport and Rock Island, East Moline, and the CP Nitrin Subdivision between East Moline and Albany, Illinois.
- IAIS – through trains between the IAIS Blue Island and Davenport Subdivisions and local trains serving customers in Silvis, East Moline, Moline, Rock Island, and Davenport.

Canadian Pacific Railway

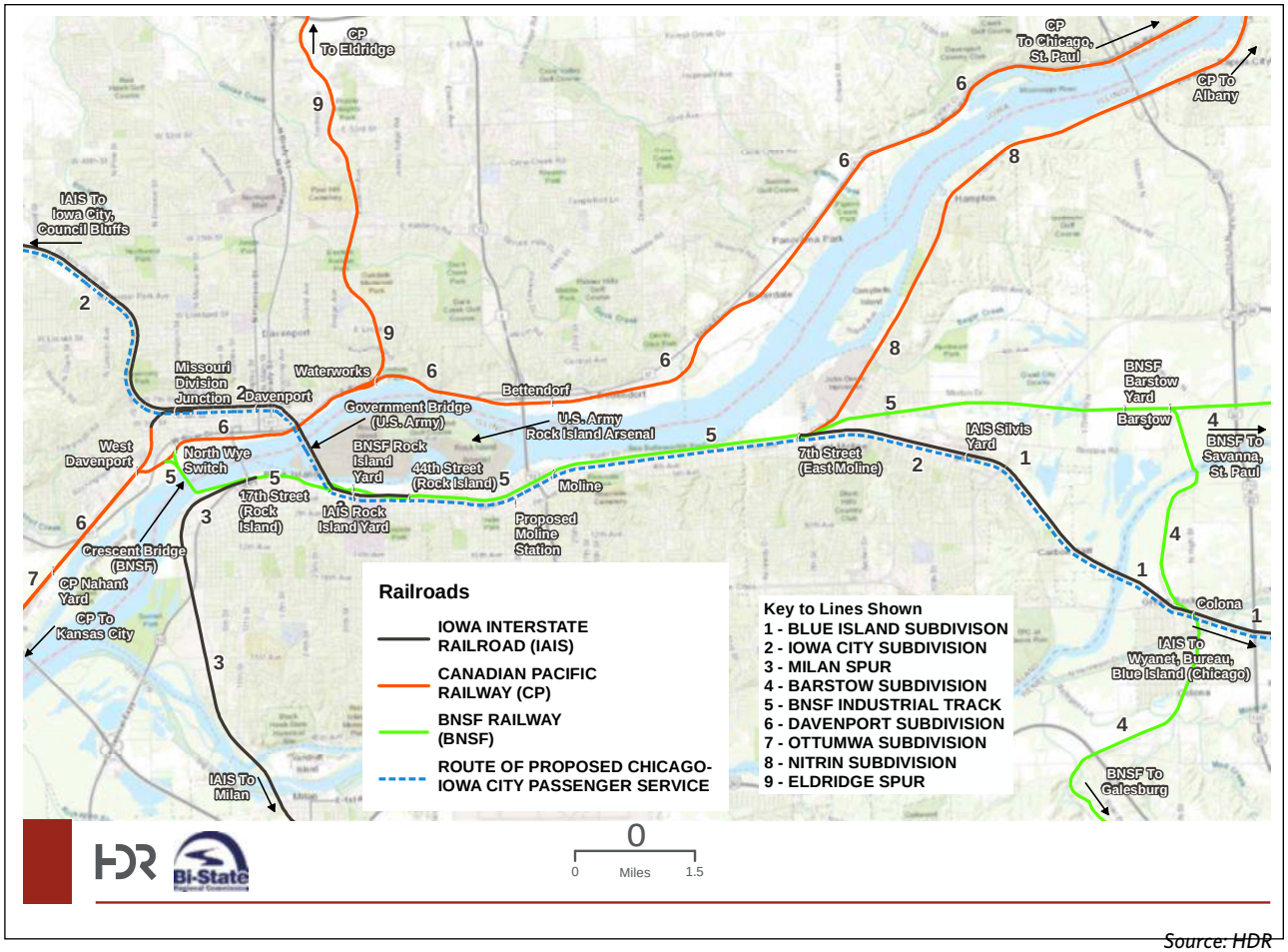
CP is a Class I (annual operating revenues greater than $420 million) railroad, operating over 12,000 miles of railway in 10 states and 6 Canadian provinces. Most of CP's area business is on the Iowa side of the river, on the Davenport and Ottumwa Subdivisions, which is part of the CP corridor between Kansas City and the Twin Cities and Chicago. CP does have customers in Illinois, including Rock Island and Moline, and operates a branch line—the Nitrin Subdivision—north to Albany, Illinois. CP has trackage rights on IAIS and BNSF, and operates over the Crescent Bridge to access its Illinois customers and interchange traffic with both railroads.

Iowa Interstate Railroad

The IAIS is a Class II (annual operating revenues between $37 million and $420 million) regional railroad that operates, over its own track or via trackage rights, between Chicago, Illinois; Peoria, Illinois; and Council Bluffs, Iowa. The IAIS was formed in 1984, acquiring tracks from the former Chicago, Rock Island, and Pacific Railroad (CRI&P).

The IAIS mainline operates through the Quad Cities, entering from the east on its Blue Island Subdivision at Silvis, Illinois, where it enters the IAIS Iowa City Subdivision and connects with the BNSF Industrial Track at 7th Street in East Moline, Illinois. IAIS operates over 5 miles of BNSF trackage to the Government Bridge, owned by the United States Army. On the Iowa side of the Government Bridge, the route operates over the Davenport, Iowa, elevated trainway and through the Fifth Street corridor. IAIS operates the greatest volume of trains in the Quad Cities, averaging 6-10 trains per day.

Figure 1: Detail of Quad Cities Area Rail Network



Source: HDR

Source: HDR

Quad Cities Mississippi River Rail Bridges

Government Bridge

History

The Government Bridge (sometimes referred to as The Arsenal Bridge) is a swing bridge that spans the Mississippi River between Rock Island and Davenport at River Mile 482.9. The drawbridge is owned and maintained by the U.S. Army Rock Island Arsenal, and IAIS operates on it through a property lease agreement.

The bridge is a twin-deck steel truss structure that accommodates rail traffic on the upper deck and vehicular and pedestrian traffic on the lower deck. From east to west, the Government Bridge is comprised of one movable truss span and six fixed truss spans. Historically, two main tracks of the IAIS predecessor CRI&P were in place over the bridge, but at present, the former westward main track is in use by IAIS as its single mainline track. The former eastward main track, while still in place over the full length of the span as a double-ended siding, is not used for meet-pass events between trains.

The Government Bridge includes one moveable truss span on the Rock Island side of the structure, which is opened as needed to allow the passage of river traffic through Lock and Dam No. 15 below. River traffic typically consists of river barges carrying bulk cargo and recreational watercraft.

The current bridge is actually the fourth rail bridge at this location. The first bridge, constructed in 1856 east of the current structure, was the first rail bridge in the country to cross the Mississippi River. The current bridge was constructed in 1894 and was built using the stone piers from the previous bridge at this location. The bridge was the first major bridge commission for engineer Ralph Modjeski, who also supervised its construction and was considered to be one of the foremost American bridge designers of the early 20th century.

In recent years, the bridge has been closed to vehicular traffic several times due to severe flooding of roadway approaches from the Mississippi River, most recently in May 2019. The bridge was also briefy closed after a CP train derailment on July 10, 2019.

Source: HDR

Rail Operations

IAIS is the rail user of the Government Bridge. CP's route across the Mississippi River is via operating rights on the BNSF Crescent Bridge. Marine traffic has the right-of-way over rail traffic, and the bridge must open to allow river barges and other watercraft to pass through. The U.S. Coast Guard can levy a steep fine on railroads and other parties that block a navigable waterway with a closed drawbridge for what is determined to be an unreasonable amount of time. The bridge does not have scheduled opening or closing times. Bridge openings occur at random, and during peak shipping and recreational boating season on the Mississippi River, the bridge will open with greater frequency. A bridge tender, employed by the Rock Island Arsenal, continuously monitors rail and river traffic, and opens and closes the bridge for one mode or the other during river navigation season. During the winter season, when the Mississippi River is closed to navigation, the Government Bridge is left lined and locked for train and vehicle movement, and a bridge tender is not on duty.

Government Bridge impacts of railroad operations:

- **On-Demand Opening** – The bridge opens on demand at any time, which impedes scheduling uninterrupted operating windows. As a result, meets at sidings between opposing trains can become difficult for dispatchers to plan.
- **Varying Open/Close Cycles** – Bridge openings can range from 30 to 45 minutes per open/close cycle, which may cause the following impacts:
  - Approaching train delays – more than one train delay approaching the bridge.
  - Prolonged waits – of trains at nearby sidings and yards where meets are planned to occur.
  - Eastward grade crossing delays – Eastward IAIS freight trains approaching Davenport will hold back west of Missouri Division Junction if proper notice is given by the bridgetender. If not informed in time, the train may block as many as five grade crossings in downtown Davenport.
  - Westward grade crossing delays – Westward IAIS through trains may potentially block IAIS switching operations at the Rock Island Yard, and grade crossings between 44th Street in Rock Island to 7th Street in East Moline.
- **Track Speed Restrictions** – Current track speed for all trains across the Government Bridge, between Rock Island and Davenport, is restricted to 10 mph. This speed restriction is a quarter of the maximum authorized speed (40 mph) of the IAIS Iowa City Subdivision west of Davenport, which prolongs travel times and impacts track capacity.
- **Track Capacity** – The mainline track over the Government Bridge limits track capacity approaching the IAIS yard at Rock Island and the BNSF Industrial Track between Rock Island and East Moline.
- **Infrastructure Maintenance** – The drawbridge is more than 125 years old, which requires significant mechanical, electrical, and operating maintenance and upkeep.
- **Signal Displays** – The bridge is a manual interlocking and the bridgetender has authority over train movements. The bridgetender can give authority for train movements via signal indication by either displaying a red (stop) signal or lunar signal for the train to come across. A lunar signal is a restricting aspect that train crews are to be prepared to stop if an issue arises. Occasionally, signals authorizing movement across the bridge display a red indication. This can occur when the bridge reseating or other condition prevents the rails on either side of the movable portion from properly lining up. Alternatively, the signal sometimes displays a red indication even though the bridge is safely lined and locked for rail movement.
- **Drawbridge Position** –There are risks for drawbridges to stick in the open or closed positions, which causes train and river traffic delays for timeframes ranging from minutes up to hours while bridge and signal maintenance employees are dispatched and repairs are made. The horizontal curve on the truss bridge restricts movements of hi-wide shipments (transformers, windblades) across the bridge.

Source: HDR

The bridge can accommodate railcars with loaded weights up to 286,000 pounds, which is the current railroad industry standard. **Table 1** provides approximate information on average daily trains, bridge openings, and open/close cycle times for the Government Bridge

Roadway Operations

The lower structure of the bridge consists of a two-lane public roadway with sidewalks on either side. Average daily traffic counts on the bridge range from 6,200 to 7,500 vehicles (Illinois DOT and Iowa DOT, respectively). The bridge has a vertical clearance of 11 feet 8 inches, which restricts the type of trucks that it can accommodate. Daily pedestrian and bicycle traffic counts were not available for inclusion in this report.

Physical Condition

The existing bridge structure is maintained by the Rock Island Arsenal and is the primary means of accessing the Arsenal from the Iowa side of the river. IAIS maintains the track across the bridge and is responsible for funding a portion of the bridge structure maintenance through its lease with the US Army. The bridge is maintained in a condition to support the current rail/roadway traffic and loading, and is inspected regularly as required by the terms of the lease with the US Army .

The railroad portion of the bridge consists of rails that are directly fixed to a steel bridge deck via a series of steel rail seats that are welded to the bridge deck. The swing span is capable of rotating a full 360 degrees, and both tracks on the swing span are maintained to IAIS mainline standards because either track could line up with their main track depending on the orientation of the span. The tracks over the remaining fixed spans of the bridge are maintained with the current mainline to IAIS mainline standards, and the second track, now the Arsenal Siding, to a lower standard because it is used for only maintenance-of-way activities.

The roadway portion of the bridge consists of a two-lane road and sidewalks on metal grating below the railroad deck. Access to either end of the Government Bridge via roadway requires traversing reversing curves that in practice, along with the vertical clearance, limit the ability of large commercial vehicles to use the bridge.

The bridge tender cabin, located on the swing span, has closed-circuit television (CCTV) and railroad signal indications that allow the bridge tender to ensure that all roadway, pedestrian, and rail traffic is off the swing span prior to opening the span for river traffic. When the span is going to be opened, the tender activates drop gates that block roadway and pedestrian access to the swing span and changes the rail signal indication to stop approaching rail traffic. Once the river traffic has cleared, the span is closed and, upon verification that the span is properly seated, the drop gates are raised and traffic is allowed to resume.

Table 01: Government Bridge Operating Statistics (2015)

AVERAGE DAILY TRAINS (2015)	AVERAGE DAILY BRIDGE OPENINGS	STATUS
06-10[1]	08	12:28

1. *Additional train movements made while switching the west end of IAIS Rock Island Yard are not included in Daily Train Volume.*

Source: HDR

Crescent Bridge

History

The Crescent Bridge is a steel truss through deck design with a swing span spanning the Mississippi River between Rock Island and Moline, slightly downstream from the Government Bridge at River Mile 481.4. It is owned and maintained by BNSF. The bridge was opened for rail service in 1900. The name of the bridge came from the curved crescent shape of the bridge combined with its Illinois and Iowa approaches.

Rail Operations

BNSF trains use the bridge to access customers on the CP Davenport Subdivision between Davenport and Clinton, where BNSF has operating rights. CP uses the bridge to access customers on the Illinois side of the river as well as interchange cars with IAIS. Current train volume varies from two to four trains per day. Crescent Bridge operating statistics were not available for inclusion in this report, but daily bridge openings would be consistent with those of the Government Bridge. Average open/close cycle times were also not available for inclusion in this report.

Crescent Bridge impacts of railroad operations:

- Because the bridge opens on demand at any time, there are no operating windows when trains can be scheduled to ensure uninterrupted movement.
- The drawbridge is over 110 years old, with a myriad of moving parts and sensitive, electrical signal and detection systems operating in a harsh, continental climate environment. Generally speaking, there is the potential for any drawbridge to face the risk of becoming stuck, either in the open or closed position. All of these conditions will delay trains or river traffic while bridge and signal maintenance employees are summoned to the bridge's location and repairs are made.
- The Crescent Bridge cannot handle freight cars exceeding 268,000 pounds in loaded weight, whereas the current industry standard is 286,000 pounds. BNSF customers whose freight crosses the Crescent Bridge must restrict the loading of their cars so as not to exceed this weight limit, resulting, in many cases, in higher freight charges per ton of freight handled.
- Due to vertical clearance issues on the route, the Crescent Bridge cannot accommodate double stack intermodal cars.

Physical Condition

The Crescent Bridge is owned and maintained by BNSF in a condition to support the current railroad operations across the bridge, and is inspected on a regular basis as required by Federal Railroad Administration regulation. The bridge was originally constructed as a secondary crossing location and was intended for lighter duty service than other BNSF Mississippi River crossings. Due in large part to its initial design and construction, it would likely require significant improvements to increase the loading capacity across the bridge above its current capacity.

Source: HDR

Previous Studies

Two recent studies commissioned by project stakeholders have discussed, at a high level, the condition of the rail bridges and potential options to address condition and capacity issues.

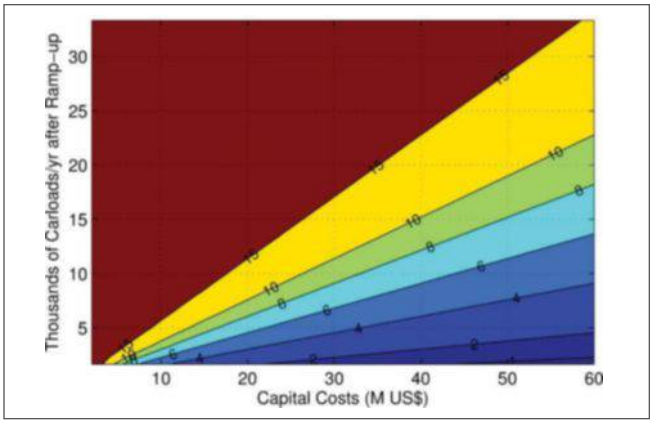
Bi-State Region Freight Plan

September 30, 2015

The *Bi-State Region Freight Plan* noted that a previous study conducted by Iowa DOT identified the Government Bridge as a freight rail bottleneck. The plan conducted a high-level benefit cost valuation of rehabilitation or replacement of the bridge. The following text and figure are taken from the *Bi-State Region Freight Plan* (Bi-State Regional Commission 2015):

> The Iowa DOT recently conducted a study of railroad bottlenecks and identified the Government Bridge as the only Bi-State Region rail freight [sic] bottleneck of note…there is a good opportunity for a replacement bridge to provide efficiency to all three railroads in the region. Other points to include are:
>
> - Is it feasible to replace this bridge in an adjacent area, upstream or downstream? If yes, the 1,608-foot span (total length) could be used for cost estimation.
> - Government Bridge carries both vehicle traffic and rail traffic currently. It is double tracked for rail. Would replacement need the roadway element? Would the rail need to be double tracked?
> - Government Bridge currently has a swing section to accommodate barge traffic navigating the locks. Could that function continue as required? Or would we leave it permanently open and let vehicles and rail freight use the replacement rail bridge and other highway facilities. Demolish the Government Bridge once replacement is in place? Security needs at the national level would suggest keeping a back-up rail bridge over this important river in working order, even with a replacement rail bridge built. It is also unlikely this bridge would be demolished as it is a designated National Landmark.
> - The freight partners survey and interview process identified access to rail and getting cheaper and faster rail connections - but they did not note any particular bridge replacement location.
> - A new rail freight transfer facility, whether bulk or intermodal, could be located so that would be served efficiently by the replacement rail bridge.
>
> (Iowa DOT 2015)

FIGURE 8.10 BCR FOR RAIL BRIDGE PROJECT @ 7% DISCOUNTING



Source: Parsons Brinckerhoff Analysis

Benefit Cost Valuation

The economic efficiency of the bridge rehabilitation will depend critically on:

(1) The freight demand that can be accommodated by removing operational bottlenecks on the bridge
(2) The costs of building the new bridge

The investments will also have positive impacts on general vehicular traffic, in addition to freight movement. These should also be considered in a benefit-cost analysis of the investment, however they are omitted in this case because they lie outside the scope of this work. The benefit-cost framework is only applied to the freight traffic on the bridge. The benefits result from the increase of rail capacity on the bridge, which would allow for additional tonnage to be transported through this corridor. It is assumed that without the investments, the bridge represents a bottleneck to rail freight movement in the region.

The analysis also assumed:

- Truck miles avoided per shipment: 1,000 miles
- Average tons per truckload: ~21 tons
- Growth of bulk market after 4 year ramp-up: 2.5 percent
- Rail to truck circuity: 1.12
- Discount provided by rail costs over trucking: 20 percent
- Analysis horizon: 30 years of operations
- Emission rates: PRISM tailored for U.S. DOT project evaluation

These represent approximations of the most likely characteristics of the traffic that would use the bridge. Some of these parameters are more uncertain than others, but in most cases they are fairly standard across the U.S. It is assumed that the facility takes three years to be designed and built, and another 4 years for the demand to ramp-up. The main benefits of the facility would be in permitting the mode shift from truck to rail. Benefits and costs are discounted at a rate of 7% per year, following U.S. DOT guidance.

The results of the analysis are shown in Figure 8.10. The BCRs are displayed as the demand of the facility and capital costs change. Blue coloring indicates a low BCR ratio, which represents a project for which benefits are small relative to capital costs. It is difficult to make an assessment of the bridge replacement based solely on this information, because it does not include a monetization of benefits for passenger vehicles. The results of this analysis would have to be combined with a broader benefit-cost analysis to account all relevant benefits of the project.

Iowa State Rail Plan
February 2017

In the *2017 Iowa State Rail Plan*, Iowa DOT listed 36 rail network bottlenecks in the state.

Typical bottlenecks in the state include:

- Insufficient capacity on main tracks and in terminals and rail yards to accommodate present and future train volumes, interchange of traffic between railroads, and provision of rail switching;
- Operating delays at railroad junctions and at movable bridge spans over principal navigable waterways;
- Bridges that constrain vertical and horizontal clearances and restrict the types of rail car equipment that can be accommodated; and,
- Potential effects on infrastructure and service for rail lines located in a major floodplain. (Iowa DOT 2017)

The Government and Crescent Bridges were included in the list of the 36 bottlenecks, with the following explanations:

- **Government Bridge** – "Existing bridge restricts all rail traffic to 10 mph, rail traffic is restricted by barge movements during navigation season, and railcar capacity of structure is marginal for railcars with a maximum allowable gross weight of 286,000 lbs. Need to replace structure" (Iowa DOT 2017).
- **Crescent Bridge** – "Railroad bridge functionally obsolete; should be replaced" (Iowa DOT 2017).

Iowa DOT listed short-range and long-range passenger and freight rail projects under their Passenger and Freight Rail Capital Program.

- The short-range projects and studies include those for which funding was made available by the state in 2016 to cover full or partial capital costs of implementation, and those that will likely be eligible based on past criteria for state funded rail projects and studies.
- Long-range projects include specific projects or prospective projects which could arise from various studies for which funding has not yet been committed, but have been identified as part of a multi-year program that exceed the four year short-range period.... The projects and studies ... are prioritized in terms of short-range projects and studies, that is, those which will occur in the first four years (2016 to 2019); and long-range projects and studies, that is, those that will be considered between Years 5 and 21 (2020 to 2040). (Iowa DOT 2017)

The following were included in the list of long-range projects:

- "Rehabilitate or replace the existing Government Bridge over the Mississippi River between Davenport, Iowa, and Rock Island, Illinois, used by IAIS and CP" (Iowa DOT 2017).
- "Replace Crescent Bridge over the Mississippi River at Davenport. Railroad bridge functionally obsolete and cannot handle 286k car weights. Bridge used by BNSF and CP should be replaced" (Iowa DOT 2017).

References

Bi-State Regional Commission. 2015. Bi State Region Freight Plan. Final Report. Prepared by Cambridge Systematics, Inc. September 30.

Iowa DOT. 2017. Iowa State Rail Plan. Final. February. https://iowadot.gov/iowainmotion/railplan/2017/IowaSRP2017_Complete.pdf.

Summary

The physical conditions of both bridges adequately support existing rail operations, albeit with some restrictions.

The Government Bridge carries the greater share of freight traffic, six to ten trains per day, along with vehicular traffic on the lower level. Bridge openings do adversely impact train operations, but there appears to be sufficient capacity to support existing service levels. The bridge also handles freight cars up to 286,000 pounds loaded weight.

The Crescent Bridge is currently used by two to four trains per day. The restricted freight car weight limit of 268,000 pounds per car does negatively impact customers whose freight is carried across the bridge. BNSF is maintaining the bridge to support 268,000-pound car weights, and has no current plans to upgrade or replace the bridge.

The preferred route for the potential introduction of passenger train service between Chicago, Moline, and Iowa City is over the Government Bridge. Any significant increase in train traffic over the bridge may necessitate discussion of bridge improvements or replacement, including reopening the second main track on the bridge. It is unknown what impact two operable main tracks may have on the bridge's ability to accommodate 286,000-pound freight cars.

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