

Memo

Date: Tuesday, October 11, 2022

Project: City of Rock Island, IL & BNSF Rail Crossing Elimination Grant Support

To: City of Rock Island, Illinois

From: Jon Markt, PE, RSP₁

Subject: 44th – 46th Street – Rail Crossing Elimination Benefit-Cost Analysis

Introduction

This memo presents HDR's review of the at-grade crossings, 6044324X and 604322J, located in Rock Island, IL and partially within Moline, IL. The two subject crossings parallel 4th Avenue in Rock Island less than 100 feet south of the Roadbed. The track and crossings are owned by Burlington Northern Santa Fe (BNSF) Railway with primary railroad-highway crossings at Milepost #0180.36 (crosses 44th Street, 400 block) and Milepost #0180.24 (1st Street, Moline). Primary railroad operation are performed by Iowa Interstate Railroad (IAIS) with other operators including BNSF, Dakota, Minnesota, and Eastern (DME).

The evaluation will discuss the anticipated impacts to the City from a proposed consolidation of highway-rail crossings to a single crossing and provide a methodology to calculate annual costs, including safety, delay, emissions, and vehicle operating costs along the corridor. The evaluation of this corridor and the two existing crossings and one potential new crossing alignment is intended to assist state and local transportation planners in identifying the most efficient grade crossing investment strategies.

Initiation of Rail Crossing Consolidation

In 2022, the City of Rock Island determined improvements to roadway and track elements in the vicinity of 4th Avenue and 44th Street were needed to address frequent crashes being reported near the 44th Street railroad crossing. The crashes routinely involved loss of control and lane departures related to the tight turning maneuver necessary to continue onto 44th Street from 4th Avenue. The crash history warranted the City to submit a pending application for safety funds from the state of Illinois Highway Safety Improvement Program (HSIP). In anticipation that HSIP funds will not cover the full costs of a potential crossing alignment study and associated environmental review, early project planning activities have focused on modeling potential alignments at a high level and preparing for a request for Rail Crossing Elimination funds from FRA. Three potential crossings were analyzed – all roadway traffic at 44th Street, all roadway traffic at 46th Street (also known as 1st Street in Moline), and new crossing with all roadway traffic at 45th Street (44th and 46th Street crossings closed). In all cases, two crossings are active today, but after implementation of the project only one highway crossing will be active.

Accident Prediction and Severity (APS) Model - APS20

The new APS model, APS20, was used to serve as a replacement for the USDOT model (APS86), which was published in 1986. The new model is estimated with newer statistical methods that explain accident risk as a function of grade crossing characteristics and accounts for accident history at the grade crossing. The most up-to-date version of the APS20 Accident Prediction and Severity Model is described in detail in the FRA's *GradeDec.net Crossing Evaluation Tool Reference Manual (Attachment A)*. Based on characteristics and crash history of the crossing, the annual predicted accidents for the crossing are summarized below.

OPTION 1: All Roadway Traffic At Enhanced 44th Street

Crash Type	2050 Predicted Accidents¹
Fatal	0.000228
Injury	0.000595
Property Damage Only	0.001956
Total	0.002779

1. Zero crashes have occurred at this crossing in the past 5 years.

OPTION 2: All Roadway Traffic At Enhanced 46th Street (AKA 1st Street)

Crash Type	2050 Predicted Accidents¹
Fatal	0.000192
Injury	0.000489
Property Damage Only	0.001488
Total	0.002169

1. Zero crashes have occurred at this crossing in the past 5 years.

OPTION 3: All Roadway Traffic At 45th Street

Crash Type	2050 Predicted Accidents¹
Fatal	0.000006
Injury	0.000015
Property Damage Only	0.000055
Total	0.000076

1. Zero crashes have occurred at this crossing in the past 5 years.

Benefit-Cost Analysis (BCA)

FRA's GradeDec software tool as used to provide a computational method for calculating a variety of cost-related impacts caused by a train blockage, such as crossing safety, vehicle delay, emissions, and vehicle operating costs and compares the benefits induced from proposed safety and infrastructure improvements in an alternative condition. USDOT provides guidance (**Attachment B**) specifically for BCA's used to support discretionary grant programs. The guidance provides recommended parameters to be used in the software tool for the

application. All FY 2022 grant applications are recommended to use a base year of 2020 and summarize monetized values in 2020 dollars. A brief list of the recommended parameters for the primary factors are summarized below.

Safety

<i>Crash Type</i>	<i>Monetized Value</i>
Fatal	\$12,837,400
Injury	\$302,600
Property Damage Only	\$4,600

Travel Time Costs

<i>Category</i>	<i>Hourly Value</i>
General, All Purpose	\$17.80
Truck Drivers	\$33.60

All other parameters, including emissions, fuel burn rates, safety device effectiveness and other supplemental measures rely on the default (national averages) values provided by the FRA.

Base Case & Alternate Case Evaluation

A comparison of the base case (No-Build) and an alternative case (Build) is required to evaluate the overall net benefits expected based on potential improvements over a period of time (between anticipated begin of construction and Year 2050). The No-Build case assumes that no improvements would be made, and the crossings would continue to operate in their current state. The Build case, for the intent of this application, assumes that a grade separation will be constructed to eliminate the at-grade crossing at a point in time in the near future. General assumptions regarding traffic growth and timing of implementation are listed below:

1. Existing traffic on 44th Street, 4,650 vehicles per day(vpd) in 2020. Existing traffic on 46th Street / 1st Street is 1,150 vpd. Both streets were assumed to grow in volume by 1.5% annually.
2. Existing train traffic, 8 trains per day (tpd) in 2020 grows 1% annually thereafter. Train volume estimates sourced from FRA records.
3. At-grade crossing is closed in 2024 and construction of enhanced crossing begins. Analysis assumes a 1-year construction schedule.
4. Construction is finished and overpass is open to the public in 2026.
 - a. Projected cost of roadway enhancements and project development in the construction year- \$8,888,259.00

Results

Based on the current crossing characteristics, the recommended parameters, and the timing of improvements, the total benefits and total costs associated with the construction of rail crossing consolidation near 4th Avenue in year 2020 dollars is show below.

OPTION 1: All Roadway Traffic At Enhanced 44th Street

Benefits, 2020 \$

Safety	\$25,589
Travel Time	\$58,739
Environmental	\$1,724
Vehicle Operating Costs	\$5,206
Network	\$0
Salvage value	\$340,933
Total Benefits	\$432,191

Costs, 2020 \$

Roadway Improvements	\$5,535,160¹
Total Cost	\$5,535,160

Benefit-Cost Ratio **0.08**

1. Future year construction costs adjusted to 2020 \$. Default value, actual construction costs may be higher.

OPTION 2: All Roadway Traffic At Enhanced 46th Street (AKA 1st Street)

Benefits, 2020 \$

Safety	\$16,542
Travel Time	\$191,789
Environmental	\$10,611
Vehicle Operating Costs	\$28,650
Network	\$0
Salvage value	\$340,933
Total Benefits	\$588,525

Costs, 2020 \$

Roadway Improvements	\$5,535,160¹
Total Cost	\$5,535,160

Benefit-Cost Ratio **0.11**

1. Future year construction costs adjusted to 2020 \$. Default value, actual construction costs may be higher.

OPTION 3: All Roadway Traffic At 45th Street

Benefits, 2020 \$

Safety	\$48,661
Travel Time	\$276,628
Environmental	\$11,649
Vehicle Operating Costs	\$32,830
Network	\$123
Salvage value	\$340,933
Total Benefits	\$710,824

Costs, 2020 \$

Roadway Improvements	\$5,535,160¹
Total Cost	\$5,535,160

Benefit-Cost Ratio **0.13**

1. Future year construction costs adjusted to 2020 \$. Default value, actual construction costs may be higher.

Attachment A:
FRA's GradeDec.net Crossing Evaluation Tool
Reference Manual

DRAFT

Attachment B:

**USDOT: Benefit-Cost Analysis Guidance for
Discretionary Grant Programs**

DRAFT