Benefit-Cost Analysis

Table of Contents

Executive Summary

The proposed investment in the Oklahoma Department of Transportation's (ODOT)'s bridge improvements in McClain County is being evaluated through a Benefit-Cost Analysis (BCA) for the Bridge Investment Program (BIP) Grant. The BCA takes into account the costs associated with the project and the benefits it will generate, with a primary focus on enhancing the current bridge condition at Goldsby in McClain County in Oklahoma.

The Project has been inspired by the primary goal of enhancing a vital corridor that facilitates connectivity between Kansas, Oklahoma City, and Texas, while supporting essential freight connections that underpin the economic vitality of both Oklahoma and the broader United States.

The replacement of the bridge at SH-74 in the City of Goldsby will be achieved by replacing the existing bridge (SH-74) over I-35, also known as the "Goldsby Bridge" in this report. The proposed project aims to enhance the capacity and safety along I-35 by replacing the Goldsby Bridge. To comply with the greater effort to widen I-35 from four (4) to six (6) lanes of traffic, moving the pier at the Goldsby location is necessary (**Figure 1**).

The BCA model utilized in this analysis is in accordance with the methodology outlined by USDOT in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs[1], with a 20 years of operational evaluation of each bridge. The detailed data and calculations integral to assessing the project's benefits and costs are outlined within the accompanying BCA model. The analysis utilized the Bridge Investment Program Benefit-Cost Analysis Tool v.1.0.4 (BIP BCA Tool) and the corresponding User Manual released by USDOT with the Notice of Funding Opportunity (NOFO) for the FYs 2023 through 2026 Bridge Project grant applications.

The project is projected to generate $66,353,103 in discounted benefits against $10,409,552 in discounted capital costs, utilizing a 3.1 percent real discount rate. This translates into an anticipated **Net Present Value of $55,943,551 resulting in a commendable Benefit/Cost Ratio of 6.37.** ODOT seeks $6,814,720 in BIP funding to support this endeavor.

The initiative will lead to reduced travel time and vehicle operating costs (VOC). Under the "Build" scenario, the estimated reduction in travel time and VOC amounts to a grant total of $56,628,426 in 2022 discounted dollars.

At the end of the 20-year operating period, the assets will retain a residual value of $2,750,369 in discounted dollars for the "Build" scenario. The residual value is included in the total benefits of the project.

The project will reduce crash incidents, travel time, and operations and maintenance costs. The overall project benefit matrix, baselines, and issues to be addressed are shown in detail in **Table 1**.

[1] Source: Benefit-Cost Analysis Guidance for Discretionary Grant Programs | US Department of Transportation

Table 1 Baseline and Issues to be Addressed.

Benefit	Benefit Description	Monetized Benefit[2]	Percent of Total Benefits
Safety	Safety benefits represent the reduction in crashes for existing and induced vehicle traffic. When the bridge is closed and detours are taken, this results in additional crash risk	$6,772	0.01%
Travel Time	Anticipated reductions in travel times and improved bridge conditions	$31,389,212	47.31%
VOC	Vehicle Operating Costs (VOC) represent the avoided costs of congestion, noise, and vehicle operations when load postings or closures result in additional vehicle miles traveled (VMT)	$25,239,214	38.04%
CO2 Emissions	Lower miles traveled equates to lower CO2 emissions. Benefits calculated at 2.0% discounted rate.	$6,204,354	9.35%
Non-CO2 Emissions	Lower miles traveled equates to lower emissions of other gases, other than CO2. Benefits calculated at 3.1% discounted rate.	$689,050	1.04%
Other Environmental	Lower miles traveled due to other environmental factors	$28,594	0.04%
Maintenance	New and better designed infrastructure equates to lower O&M costs	$45,538	0.07%
Residual Value	Anticipated present value of the sum of the expected annual avoided damages over the project useful life.	$2,750,369	4.15%

In addition to the quantifiable benefits outlined in **Table 1**, the Project stands to deliver qualitative benefits that, while challenging to quantify and monetize, significantly enhance the project's impact. Among these benefits is the improved travel reliability and emergency service response. The expected decrease in travel times and enhanced bridge efficiency are projected to result in smoother vehicle flow, which will benefit both personal and commercial travel across the bridge locations.

A benefit-cost analysis (BCA) was conducted for the Goldsby bridge in McClain County in Oklahoma with the goal of increasing connectivity and enhancing the economic well-being of the community. This analysis was prepared for submission to the U.S. Department of Transportation (USDOT) as a requirement of a discretionary grant application for the FY 2023 and 2024 BIP. This appendix is organized as follows:

[2] At 3.1% Discount Rate, except CO2 Discounted At 2.0%

- Section 2 contains the project description.
- Section 3 documents the BCA framework, including key assumptions.
- Section 4 contains a detailed explanation and calculation of the project benefits.
- Section 5 contains the detailed results of the BCA.
- Section 6 contains the sensitivity analysis.

Project Description

The Oklahoma Department of Transportation (ODOT) is actively pursuing $11,348,324 funding from the FY 2023 and 2024 Bridge Investment Program (BIP) Discretionary grant to replace the Goldsby Bridge in McClain County, Oklahoma. The primary goal is to enhance vital bridges for the community, facilitating connectivity between towns that depend on the conditions of the Goldsby Bridge to continue with their day-today activities.

The Project consists of two main components that have been inspired by the primary goal of enhancing a vital corridor that facilitates connectivity between Kansas, Oklahoma City, and Texas, while supporting essential freight connections that underpin the economic vitality of both Oklahoma and the broader United States.

Figure 1 Project Components and Location

The first component of the project involves replacing the bridge at SH-74 in the City of Goldsby. The existing bridge, also known as the "Goldsby Bridge" in this report, will be replaced to enhance the capacity and safety along I-35. This component is crucial in complying with the greater effort to widen I-35 from four (4) to six (6) lanes of traffic. Moving the pier at the Goldsby location is necessary to achieve this, as shown in **Figure *1***.

By replacing the Goldsby Bridge, the proposed project will allow for future widening of I-35, provide greater emergency access for a stretch of I-35 that has over four miles between interchanges (one of which is a partial interchange), and enable multimodal connectivity within the community along SH-74, as shown in **Figure *1***. Overall, the I-35 Corridor Improvements in McClain County Project is a vital initiative aimed at enhancing a crucial corridor's capacity, facilitating connectivity, and supporting essential freight connections. This project will not only benefit the local communities but also contribute to the economic vitality of Oklahoma and the broader United States.

The total projected cost of this Project amounts to $8,518,400 (measured in 2024 dollars). This total cost includes the anticipated project costs as well as any previously incurred costs (Project Development cost). The $6,814,720 investment from the BIP grant plays a pivotal role in securing full construction funding for the Goldsby bridge. The funds requested from the BIP grant solely pertain to anticipated project costs, covering construction costs, engineering and inspection costs (E&C), and a 15% contingency of construction costs. Notably, all previously incurred costs ($1,404,678) are excluded from the BIP funding request but are accounted for

within the project costs for BCA assessment as outlined by USDOT in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs[3] - Section 6. As per the BCA, the anticipated bridge replacements are forecasted to yield a remarkable **benefit-cost ratio (BCR) of 6.37, accompanied by a net present value (NPV) of $55,943,551.** This project holds great significance as it is a crucial step towards strengthening transportation infrastructure and driving economic growth in the region. The Goldsby Bridge replacement represent an expansion to critical infrastructure, enhancing transportation efficiency and safety.

The Goldsby Bridge replacement will accommodate future widening of I-35, allow for an interchange to improve access for the community, allow for greater emergency access for a stretch of I-35 that has over four miles between interchange (one of which is a partial interchange), and allows for multimodal connectivity within the community along SH-74.

The Goldsby Bridge is interconnected as a system by I-35. The I-35 corridor functions as a dynamic economic catalyst for Oklahoma, the Chickasaw Nation, Texas, and the United States at large, facilitating trade and connectivity between the Oklahoma City vicinity and the Dallas/Fort Worth region. Furthermore, this strategic conduit stands as a vital freight artery connecting the United States and Mexico, culminating at the Port of Laredo in Texas. The Project's scope aligns with rural classifications, adhering to both the USDOT Notice of Funding Opportunities (NOFO) and the ODOT 2045 Long Range Transportation Plan criteria, targeting counties with populations below 200,000 and devoid of urban clusters.

By introducing additional capacity to the congested I-35 corridor, the initiative will mitigate traffic congestion, leading to reduced travel durations and heightened overall reliability for all users. The corresponding decrease in halted and idling vehicles will also contribute to a reduction in vehicle emissions, thereby fostering environmental sustainability. Moreover, the expanded inner shoulder is anticipated to play a pivotal role in curbing collisions, bolstering overall motorist safety.

The anticipated success of the Project extends beyond localized communities and businesses, permeating the efficient flow of commodities and services across both state and national borders. This grant application endeavors to secure funding that will propel this pivotal infrastructure enhancement, thereby enriching regional economies and promoting a safer, more efficient transportation network accessible to all.

By replacing the Goldsby Bridge, several benefits are anticipated. The initiative will mitigate traffic detours, leading to reduced travel durations and heightened overall reliability for all users. The corresponding decrease in idling vehicles will also contribute to a reduction in vehicle emissions, thereby fostering environmental sustainability and bolstering overall safety.

Benefit Cost Analysis Framework

The Benefit-Cost Analysis (BCA) framework offers an evaluative structure to gauge the economic pros (benefits) and cons (costs) of a potential infrastructure project. These project

[3] Source: Benefit-Cost Analysis Guidance for Discretionary Grant Programs | US Department of Transportation

benefits and costs are broadly defined and, to the extent feasible, quantified in monetary terms. The overarching objective of the Project's BCA is to assess whether the anticipated benefits of the Project sufficiently outweigh the costs from a national perspective. This BCA framework endeavors to encapsulate the net change in societal welfare resulting from the Project, encompassing cost savings and increases in welfare (benefits), along with potential disbenefits represented by identifiable costs (e.g., project capital expenses), and welfare reductions where specific groups might experience adverse impacts due to the proposed project.

This BCA framework involves defining a Base or "No Build" scenario, which is compared to the "Full Build" scenario. The BCA assesses the incremental difference between these scenarios, which represents the net change in welfare. BCAs seek to assess the incremental change in welfare over a project life cycle. The importance of future changes is determined through discounting, which is meant to reflect the time value of money.

The BCA conducted for this grant application assesses the costs linked to the proposed investment against the potential benefits of the project. To the best extent possible, these benefits have been quantified monetarily. Furthermore, a qualitative exploration is provided when a benefit is anticipated but challenging to quantify or express in monetary terms.

Failure to replace this bridge will bring congestion and detour twice as long in terms of miles traveled. Such congestion contributes to increased travel times, compromised reliability, emissions, and secondary accidents. The proposed bridge replacements aim to alleviate these challenges, catering to present and future traffic needs.

This project's evaluation period spans 20 years of operation. Detailed computations and data used for deriving project benefits and costs are presented in the accompanying BCA model. Refer to **Table 2** below for further details on project costs breakdown.

Table 2 Project Cost Summary (2024$)

Project Name	Construction Costs			Project Development (Previously Incurred)	
	Construction	E&C	Contingency	Design	Right of Way & Utilities
Goldsby Bridge (NBI: 14496)	$7,040,000	$422,400	$1,056,000	$889,200	$515,478
Sub-Total	***$8,591,300***	***$515,478***	***$1,056,000***	***$889,200***	***$515,478***
Total	**$8,518,400**			**$1,404,678**	

Based on this analysis, the Project is expected to yield $66,353,103 in discounted benefits and $10,409,552 in discounted capital costs, applying a 6.37 percent real discount rate. As a result, the Project is anticipated to generate a Net Present Value of $55,943,551, along with a commendable **Benefit/Cost Ratio of 6.37.**

Beyond the quantified benefits outlined in **Table 1** and ***Table 2***, the Project also offers challenging-to-quantify qualitative advantages. These include enhancing travel reliability, supporting priority planning efforts for improved connections on within the county.

Key Assumptions

General BCA assumptions and inputs include the following:

- All dollars assume 2022 as the base year.
- All benefits and costs beyond the base year are discounted at 3.1%, except for carbon dioxide emissions that are discounted at 2.0%.
- The time period begins in 2024, the first year of the project expenditures. For future years, the analysis period is capped at 20 years from anticipated completion. Since the Project is anticipated to be complete and open to traffic in 2028, the study time period ends at the end of the year 2047.

Table 3 shows the timeline variable for the Goldsby Bridge. Additional BCA assumptions and inputs used in this analysis's development are provided below.

Table 3 Project Timeline Variables

Timeline Variables	Goldsby Bridge (NBI: 14496)
Current Year	2024
First Year of Construction Costs	2026
Last Year of Construction Costs	2027
Project Opens (Start of Benefits)	2028
Years of Benefits for Analysis	20

Bridge Conditions and Closures

The BCA Tool utilizes FHWA's NBIAS to predict when the bridge will need posting and eventual closure, relying on statistical data. According to NBIAS, **Table 4** shows the details of when the bridge is expected to be fully posted (for truck and buses) and closed. However, annual inspection reports conducted by ODOT revealed various deficiencies, indicating potential earlier issues. Rating at these locations is expected to drop to 2 or 3 before posting/closure, safety concerns demand swift action, with the bridge in this project at risk of immediate failure in a collision. ODOT's throughout examination suggests that several load postings at these bridge locations could happen as early as next year. Refer to **Table 24** and **25** on the BCA Tool for more information on anticipated bridge closures.

Table 4 Bridge Details

Variable	Goldsby Bridge (NBI: 14496)
Bridge Currently Closed or Load Posted? (NBI)	A
Current Superstructure Condition Rating	5
Current Operating Rating (metric tons)	47.2

Table 5 Forecasted Condition Ratings

Bridge Component and Rating	Condition Rating Reference Value	NBIAS Forecast Year
Overall Condition Rating 3	3	2028
Overall Condition Rating 2	2	2038
Superstructure Condition Rating 4	4	2033
Superstructure Condition Rating 3	3	2048

Travel Time Assumptions

Travel time savings are computed by contrasting person-hours of travel time between the "No-Build" and "Build" scenarios. For lane expansions, person-hours of travel time are calculated by multiplying the average vehicle occupancy with the Vehicle Miles Traveled (VMT) projections, then dividing by the speeds outlined in **Table 6**.

Table 6 Traffic Assumptions

Parameters	Goldsby Bridge (NBI: 14496)
Bridge Average Speed (FHWA)	47
Average Car Occupancy	1.67
Share of Long-Distance Personal Travel	0%
Value of Time - Long-Distance Personal Travel	$25.10
Share of Business Travel	11.8%
Value of Travel Time - Business	$32.30
Value of Travel Time - Personal	$17.90
Value of Travel Time - All Purposes	$19.60
Walking, Cycling, Waiting, Standing, and Transfer Time	$35.80
Truck Driver	$33.50
Bus Driver	$36.50
Average Bus Occupancy	0

Safety Assumptions

The methodology employed for crash predictions involved analyzing historical collision data and considering the projected growth rate of Average Annual Daily Traffic (AADT). There was a total of 25 collisions in the Goldsby bridge. Details on collision data can be found in

Table 7 of this report and in the **Merit Criteria** of the project narrative.

Table 7 Historical Collision Data (Goldsby Bridge. NBI: 14496)

Year	Severity			Total
	Fatality	Injury	PDO	
2017	0	2	3	**5**
2018	0	1	2	**3**
2019	0	0	4	**4**
2020	0	1	5	**6**
2021	0	5	2	**7**
Grand Total	**0**	**9**	**16**	**25**
Average	0.0	1.8	3.2	**5.0**
Distribution	0.0%	0.36%	0.64%	**100.0%**

Operation Cost and Residual Value Assumptions

To assess the advantages linked with upholding the existing transportation infrastructure in a well-maintained state, we consider the incremental expenses for operations and maintenance (O&M) as well as the residual value of assets.

The calculation of O&M cost savings involves contrasting the costs between the "No-Build" and "Build" scenarios. By subtracting the Build estimates from the No-Build estimates, we determine the incremental O&M costs. Positive values signify savings in operations and maintenance costs, resulting in a net benefit, whereas negative values indicate heightened operations and maintenance expenses, implying a net incremental cost of the project. Despite the increase in lane-miles and annual routine maintenance costs in the “No-Build” scenario due to frequent asphalt resurfacing, incremental O&M cost savings are observed. Refer to **Table 17** of the BCA Tool for more details regarding the O&M Cost Schedule for each bridge included in this project. **Table 8** highlight the activities assumed for the Goldsby Bridge.

Table 8 Goldsby Activity Schedule for O&M

Parameters and Assumptions		
Parameter	**Value**	**Notes**
Existing Bridge Assumptions (expected activities within study time period)		
Maintenance Activity 1 (per sf)	$1.00	1 year interval (inspection & flushing of deicing salts)
Maintenance Activity 2 (per sf)	$10.00	10 year interval (bridge deck sealing)
Maintenance Activity 3 (per sf)	$75.00	25 year interval (rehab)
Maintenance Activity 4 (per sf)	$175.00	50 year interval (total reconstruction)
New Bridge Assumptions (expected activities within study time period)		
Maintenance Activity 1 (per sf)	$0.50	1 year interval (inspection & flushing of deicing salts)
Maintenance Activity 2 (per sf)	$5.00	15 year interval (bridge deck sealing)
Maintenance Activity 3 (per sf)	$50.00	40 year interval (re-deck & rehab)
Maintenance Activity 4 (per sf)	$175.00	75 year interval (total reconstruction)
Parameters		
Existing Bridge - Bridge Deck Area (sf)	8388	Bridge NBI: 14496
New Bridge - Bridge Deck Area (sf)	19350	43'x450' bridge
Calculated Cost Assumptions		
Existing - 1 year interval cost	$8,388	in base year 2021 dollars
Existing - 10 year interval cost	$83,879	in base year 2021 dollars
Existing - 25 year interval cost	$629,090	in base year 2021 dollars
New - 1 year interval cost	$9,675	in base year 2021 dollars
New - 15 year interval cost	$96,750	in base year 2021 dollars
Notes: N/A		

Project Benefits

Safety Benefits

Safety benefits results in a $6,772 benefit, which represents 0.01% of the total benefits. **Table *9*** shows the breakdown on safety benefits for the Goldsby Bridge.

Table 9 Safety Benefits

Project Name	Safety Benefits ($)
Goldsby Bridge (NBI: 14496)	$6,772
Total	**$6,772**
Percent Of Total Benefits	**0.01%**

Travel Time Benefits

Travel time savings due to delay reduction results in a $31,389,212 benefit, which represents 47.31% of the total benefits. **Table 10** shows the breakdown on travel time saving for the Goldsby Bridge**.**

Table 10 Travel Time Benefits

Project Name	Travel Time Savings ($)
Goldsby Bridge (NBI: 14496)	$31,389,212
Total	**31,389,212**
Percent Of Total Benefits	**47.31%**

VOC Benefits

VOC benefits due to delay reduction results in a $25,239,214 benefit, which represents 38.04% of the total benefits. **Table *11*** shows the breakdown on VOC benefits for the Goldsby Bridge.

Table 11 VOC Benefits

Project Name	VOC Benefits ($)
Goldsby Bridge (NBI: 14496)	$25,239,214
Total	**$25,239,214**
Percent Of Total Benefits	**38.04%**

CO2 Emissions Benefits

CO2 Emissions benefits due to delay reduction results in a $6,204,354 benefit, which represents 9.35% of the total benefits. **Table 12** shows the breakdown on CO2 emissions benefits for the Goldsby Bridge**.**

Table 12 CO2 Emissions Benefits

Project Name	CO2 Emissions Benefits ($)
Goldsby Bridge (NBI: 14496)	$6,204,354
Total	**$6,204,354**
Percent Of Total Benefits	**9.35%**

Non-CO2 Emissions Benefits

Non-CO2 Emissions benefits due to delay reduction results in a $689,050 benefit, which represents 1.04% of the total benefits. **Table *13*** shows the breakdown on Non-CO2 Emissions benefits for the Goldsby Bridge.

Table 13 Non-CO2 Emissions Benefits

Project Name	Non-CO2 Emissions Benefits ($)
Goldsby Bridge (NBI: 14496)	$689,050
Total	**$689,050**
Percent Of Total Benefits	**1.04%**

Other Environmental Benefits

Other Environmental benefits due to delay reduction results in a $28,594 benefit, which represents 0.04% of the total benefits. **Table *14*** shows the breakdown on other environmental benefits for each bridge.

Table 14 Other Environmental Benefits

Project Name	Other Environmental Benefits ($)
Goldsby Bridge (NBI: 14496)	$28,594
Total	**$28,594**
Percent Of Total Benefits	**0.04%**

Maintenance Benefits

maintenance benefits due to delay reduction results in a $45,538 benefit, which represents 0.07% of the total benefits. **the *Goldsby*** Bridge**.**
Table 15 shows the breakdown on maintenance benefits for the Goldsby Bridge**.**

Table 15 Maintenance Benefits

Project Name	Maintenance Benefits ($)
Goldsby Bridge (NBI: 14496)	$45,538
Total	**$45,538**
Percent Of Total Benefits	**0.07%**

Residual Value Benefits

Residual value benefits due to delay reduction results in a $2,750,369 benefit, which represents 4.15% of the total benefits. **Table 16** shows the breakdown on residual value benefits for the Goldsby Bridge**.**

Table 16 Residual Value Benefits

Project Name	Residual Value Benefits ($)
Goldsby Bridge (NBI: 14496)	$2,750,369
Total	**$2,750,369**
Percent Of Total Benefits	**4.15%**

Summary of Results

The table below summarize the BCA findings. Annual costs and benefits are estimated over the study period. As stated earlier, project completion is expected to be completed by the end of 2027. Benefits accrue during the operation of the project (over the years 2028-2047). With a 3.1 percent real discount rate, the $6,814,720 BIP investment would result in $66,353,103 in total discounted benefits, net present value of $55,943,551 and a Benefit/Cost ratio of approximately 6.37. **Table *17*** compiles all project benefits evaluated.

As shown in **Table *17***, the vast majority of project benefits (at 47.31 percent) is accounted for by travel time savings. Reduction in vehicle operating costs accounts for about 38.04 percent of the overall benefits. Maintenance cost savings account for less than 1 percent, while environmental cost savings account for about 10.43 percent. Residual value of assets accounts for approximately 4.15 percent of total benefits.

Table 17 Summary of Benefits

Category	Goldsby Bridge (NBI: 14496)	Total	Percent of Total Benefits
Safety	$6,772	$6,772	0.01%
Travel Time	$31,389,212	$31,389,212	47.31%
VOC	$25,239,214	$25,239,214	38.04%
CO2 Emissions	$6,204,354	$6,204,354	9.35%
Non-CO2 Emissions	$689,050	$689,050	1.04%
Other Environmental	$28,594	$28,594	0.04%
Maintenance	$45,538	$45,538	0.07%
Residual Value	$2,750,369	$2,750,369	4.15%
Total Benefits	**$66,353,103**	**$66,353,103**	**100%**
Total Discounted Costs	**$10,409,552**	**$10,409,552**	**N/A**
BCR	**6.37**	**6.37**	**N/A**
Net Present Value (NPV)	**$55,943,551**	**$55,943,551**	**N/A**

Sensitivity Analysis

The BCA outcomes presented in the previous sections rely on many assumptions and long-term projections, all of which are subject to considerable uncertainty. The primary purpose of the sensitivity analysis is to help identify the variables and model parameters whose variations have the greatest impact on the BCA outcomes: the "critical variables."

The sensitivity analysis can also be used to:

- Evaluate the impact of changes in individual critical variables—how much the results would vary with reasonable departures from the "preferred" or value for the variable; and;
- Assess the robustness of the BCA and evaluate whether the conclusions reached under the "preferred" set of input values are significantly altered by reasonable departures from those values.

The outcomes of the quantitative analysis for the Project, using a 3 percent discount rate for CO2-related impacts and 7 percent discount rate for all other impacts, are summarized in **Table *18*.** This table provides the percentage changes in the Project's NPV associated with variations in variables or parameters, as indicated in the column headers.

Based on the sensitivity analysis, the following conclusions are drawn:

- A 15 percent change in the future capital cost is expected to translate into a 2 percent change in the NPV, resulting a BCR ranging from 5.67 to 7.29.
- Reducing the years of benefits from 20 to 15 years of benefit is expected to reduce the NPV from $55,943,551 to $39,355,275 (a 30 percent reduction) with a BCR of 4.78, which it is greater than the 1.0 threshold.
- A 20 percent change in the AADT, which greatly influences the benefits from travel time savings, translates into 24 percent change in the NPV, resulting in a BCR that ranges from 5.10 to 7.65.
- Completely removing any safety improvement, which is directly linked to the safety benefits, results in a very small reduction in the NPV, a less than 1 percent reduction in the NPV.

Table 18 Sensitivity Analysis Results

Original Benefits Discounted	Original Costs Discounted	Original NPV Discounted	Original BCR	
$ 65,353,103	**$10,409,552**	**$ 55,943,551**	**6.37**	
Parameters	**Change in Parameter Value**	**New NPV Discounted**	**Change In NPV**	**New B/C Ratio**
Project Capital Cost	-15% of future project capital cost	$56,939,428	2%	7.29
	+15% of future project capital cost	$54,947,675	-2%	5.67
Years of Benefit	15 years of benefit	$39,355,275	-30%	4.78
Travel Time Savings	-20% of AADT benefitting from Travel Time Saving	$42,707,763	-24%	5.10
	+20% of AADT benefitting from Travel Time Saving	$69,179,340	24%	7.65
	Completely removes safety improvements	$55,935,193	-0.01%	6.37