

# BENEFIT-COST ANALYSIS

Prepared for City of LeClaire, Iowa  
The US 67 Corridor Connectivity Improvements and Mississippi Riverfront Revitalization Project  
2020 BUILD Grant Application  
April 30, 2020

## Introduction

A Benefit-Cost Analysis (BCA) was performed for the City of LeClaire “The US 67 Corridor Connectivity Improvements and Mississippi Riverfront Revitalization Project” for submission to the U.S. Department of Transportation (U.S. DOT). Benefit-cost analysis is required as part of the grant application for the 2020 BUILD program. The analysis was completed to determine the possible benefit-cost ratios of proposed street, bicycle, pedestrian, and transit improvements providing multi-modal connections to LeClaire’s Downtown/ Riverfront. Recommended U.S. DOT methodologies for benefit-cost analysis were followed in order to provide the department with “apples-to-apples” comparisons and to make analysis strategy transparent. Benefit-cost methodologies were captured in “The Guide to Preparing Benefit-Cost Analysis for BUILD grants”<sup>1</sup>. Additional categories of monetized benefits and costs that are not shown in the guide have been developed using alternative strategies. Sources, detailed calculations, and rationale are identified in this report for determining these monetized benefits/costs.

This BCA is based on the difference between the “no-build” scenario and the proposed improvements scenario. The “no-build” scenario is for baseline projections if the project were not to take place and is to go without improvements to the existing road and flood area. The baseline projections were then used to estimate the proposed scenario where improvements for flood protection and roadways were taken into account.

## General Assumptions

### Constant Dollar Values and Discount Rates

Benefit-cost investments for the projects are shown in constant 2018-dollar values. Most benefit valuations and some costs were expressed in dollar values in a past year dollar value amount. In order to adjust and translate these monetized historical year values into 2018 dollars, the U.S. Bureau of Labor Statistics’ Consumer Price Index (CPI) for Urban Consumers<sup>2</sup> was applied to historical values. Analyzing everything in a single base year of 2018 dollar values helps to further establish an “apples-to-apples” comparison of monetized benefits and costs for the U.S. DOT.

A real discount rate of 7.0% was used in this BCA as recommended by the U.S. DOT guidance for BUILD grants and the White House Office of Management and Budget (OMB Circular A-4)<sup>3</sup>.

“As a default position, OMB Circular A-94 states that a real discount rate of 7 percent should be used as a base-case for regulatory analysis. The 7 percent rate is an estimate of the average before-tax rate of return to private capital in the U.S. economy. It is a broad measure that reflects the returns to real estate and small business capital as well as corporate capital. It approximates the opportunity cost of capital, and it is the appropriate discount rate whenever the main effect of a regulation is to displace or

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<sup>1</sup> US Department of Transportation: Benefit-Cost Analysis Guidance for Discretionary Grant Programs, January 2020; [https://www.transportation.gov/sites/dot.gov/files/2020-01/benefit-cost-analysis-guidance-2020\\_0.pdf](https://www.transportation.gov/sites/dot.gov/files/2020-01/benefit-cost-analysis-guidance-2020_0.pdf).

<sup>2</sup> U.S. Bureau of Labor Statistics. Consumer Price Index, All Urban Consumers, U.S. City Average, Series CUSR0000SA0. 1982-1984=100.

<sup>3</sup> White House Office of Management and Budget, Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (October 29, 1992). (<https://www.whitehouse.gov/sites/default/files/omb/assets/omb/circulars/a004/a-4.pdf>).

alter the use of capital in the private sector.... The effects of regulation do not always fall exclusively or primarily on the allocation of capital. When regulation primarily and directly affects private consumption (e.g., through higher consumer prices for goods and services), a lower discount rate is appropriate. The alternative most often used is sometimes called the “social rate of time preference.” This simply means the rate at which “society” discounts future consumption flows to their present value. If we take the rate that the average saver uses to discount future consumption as our measure of the social rate of time preference, then the real rate of return on long-term government debt may provide a fair approximation. Over the last thirty years, this rate has averaged around 3 percent in real terms on a pre-tax basis.”<sup>4</sup>

**Evaluation Period**

The evaluation period for the City of LeClaire “The US 67 Corridor Connectivity Improvements and Mississippi Riverfront Revitalization Project” includes both the construction period and the post-construction period. The post-construction period considered was 20-years of operations and allows for benefit accrual to take place. The construction period is considered to be when capital investment costs are used. This study has assumed the construction period to take place during years 2023-2027. Operations are assumed to begin in year 2028 and designed for 20-years of operations through 2047.

**Results & Methodology**

The analysis results in a positive return on investment for the 7% discount rate over the evaluation period. These discounted net-present values are based upon undiscounted costs and undiscounted benefits for the period. Undiscounted costs totaled \$31.1 million dollars over the evaluation period and include both capital costs and operations/maintenance costs. Total undiscounted benefits were \$142.5 million dollars over the 20-year period. Analysis yielded a benefit-cost ratio of 2.63 discounted at 7%. The cost summary table is in Appendix D – Page 14. It should be noted that benefits do not include operation and maintenance (O&M) cost savings from doing proposed road and flood improvements. The O&M costs for “no-build” situation would likely create an even larger savings benefit for the proposed improvements situation, further increasing the Benefit-Cost Ratio.

Benefit-Cost Summary in 2018 Dollars	
	7% Discount
Total Benefits	\$ 53,115,572
Total Costs	\$ 20,163,184
Benefit-Cost Ratio	2.63

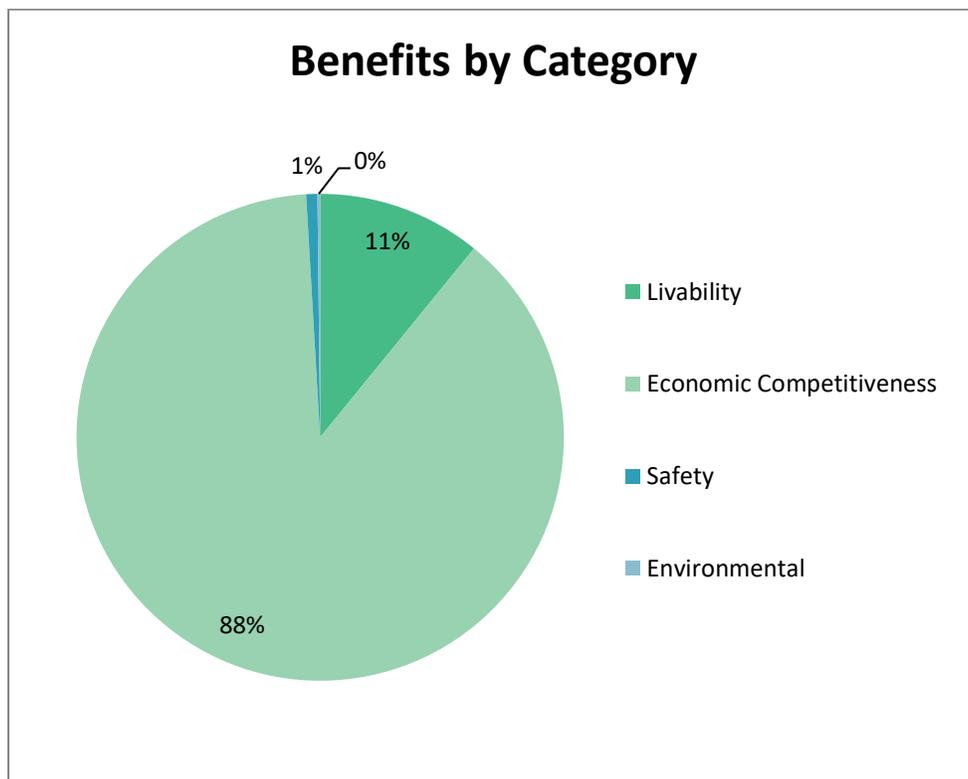
Impacts from proposed improvements that created the largest benefit were from additional annual revenue from increased business attraction and increased property values.

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<sup>4</sup> White House Office of Management and Budget, Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (October 29, 1992). (<https://www.whitehouse.gov/sites/default/files/omb/assets/omb/circulars/a004/a-4.pdf>).

Benefits Summary in Constant 2018 Dollars			
Type of Impact	Benefit	Undiscounted Benefit	Value @ 7% Discount
Livability	Increased Property Value	\$ 1,756,000	\$ 834,263
	New Properties - Values	\$ 13,750,000	\$ 4,909,345
Economic Competitiveness	Increased Business/Tourism	\$ 121,260,000	\$ 45,796,178
	Vehicle Operating Costs (VMT Reduction)	\$ 4,580,987	\$ 1,206,868
Safety	Crash Reduction	\$ 822,061	\$ 271,174
Environmental	Reduced Emissions	\$ 289,583	\$ 97,744
<b>Total Benefits</b>		<b>\$ 142,458,630</b>	<b>\$ 53,115,572</b>

The categorical pie chart below gives a conceptual look at the percentages that each benefit provided compared to the overall improvement benefits.



Human health benefits were not estimated with monetary values such as the ones shown above. With the “Complete Streets” initiative and apart of the proposed improvements, increased physical activity is linked to improved health and will benefit and have a positive impact on the community of LeClaire.

Increased Property Value

Improved roadway/pedestrian-based infrastructure along LeClaire’s Riverfront is likely to increase property value in the downtown. The proposed implementation of “Complete Streets” along US 67/

Cody Road, Wisconsin Street, and at the Riverfront will help make these areas more accessible for people on foot or riding bikes. The National Complete Streets Coalition states that increased walkability leads to increased property values and has showed cases where property value increased \$3,000-\$9,000 as a result of Complete Street type projects (added trees, bike paths, sidewalks, green spaces, increased walkability, etc.)<sup>5</sup>. A conservative estimate of 5% increase in property value due to accessibility for pedestrian travel and enhanced multi-modal infrastructure as a result of “Complete Streets” was applied to the existing downtown and Wisconsin Street property value in LeClaire. An existing property value of \$23.7 million in the downtown area and Wisconsin Street was obtained from the Scott County Assessors website.

For this analysis, the current value of property is considered the “no-build” scenario where improvements would not take place. Overall, the improvements are estimated to result in a 5% increase in downtown and Wisconsin Street properties. The increased property value benefit was considered a one-time "stock" benefit applied in 2028 (first year post-construction) in this analysis and led to a total undiscounted benefit of \$1,756,000. Property value benefits of \$0.83 million was calculated for the 7% discount.

Also, the project will bring new commercial buildings for retail, office, and restaurants to US 67/Cody Road Phase II once built. After building US 67/Cody Road Phase I, businesses expanded on the 48 adjacent properties. US 67/Cody Road Phase II prorated for length of the road versus Phase I length, 55 businesses could be created. The properties on Phase 1 increased 23% after the public infrastructure installation. The City is confident that this will happen again after this investment. The average Phase 1 property value is \$198,000, therefore the Phase II properties will average \$250,000, due to the 23% increase. The 55 new properties will fill in over a 10-year period after construction. This analysis led to a total undiscounted benefit of \$13,750,000. Property value benefits of \$4.91 million was calculated for the 7% discount.

#### Increased Spending (Business/Tourism)

Improved transportation infrastructure is seen as a way to improve economic development in the City of LeClaire. Multi-modal “Complete Streets” improvements along with riverfront flood protection and reconditioning are estimated to increase visitor spending by \$6.06 million (undiscounted 2018 dollars) annually. For this analysis, the \$6.06 million was assumed to stay constant over the 20-year post-construction period and applied at a discount of 7%. Total benefits from increased spending were calculated to be \$45.80 million for a 7% discount. In this case, the “no-build” scenario assumes that no annual increase is seen during the evaluation period.

Additional visitors to the LeClaire Mississippi River Downtown and Riverfront are estimated at 57,500 and are mainly based on larger event attendance and increased business. The following table shows projections on additional visitors.

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<sup>5</sup> "Economic Development." *Smart Growth America*. (2016). <http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/factsheets/economic-revitalization>.

2028 Proposed Additional Visitors to Burlington Mississippi River Riverfront				
Event	Attendance	Estimated # of Days	Economic Impact	Notes
Riverfront (the landing/bike trail)	8,000	0.5	\$376,000	additional daily use including residents
Tug Fest	3,500	2	\$658,000	additional to the already 35,000 attendees
Buffalo Bill Cody Museum	4,000	1	\$376,000	additional to the current 20,000 attendees
Twilight Boat	2,000	1	\$188,000	better dockage and rise landing (factoring April – July events under flood threats)
American Queen	3,000	1	\$282,000	8 dockings (400 people each dock)
Viking River Cruises (hoping for)	1,200	1	\$112,800	2 dockings (600 people each dock)
New Events Using Riverfront	15,000	1.5	\$2,115,000	proposing 3 new events to the space
New Downtown Events	6,500	1	\$611,000	proposing 3 new events to the space
New Downtown Patrons	14,300	1	\$1,344,200	55 places X 5 new patrons a week for new stores/restaurants
<b>Total</b>	<b>57,500</b>		<b>\$6,063,000</b>	

In the calculated spending increase estimate, it is assumed that the additional attendance spent an average amount of \$94 dollars per visitor and was multiplied by the estimated number of days spent in the community. Projections were obtained from the LeClaire Convention & Visitors Bureau. Also, the Federal per diem per day was checked and used for LeClaire. Appendix D – Page 9 shows calculated present value benefits for increased spending.

#### Reduced Average Daily Traffic (ADT)

A travel-related improvement expected as a result of the improved road infrastructure and pedestrian-based infrastructure is the reduction in ADT along US 67/Cody Road and Wisconsin Street. Impacts to ADT along these roads create a reduction benefit for vehicle operation costs (VOC) and emissions reductions.

VOC is directly related to the amount of vehicle miles traveled (VMT). In this analysis, it was assumed there would be a 20% decrease in ADT. U.S. DOT FHWA Road Diet case studies showed cases for

"Complete Streets" programs with 18-29% volume reduction<sup>6</sup>, as well as a case with 36% reduction. A value of 20% decrease for the proposed improvements project in LeClaire is considered conservative. The 20% reduction is based on the assumption that 20% of the traveling vehicle population will use walking, biking and other modes of transit in this area. ADT traffic information in these corridors was found on 2018 IDOT AADT mapping and averaged 6800 vehicles/day along US 67/Cody Road and 900 vehicles/day on Wisconsin Street in this corridor. The vehicles/day counts were multiplied by 365 to give an annual estimate for the "no-build" scenario. The "no-build" was based on current ADT rates and is assumed to increase 1% per year over the project period. The reduction benefit of 20% of the current "no-build" rates was used. This benefit of vehicles/year was then multiplied by the distances of US 67/ Cody Road and Wisconsin Street within the project corridor to get VMT reductions. Total distance in this area is 1.47 miles and was considered the total trip length. These reductions were multiplied by the IRS 2018 Standard Mileage Rates<sup>7</sup> used for cost/mile (\$0.545/mile) to create the VOC savings.

An undiscounted VOC benefit savings of \$4.58 million was calculated, while present benefit values of \$1.21 million was calculated for the 7% discount. The detailed VOC cost savings table is shown in Appendix D – Page 10.

Reduced ADT also create emission reductions in the project area. Emission rates were analyzed at the current speed limit of 25 MPH. The speed is assumed to stay the same with the improvements project. The following table summarizes monetary values of emissions in accordance with the benefit-cost analysis values as recommended by the U.S. DOT and emissions rates taken from Iowa, ICAAP emissions tables<sup>8</sup>.

Monetary Values of Emissions		
	Emission Rate at 25 MPH <sup>1</sup> (gram/ VMT)	\$ / Metric Ton (2018 Dollars)
CO2 (2017-2034)	563.19	\$1 <sup>2</sup>
CO2 (2035-2050)	563.19	\$2 <sup>2</sup>
VOC	1.818	\$ 2,313.15
NOx	1.806	\$ 9,472.90
PM	0.0327	\$ 426,610.95
SOx	0.0097	\$ 55,185.15

<sup>1</sup>Source: Iowa DOT, ICAAP emissions tables

<sup>2</sup> 7 % Social Cost of Carbon as outlined in 2020 Benefit-Cost Analysis Guidance for BUILD Grant Applicants. Dollar values were converted to 2018 dollars.

<sup>6</sup> "Case Studies - Safety | Federal Highway Administration." Case Studies - Safety | Federal Highway Administration. ([http://safety.fhwa.dot.gov/road\\_diets/case\\_studies/](http://safety.fhwa.dot.gov/road_diets/case_studies/)).

<sup>7</sup> "Standard Mileage Rates for 2018 Up from Rates for 2017." 2018 Standard Mileage Rates for Business, Medical and Moving Announced. (<https://www.irs.gov/newsroom/standard-mileage-rates-for-2018-up-from-rates-for-2017>).

<sup>8</sup> Source: Iowa DOT, ICAAP emissions tables ([http://www.iowadot.gov/systems\\_planning/icaap.htm](http://www.iowadot.gov/systems_planning/icaap.htm)).

Present benefit values for emissions totaled \$0.11 million was calculated at the 7% discount. The detailed emissions reduction benefit savings table is shown in Appendix D – Page 11.

Reduction in Accidents

The Benefit-Cost Analysis assumes a 40% reduction in the number of accidents as a result of safety improvements along the roadway. The “Complete Streets” improvements include bicycle lanes and enhanced pedestrian walkways. The U.S. DOT FHWA Road Diet “Complete Streets” case studies showed strong reinforcement of crash reduction as a result of complete streets programs. Most studies found between 20% and 70% reduction for crash/injury incidents<sup>9</sup>. A conservative estimate of 40% was used for the analysis due to evidence through “Road Diet” documentation. The case studies show decreased speeding in these improved traffic areas.

The “no-build” scenario considers current crash data obtained from the Iowa DOT’s Iowa Crash Analysis Tool. Through ICAT, historical data of crashes of the past 10 years along US 67/Cody Road, Wisconsin Street, and Territorial Road were found and data was used to create average incidents per year for baseline projections. The table below shows ICAT data.

2010-2019 IDOT ICAT Crash Injury Summary		
Crash Type	Incidents	Avg. Incidents/Yr
Unknown	0	0
Possible Injury/Unknown	8	0.8
Minor Injury	3	0.3
Major Injury	0	0
Fatal	1	0.1
Total Injury	12	1.2
Property Damage Only (PDO)	35	3.5

For the improvement scenario, the average incidents/year was calculated by multiplying 40% to the incidents/year values in the ICAT table shown. In order to get monetized values, the obtained data was converted to U.S. DOT recommended AIS scale which allows an “apples-to-apples” comparisons. The AIS scale conversion table is on Page 12 of this Appendix. Annual cost reduction benefits of approximately \$41,103 were calculated and used for the 20-year post construction period. An undiscounted accident cost savings of \$0.82 million was calculated, while a present benefit value of \$0.27 million was calculated for a 7% discount. The detailed crash reduction benefits table is shown in Appendix D – Page 13.

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<sup>9</sup> "Case Studies - Safety | Federal Highway Administration." Case Studies - Safety | Federal Highway Administration. ([http://safety.fhwa.dot.gov/road\\_diets/case\\_studies/](http://safety.fhwa.dot.gov/road_diets/case_studies/)).

### Increased Spending Benefits Table (2018 Dollars)

Economic Increase Benefit 2018 Dollars			
Project Year	Analysis Year	Increased Business & Tourism	Total Benefits @ 7% Discount
1	2022	\$ -	\$ -
2	2023	\$ -	\$ -
3	2024	\$ -	\$ -
4	2025	\$ -	\$ -
5	2026	\$ -	\$ -
6	2027	\$ -	\$ -
7	2028	\$ 6,063,000.00	\$ 4,040,032.90
8	2029	\$ 6,063,000.00	\$ 3,775,731.69
9	2030	\$ 6,063,000.00	\$ 3,528,721.20
10	2031	\$ 6,063,000.00	\$ 3,297,870.28
11	2032	\$ 6,063,000.00	\$ 3,082,121.76
12	2033	\$ 6,063,000.00	\$ 2,880,487.62
13	2034	\$ 6,063,000.00	\$ 2,692,044.51
14	2035	\$ 6,063,000.00	\$ 2,515,929.45
15	2036	\$ 6,063,000.00	\$ 2,351,335.93
16	2037	\$ 6,063,000.00	\$ 2,197,510.22
17	2038	\$ 6,063,000.00	\$ 2,053,747.87
18	2039	\$ 6,063,000.00	\$ 1,919,390.53
19	2040	\$ 6,063,000.00	\$ 1,793,822.92
20	2041	\$ 6,063,000.00	\$ 1,676,470.02
21	2042	\$ 6,063,000.00	\$ 1,566,794.41
22	2043	\$ 6,063,000.00	\$ 1,464,293.84
23	2044	\$ 6,063,000.00	\$ 1,368,498.92
24	2045	\$ 6,063,000.00	\$ 1,278,970.95
25	2046	\$ 6,063,000.00	\$ 1,195,299.96
26	2047	\$ 6,063,000.00	\$ 1,117,102.76
<b>Totals</b>		<b>\$ 121,260,000.00</b>	<b>\$ 45,796,177.76</b>

### Reduced ADT - Vehicle Operating Costs Savings Benefits Table (2018 Dollars)

Project Year	Analysis Year	ADT <sup>1</sup> x 365 (No-Build)	365*ADT After (20% Reduction <sup>2</sup> )	Reduction Benefit	US 67/Cody Annual VMT Savings	ADT <sup>1</sup> x 365 (No-Build)	365*ADT After (20% Reduction <sup>2</sup> )	Reduction Benefit	Wisconsin Annual VMT Savings	Total Annual VMT Savings	\$/Mile <sup>3</sup>	Cost Savings Undiscounted	Total VMT Benefits @ 7% Discount	
1	2018	3,102,500	2,482,000	620,500	279,225	328,500	262,800	65,700	66,357	345,582	0.545			
2	2019	3,133,525	2,506,820	626,705	282,017	331,785	265,428	66,357	67,021	349,038	0.545			
3	2020	3,164,860	2,531,888	632,972	284,837	335,103	268,082	67,021	67,691	352,528	0.545			
4	2021	3,196,509	2,557,207	639,302	287,686	338,454	270,763	67,691	68,368	356,053	0.545			
5	2022	3,228,474	2,582,779	645,695	290,563	341,838	273,471	68,368	69,051	359,614	0.545			
6	2023	3,260,759	2,608,607	652,152	293,468	345,257	276,205	69,051	69,742	363,210	0.545			
7	2024	3,293,366	2,634,693	658,673	296,403	348,709	278,967	69,742	70,439	366,842	0.545			
8	2025	3,326,300	2,661,040	665,260	299,367	352,196	281,757	70,439	71,144	370,511	0.545			
9	2026	3,359,563	2,687,650	671,913	302,361	355,718	284,575	71,144	71,855	374,216	0.545			
10	2027	3,393,159	2,714,527	678,632	305,384	359,276	287,420	71,855	72,574	377,958	0.545			
11	2028	3,427,090	2,741,672	685,418	308,438	362,868	290,295	72,574	73,299	381,738	0.545	\$ 208,046.95	\$ 98,841.61	
12	2029	3,461,361	2,769,089	692,272	311,522	366,497	293,198	73,299	74,032	385,555	0.545	\$ 210,127.42	\$ 93,299.09	
13	2030	3,495,975	2,796,780	699,195	314,638	370,162	296,130	74,032	74,773	389,410	0.545	\$ 212,228.69	\$ 88,067.36	
14	2031	3,530,934	2,824,748	706,187	317,784	373,864	299,091	74,773	75,520	393,305	0.545	\$ 214,350.98	\$ 83,129.01	
15	2032	3,566,244	2,852,995	713,249	320,962	377,602	302,082	75,520	76,276	397,238	0.545	\$ 216,494.49	\$ 78,467.57	
16	2033	3,601,906	2,881,525	720,381	324,172	381,378	305,103	76,276	77,038	401,210	0.545	\$ 218,659.44	\$ 74,067.52	
17	2034	3,637,925	2,910,340	727,585	327,413	385,192	308,154	77,038	77,809	405,222	0.545	\$ 220,846.03	\$ 69,914.20	
18	2035	3,674,304	2,939,444	734,861	330,687	389,044	311,235	77,809	78,587	409,274	0.545	\$ 223,054.49	\$ 65,993.78	
19	2036	3,711,048	2,968,838	742,210	333,994	392,934	314,348	78,587	79,373	413,367	0.545	\$ 225,285.04	\$ 62,293.19	
20	2037	3,748,158	2,998,526	749,632	337,334	396,864	317,491	79,373	80,166	417,501	0.545	\$ 227,537.89	\$ 58,800.11	
21	2038	3,785,640	3,028,512	757,128	340,708	400,832	320,666	80,166	80,968	421,676	0.545	\$ 229,813.26	\$ 55,502.91	
22	2039	3,823,496	3,058,797	764,699	344,115	404,841	323,873	80,968	81,778	425,892	0.545	\$ 232,111.40	\$ 52,390.60	
23	2040	3,861,731	3,089,385	772,346	347,556	408,889	327,111	81,778	82,596	430,151	0.545	\$ 234,432.51	\$ 49,452.81	
24	2041	3,900,348	3,120,279	780,070	351,031	412,978	330,382	82,596	83,422	434,453	0.545	\$ 236,776.84	\$ 46,679.75	
25	2042	3,939,352	3,151,481	787,870	354,542	417,108	333,686	83,422	84,256	438,797	0.545	\$ 239,144.60	\$ 44,062.20	
26	2043	3,978,745	3,182,996	795,749	358,087	421,279	337,023	84,256	85,098	443,185	0.545	\$ 241,536.05	\$ 41,591.42	
27	2044	4,018,533	3,214,826	803,707	361,668	425,492	340,393	85,098	85,949	447,617	0.545	\$ 243,951.41	\$ 39,259.19	
28	2045	4,058,718	3,246,974	811,744	365,285	429,747	343,797	85,949	86,809	452,093	0.545	\$ 246,390.93	\$ 37,057.74	
29	2046	4,099,305	3,279,444	819,861	368,937	434,044	347,235	86,809	87,677	456,614	0.545	\$ 248,854.83	\$ 34,979.74	
30	2047	4,140,298	3,312,239	828,060	372,627	438,385	350,708	87,677	88,554	461,181	0.545	\$ 251,343.38	\$ 33,018.26	
		VMT Savings along US 67/Cody Road (0.45 miles)				VMT Savings along Wisconsin Street (1.02 miles)							<b>\$ 4,580,986.63</b>	<b>\$ 1,206,868.03</b>

<sup>1</sup> Average Daily Traffic (ADT) values were averaged along both Wisconsin, Territorial, US 67/Cody Road with Iowa DOT AADT Maps. 1% annual increase in traffic was applied. (<http://www.iowadot.gov/maps/msp/traffic/2018/cities/LeClaire.pdf>).

<sup>2</sup> US DOT FHWA Road Diet case studies showed cases for "Complete Streets" programs with 18-29% volume reduction, as well as a case with 36% reduction. A conservative estimate of 20% reduction was estimated due to increased use of other modes of transportation. ([http://safety.fhwa.dot.gov/road\\_diets/case\\_studies/roaddiet\\_cs.pdf](http://safety.fhwa.dot.gov/road_diets/case_studies/roaddiet_cs.pdf)).

<sup>3</sup> The IRS 2018 Standard Mileage Rates were used for cost/mile. (<https://www.irs.gov/pub/irs-drop/n-18-03.pdf>).

Reduced ADT - Emission Reduction Benefits Table (2018 Dollars)

Project Year	Analysis Year	Total VMT Savings/Yr	CO2 (Metric Tons/Yr)	CO2 (\$/Metric Ton)	VOC (Metric Tons/Yr)	VOC (\$/Metric Ton)	NOx (Metric Tons/Yr)	NOx (\$/Metric Ton)	PM (Metric Tons/Yr)	PM (\$/Metric Ton)	SOx (Metric Tons/Yr)	SOx (\$/Metric Ton)	Undiscounted Total Non-CO2 Emissions	NPV CO2 at 7% Avg SCC	Total Emissions Benefits @ 7% Discount
1	2022	359,614	202.53		0.65		0.65		0.012		0.003				
2	2023	363,210	204.56		0.66		0.66		0.012		0.004				
3	2024	366,842	206.60		0.67		0.66		0.012		0.004				
4	2025	370,511	208.67		0.67		0.67		0.012		0.004				
5	2026	374,216	210.75		0.68		0.68		0.012		0.004				
6	2027	377,958	212.86		0.69		0.68		0.012		0.004				
7	2028	381,738	214.99	\$ 214.99	0.69	\$ 1,605.32	0.69	\$ 6,530.79	0.012	\$ 5,325.31	0.004	\$ 204.34	\$ 13,665.76	\$ 133.89	\$ 8,644.23
8	2029	385,555	217.14	\$ 217.14	0.70	\$ 1,621.38	0.70	\$ 6,596.10	0.013	\$ 5,378.56	0.004	\$ 206.39	\$ 13,802.42	\$ 126.38	\$ 8,159.51
9	2030	389,410	219.31	\$ 219.31	0.71	\$ 1,637.59	0.70	\$ 6,662.06	0.013	\$ 5,432.35	0.004	\$ 208.45	\$ 13,940.44	\$ 119.29	\$ 7,701.97
10	2031	393,305	221.51	\$ 221.51	0.72	\$ 1,653.97	0.71	\$ 6,728.68	0.013	\$ 5,486.67	0.004	\$ 210.53	\$ 14,079.85	\$ 112.60	\$ 7,270.08
11	2032	397,238	223.72	\$ 223.72	0.72	\$ 1,670.51	0.72	\$ 6,795.96	0.013	\$ 5,541.54	0.004	\$ 212.64	\$ 14,220.64	\$ 106.29	\$ 6,862.41
12	2033	401,210	225.96	\$ 225.96	0.73	\$ 1,687.21	0.72	\$ 6,863.92	0.013	\$ 5,596.95	0.004	\$ 214.77	\$ 14,362.85	\$ 100.33	\$ 6,477.61
13	2034	405,222	228.22	\$ 228.22	0.74	\$ 1,704.08	0.73	\$ 6,932.56	0.013	\$ 5,652.92	0.004	\$ 216.91	\$ 14,506.48	\$ 94.70	\$ 6,114.38
14	2035	409,274	230.50	\$ 461.00	0.74	\$ 1,721.12	0.74	\$ 7,001.89	0.013	\$ 5,709.45	0.004	\$ 219.08	\$ 14,651.54	\$ 178.78	\$ 5,860.90
15	2036	413,367	232.80	\$ 465.61	0.75	\$ 1,738.34	0.75	\$ 7,071.91	0.014	\$ 5,766.54	0.004	\$ 221.27	\$ 14,798.06	\$ 168.76	\$ 5,532.26
16	2037	417,501	235.13	\$ 470.26	0.76	\$ 1,755.72	0.75	\$ 7,142.63	0.014	\$ 5,824.21	0.004	\$ 223.49	\$ 14,946.04	\$ 159.29	\$ 5,222.04
17	2038	421,676	237.48	\$ 474.97	0.77	\$ 1,773.28	0.76	\$ 7,214.05	0.014	\$ 5,882.45	0.004	\$ 225.72	\$ 15,095.50	\$ 150.36	\$ 4,929.21
18	2039	425,892	239.86	\$ 479.72	0.77	\$ 1,791.01	0.77	\$ 7,286.19	0.014	\$ 5,941.28	0.004	\$ 227.98	\$ 15,246.46	\$ 141.93	\$ 4,652.81
19	2040	430,151	242.26	\$ 484.51	0.78	\$ 1,808.92	0.78	\$ 7,359.05	0.014	\$ 6,000.69	0.004	\$ 230.26	\$ 15,398.92	\$ 133.97	\$ 4,391.90
20	2041	434,453	244.68	\$ 489.36	0.79	\$ 1,827.01	0.78	\$ 7,432.65	0.014	\$ 6,060.70	0.004	\$ 232.56	\$ 15,552.91	\$ 126.46	\$ 4,145.63
21	2042	438,797	247.13	\$ 494.25	0.80	\$ 1,845.28	0.79	\$ 7,506.97	0.014	\$ 6,121.30	0.004	\$ 234.89	\$ 15,708.44	\$ 119.37	\$ 3,913.16
22	2043	443,185	249.60	\$ 499.20	0.81	\$ 1,863.73	0.80	\$ 7,582.04	0.014	\$ 6,182.52	0.004	\$ 237.24	\$ 15,865.52	\$ 112.67	\$ 3,693.73
23	2044	447,617	252.09	\$ 504.19	0.81	\$ 1,882.37	0.81	\$ 7,657.86	0.015	\$ 6,244.34	0.004	\$ 239.61	\$ 16,024.18	\$ 106.36	\$ 3,486.61
24	2045	452,093	254.61	\$ 509.23	0.82	\$ 1,901.19	0.82	\$ 7,734.44	0.015	\$ 6,306.78	0.004	\$ 242.00	\$ 16,184.42	\$ 100.39	\$ 3,291.10
25	2046	456,614	257.16	\$ 514.32	0.83	\$ 1,920.20	0.82	\$ 7,811.78	0.015	\$ 6,369.85	0.004	\$ 244.42	\$ 16,346.26	\$ 94.76	\$ 3,106.55
26	2047	461,181	259.73	\$ 519.46	0.84	\$ 1,939.41	0.83	\$ 7,889.90	0.015	\$ 6,433.55	0.004	\$ 246.87	\$ 16,509.73	\$ 89.45	\$ 2,932.35
<b>Totals</b>				<b>\$ 7,916.92</b>		<b>\$ 35,347.62</b>		<b>\$ 143,801.44</b>		<b>\$ 117,257.94</b>		<b>\$ 4,499.42</b>	<b>\$ 300,906.42</b>	<b>\$ 2,476.04</b>	<b>\$ 106,388.43</b>

### AIS Crash Data Conversion Calculations

NO-BUILD	No Injury		Possible Injury		Non-incapacitating		Incapacitating		Killed		Injured Severity Unknown		Property Damage Only		
	AIS Accident Scale	0	2018 \$ Value	0.8	2018 \$ Value	0.3	2018 \$ Value	0	2018 \$ Value	0.1	2018 \$ Value	0	2018 \$ Value	3.5	2018 \$ Value
0	0.00	\$ -	0.187496	\$ -	0.025041	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
1	0.00	\$ -	0.551568	\$ 15,885.16	0.230529	\$ 6,639.24	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
2	0.00	\$ -	0.051128	\$ 23,068.95	0.032694	\$ 14,751.53	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
3	0.00	\$ -	0.008568	\$ 8,636.54	0.009573	\$ 9,649.58	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
4	0.00	\$ -	0.001136	\$ 2,900.89	0.00186	\$ 4,749.70	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
5	0.00	\$ -	0.000104	\$ 592.05	0.000303	\$ 1,724.92	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
Fatality	0.00	\$ -	0.000000	\$ -	0.000000	\$ -	0.00	\$ -	0.100000	\$ 960,000.00	0.00	\$ -	N/A	N/A	
	<b>0.0</b>	<b>\$ -</b>	<b>0.8</b>	<b>\$ 51,083.60</b>	<b>0.3</b>	<b>\$ 37,514.97</b>	<b>0.0</b>	<b>\$ -</b>	<b>0.1</b>	<b>\$ 960,000.00</b>	<b>0.0</b>	<b>\$ -</b>	<b>3.5</b>	<b>\$ 15,400.00</b>	<b>\$ 1,063,998.56</b>

Notes: This case assumes that improvements are NOT built and crash/injury stays consistent with historical data given by Iowa Department of Transportation crash data from 2010-2019.

This table has converted available IDOT crash data (shown on a KABCO scale) into AIS Data in accordance to the U.S. DOT'S BUILD BENEFIT-COST ANALYSIS RESOURCE GUIDE. This table, provided by the National Highway Traffic Safety Administration (NHTSA), makes a conversion from available reported data into re-interpreted AIS data for apples-to-apples comparisons for the U.S. DOT.

Property Damage Only (PDO) - This is not originally part of the AIS conversion table, but has been added to this table to account for PDO damage costs. Monetary values for injury/pdo are given by U.S. DOT's BUILD BENEFIT-COST ANALYSIS GUIDE and amounts have been converted to 2018 dollars.

REDUCTION OF 40% <sup>1</sup>	No Injury		Possible Injury		Non-incapacitating		Incapacitating		Killed		Injured Severity Unknown		Property Damage Only		
	AIS Accident Scale	0	2018 \$ Value	0.32	2018 \$ Value	0.12	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	1.4	2018 \$ Value
0	0.00	\$ -	0.0749984	\$ -	0.010016	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
1	0.00	\$ -	0.2206272	\$ 6,354.06	0.092212	\$ 2,655.69	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
2	0.00	\$ -	0.0204512	\$ 9,227.58	0.013078	\$ 5,900.61	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
3	0.00	\$ -	0.0034272	\$ 3,454.62	0.003829	\$ 3,859.83	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
4	0.00	\$ -	0.0004544	\$ 1,160.36	0.000744	\$ 1,899.88	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
5	0.00	\$ -	0.0000416	\$ 236.82	0.000121	\$ 689.97	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
Fatality	0.00	\$ -	0.000000	\$ -	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
	<b>0.0</b>	<b>\$ -</b>	<b>0.32</b>	<b>\$ 20,433.44</b>	<b>0.12</b>	<b>\$ 15,005.99</b>	<b>0.00</b>	<b>\$ -</b>	<b>0.0</b>	<b>\$ -</b>	<b>0.00</b>	<b>\$ -</b>	<b>1.4</b>	<b>\$ 5,663.60</b>	<b>\$ 41,103.03</b>

<sup>1</sup> Assumption: US DOT FHWA Road Diet "Complete Street" case studies showed strong support for crash reduction as a result of the complete streets program. Most case studies found reductions between 20% and 70% for crash/injury incidents. A conservative estimate of 40% reduction was used for analysis of crash reduction due to improvements project and is strongly reinforced by "Road Diet" documentation. ([http://safety.fhwa.dot.gov/road\\_diets/case\\_studies/roaddiet\\_cs.pdf](http://safety.fhwa.dot.gov/road_diets/case_studies/roaddiet_cs.pdf))

Crash Reduction Benefits (2018 Dollars)

Crash Reduction Savings Benefits in 2018 Dollars			
Project Year	Analysis Year	Crash Reduction (40%)	Total Benefits @ 7% Discount
1	2021	\$ -	\$ -
2	2022	\$ -	\$ -
3	2023	\$ -	\$ -
4	2024	\$ -	\$ -
5	2025	\$ -	\$ -
6	2026	\$ -	\$ -
7	2027	\$ -	\$ -
8	2028	\$ 41,103.03	\$ 23,922.34
9	2029	\$ 41,103.03	\$ 22,357.32
10	2030	\$ 41,103.03	\$ 20,894.69
11	2031	\$ 41,103.03	\$ 19,527.75
12	2032	\$ 41,103.03	\$ 18,250.24
13	2033	\$ 41,103.03	\$ 17,056.30
14	2034	\$ 41,103.03	\$ 15,940.46
15	2035	\$ 41,103.03	\$ 14,897.63
16	2036	\$ 41,103.03	\$ 13,923.02
17	2037	\$ 41,103.03	\$ 13,012.17
18	2038	\$ 41,103.03	\$ 12,160.90
19	2039	\$ 41,103.03	\$ 11,365.33
20	2040	\$ 41,103.03	\$ 10,621.80
21	2041	\$ 41,103.03	\$ 9,926.92
22	2042	\$ 41,103.03	\$ 9,277.49
23	2043	\$ 41,103.03	\$ 8,670.56
24	2044	\$ 41,103.03	\$ 8,103.32
25	2045	\$ 41,103.03	\$ 7,573.20
26	2046	\$ 41,103.03	\$ 7,077.76
27	2047	\$ 41,103.03	\$ 6,614.73
<b>Totals</b>		<b>\$ 822,060.55</b>	<b>\$ 271,173.92</b>

### Costs Summary Table (2018 Dollars)

Cost Summary in Constant 2018 Dollars					
Project Year	Analysis Year	Cost of Improvements	Maintenance	Total Costs Undiscounted	NPV of Costs
		Capital Costs Undiscounted	O&M Costs Undiscounted		Total Costs @ 7% Discount
1	2018	\$ -	-	\$ -	\$ -
2	2019	\$ -	-	\$ -	\$ -
3	2020	\$ -	-	\$ -	\$ -
4	2021	\$ 1,000,000	\$ -	\$ 1,000,000	\$ 816,298
5	2022	\$ 1,682,489	\$ -	\$ 1,682,489	\$ 1,283,563
6	2023	\$ 6,365,801	\$ -	\$ 6,365,801	\$ 4,538,728
7	2024	\$ 4,415,801	\$ -	\$ 4,415,801	\$ 2,942,434
8	2025	\$ 8,915,755	\$ -	\$ 8,915,755	\$ 5,552,284
9	2026	\$ 6,960,022	\$ -	\$ 6,960,022	\$ 4,050,796
10	2027	\$ 1,800,000	\$ -	\$ 1,800,000	\$ 979,081
11	2028	\$ -	\$ -	\$ -	\$ -
12	2029	\$ -	\$ -	\$ -	\$ -
13	2030	\$ -	\$ -	\$ -	\$ -
14	2031	\$ -	\$ -	\$ -	\$ -
15	2032	\$ -	\$ -	\$ -	\$ -
16	2033	\$ -	\$ -	\$ -	\$ -
17	2034	\$ -	\$ -	\$ -	\$ -
18	2035	\$ -	\$ -	\$ -	\$ -
19	2036	\$ -	\$ -	\$ -	\$ -
20	2037	\$ -	\$ -	\$ -	\$ -
21	2038	\$ -	\$ -	\$ -	\$ -
22	2039	\$ -	\$ -	\$ -	\$ -
23	2040	\$ -	\$ -	\$ -	\$ -
24	2041	\$ -	\$ -	\$ -	\$ -
25	2042	\$ -	\$ -	\$ -	\$ -
26	2043	\$ -	\$ -	\$ -	\$ -
<b>Totals</b>		<b>\$ 31,139,868</b>	<b>\$ -</b>	<b>\$ 31,139,868</b>	<b>\$ 20,163,184</b>

Note: O&M costs savings due to improvements and not having a “no-build” situation would further increase benefits. An annual O&M savings was not used due to lack of available information on current cost of operations and maintenance on the roadways.