



BENEFIT-COST ANALYSIS



Prepared for City of East Moline, Illinois
Greater Downtown Revitalization Project
2020 BUILD Grant Application
May 15, 2020

Introduction

A Benefit-Cost Analysis (BCA) was performed for the City of East Moline’s “Greater Downtown 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 East Moline’s downtown and The Bend areas. 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”¹. 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 roadway areas. The baseline projections were then used to estimate the proposed scenario where improvements for 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 Consumers² 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 percent 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)³.

¹ 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.

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

³ 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>).



“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 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.”⁴

Evaluation Period

The evaluation period for the City of East Moline’s “Greater Downtown 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 2022-2024. Operations are assumed to begin in year 2025 and designed for 20-years of operations through 2044.

Results & Methodology

The analysis results in a positive return on investment for the 7 percent 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 \$35.0 million dollars over the evaluation period and include both capital costs and operations/maintenance costs. Total undiscounted benefits were \$546.7 million dollars over the 20-year period. Analysis yielded a benefit-cost ratio of 8.27 discounted at 7 percent. 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 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.

⁴ 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>).

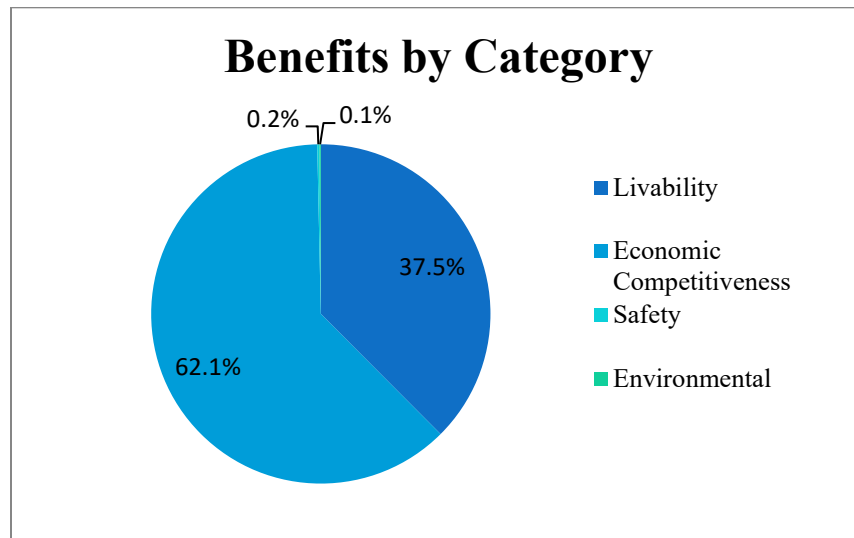


Benefit-Cost Summary in 2018 Dollars	
	7% Discount
Total Benefits	\$ 236,973,708
Total Costs	\$ 28,641,167
Benefit-Cost Ratio	8.27

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

Benefits Summary in Constant 2018 Dollars			
Type of Impact	Benefit	Undiscounted Benefit	Value @ 7% Discount
Livability	Increased Property Value	\$ 9,643,400	\$ 5,612,547
	New Properties - Values	\$ 195,515,000	\$ 85,516,963
Economic Competitiveness	Increased Business/Tourism	\$ 328,965,000	\$ 142,242,350
	Vehicle Operating Costs (VMT Reduction)	\$ 10,770,541	\$ 2,837,516
Safety	Crash Reduction	\$ 1,134,944	\$ 458,638
Environmental	Reduced Emissions	\$ 713,875	\$ 305,695
Total Benefits		\$ 546,742,760	\$ 236,973,708

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 East Moline.

Increased Property Value

Improved roadway/pedestrian-based infrastructure along East Moline’s Downtown and The Bend areas is likely to increase property value in both areas. The proposed implementation of “Complete Streets” along downtown 15th Avenue, Bend Boulevard, and 12th Avenue will make these areas more accessible for people on foot or bicycling. 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 Streets” type projects (added trees, bike paths, sidewalks, green spaces, increased walkability, etc.)⁵. A conservative estimate of 5 percent 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 The Bend property value in East Moline. An existing property value of \$96.4 million in the downtown area and The Bend was obtained from correspondence with the City of East Moline.

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 percent increase in downtown and The Bend properties. The increased property value benefit was considered a one-time "stock" benefit applied in 2025 (first year post-construction) in this analysis and led to a total undiscounted benefit of \$9,643,400. Property value benefits of \$5.61 million was calculated for the 7 percent discount.

Also, the project will bring new commercial buildings for retail, office, music venues, mid- to large-size events, hotels, and restaurants to the downtown and The Bend once improved. Average increases to property values were determined based on average values per square foot of new development/rehabilitation by type of property on an annual basis, multiplied by a 10-year development period. Estimated property values by square-foot were obtained through information from multiple organizations: REDEEM, area developers in the project area, East Moline SSA, East Moline Main Street, and the City of East Moline. Values were based on increased valuations from recent improvements completed on properties contained within the project area. The 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 \$85.5 million was calculated for the 7 percent discount. Pages 16 and 17 of this appendix contain tables for estimated value increases by property location and total new property value benefits.

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



Increased Spending (Business/Tourism)

Improved transportation infrastructure is seen as a way to improve economic development in the City of East Moline. Multi-modal “Complete Streets” improvements are estimated to increase visitor spending by \$16.4 million (undiscounted 2018 dollars) annually. For this analysis, the \$16.4 million was assumed to stay constant over the 20-year post-construction period and applied at a discount of 7 percent. Total benefits from increased spending were calculated to be \$142.2 million for a 7 percent discount. In this case, the “no-build” scenario assumes that no annual increase is seen during the evaluation period.

2025 Proposed Additional Visitors to City of East Moline Project Area				
Event	Additional Attendance per Event	Estimated # of Days	Economic Impact	Notes
Music at Runners Park Downtown	100	15	\$126,000	extra 100 people per event; day trip
Mercado on Main Street	250	21	\$441,000	expanding from 3 Sundays to every Sunday; day trip
Freedom Fest	500	1	\$42,000	day trip
Cinco de Mayo	600	1	\$50,400	day trip
Firecracker Run/July 4th	1000	1	\$84,000	day trip
Rock Island County Fair Talent Show	150	1	\$12,600	day trip
Downtown Pub Crawl	300	2	\$50,400	New event beginning 2021; day trip
Shop Small (partnered with City of Silvis)	200	1	\$16,800	day trip
Downtown Halloween	200	1	\$16,800	day trip
Downtown Christmas Event	500	1	\$42,000	day trip
Murphy Park in the Bend (music)	200	30	\$504,000	day trip
The Rust Belt music events	500	36	\$2,016,000	overnight
Freedom Run	300	1	\$25,200	day trip
Labor Day Parade	500	1	\$42,000	day trip
Mecum Auctions	4000	36	\$12,096,000	New event beginning 2021; day trip
Shopping/Dining	200	52	\$873,600	day trip
Riverfront Bicycle Trail	75	0.5	\$3,150	additional daily use, including residents; day trip
East Moline Farmers Market	150	0.5	\$6,300	Relocating to downtown from Kennedy Square; day trip
Total	9,725		\$16,448,250	



Additional visitors to the East Moline Greater Downtown Area are estimated at 9,725 and are based on larger event attendance, attendance to new events, and auxiliary increased business. The following table shows projections on additional visitors.

In the calculated spending increase estimate, it is assumed that the additional attendance spent an average amount of dollars based on visit type per visitor and was multiplied by the estimated number of days spent in the community. Estimated dollars spent by trip type was made available through Visit Quad Cities. Projections were obtained from aggregate data provided through REDEEM and The Bend and The Rust Belt developments. Appendix D – Page 9 shows calculated present value benefits for increased spending.

Visit Quad Cities Estimated Sales Values Per Person	
Day Trip	\$ 84
Overnight	\$ 112
Sporting event	\$ 150
Meeting/Convention	\$ 184

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 12th Avenue and Downtown 15th Avenue. 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 percent volume reduction⁶, as well as a case with 36 percent reduction. A value of 20 percent decrease for the proposed improvements project in East Moline is considered conservative. The 20 percent reduction is based on the assumption that 20 percent 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 2015 IDOT AADT mapping and averaged 7512 vehicles/day in the project area along 12th Avenue and 1056 vehicles/day along downtown 15th Avenue. 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 percent per year over the project period. The reduction benefit of 20 percent of the current “no-build” rates was used. This benefit of vehicles/year was then multiplied by the distances of 12th Avenue and 15th Avenue within the project corridor to get VMT

⁶ "Case Studies - Safety | Federal Highway Administration." Case Studies - Safety | Federal Highway Administration. (http://safety.fhwa.dot.gov/road_diets/case_studies/).



reductions. Total distance in this area is 2.14 miles and was considered the total trip length. These reductions were multiplied by the IRS 2018 Standard Mileage Rates⁷ used for cost/mile (\$0.545/mile) to create the VOC savings.

An undiscounted VOC benefit savings of \$10.77 million was calculated, while present benefit values of \$2.84 million was calculated for the 7 percent discount. The detailed VOC cost savings table is shown in Appendix D – Page 11.

Reduced ADT also create emission reductions in the project area. Emission rates were analyzed at the current speed limit of 25 MPH for 15th Avenue downtown and 35 MPH for 12th Avenue. The speeds are assumed to stay the same with the improvement projects. 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 ICAAP emissions tables⁸. ICAAP emissions tables as calculated by the Iowa DOT were used for emissions calculations as East Moline is a part of the bi-state Davenport designated Urban Area and would share similar ridership and driving style to this area than to larger Illinois cities.

Monetary Values of Emissions			
	Emission Rate at 25 MPH ¹ (gram/ VMT)	Emission Rate at 35 MPH ¹ (gram/ VMT)	\$ / Metric Ton (2018 Dollars)
CO2 (2017-2034)	563.19	563.19	\$1 ²
CO2 (2035-2050)	563.19	563.19	\$2 ²
VOC	1.818	1.625	\$ 2,313.15
NOx	1.806	1.903	\$ 9,472.90
PM	0.0327	0.0327	\$ 426,610.95
SOx	0.0097	0.0096	\$ 55,185.15

¹Source: ICAAP emissions tables

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

Present benefit values for emissions totaled \$0.31 million was calculated at the 7 percent 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 percent 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”

⁷ "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>).

⁸ Source: Iowa DOT, ICAAP emissions tables (http://www.iowadot.gov/systems_planning/icaap.htm).



case studies showed strong reinforcement of crash reduction as a result of complete streets programs. Most studies found between 20 percent and 70 percent reduction for crash/injury incidents⁹. A conservative estimate of 40 percent 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 Illinois DOT. Through provided historical data of crashes from the past 4 years along 12th Avenue and 15th Avenue, data was used to create average incidents per year for baseline projections. The table below shows Illinois DOT data.

2015-2019 Crash Injury Summary		
Crash Type	Incidents	Avg. Incidents/Yr
Unknown	0	0
Possible Injury/Unknown	8	2
Minor Injury	0	0
Major Injury	0	0
Fatal	0	0
Total Injury	8	2
Property Damage Only (PDO)	90	22.5

For the improvement scenario, the average incidents/year was calculated by multiplying 40 percent to the incidents/year values in the crash data 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” comparison. The AIS scale conversion table is on Page 12 of this Appendix. Annual cost reduction benefits of approximately \$56,747 were calculated and used for the 20-year post construction period. An undiscounted accident cost savings of \$1.13 million was calculated, while a present benefit value of \$0.46 million was calculated for a 7 percent discount. The detailed crash reduction benefits table is shown in Appendix D – Page 13.

⁹ "Case Studies - Safety | Federal Highway Administration." Case Studies - Safety | Federal Highway Administration. (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	\$ 16,448,250.00	\$ 12,548,291.17
5	2026	\$ 16,448,250.00	\$ 11,727,374.93
6	2027	\$ 16,448,250.00	\$ 10,960,163.48
7	2028	\$ 16,448,250.00	\$ 10,243,143.44
8	2029	\$ 16,448,250.00	\$ 9,573,031.25
9	2030	\$ 16,448,250.00	\$ 8,946,758.18
10	2031	\$ 16,448,250.00	\$ 8,361,456.24
11	2032	\$ 16,448,250.00	\$ 7,814,445.09
12	2033	\$ 16,448,250.00	\$ 7,303,219.71
13	2034	\$ 16,448,250.00	\$ 6,825,438.98
14	2035	\$ 16,448,250.00	\$ 6,378,914.93
15	2036	\$ 16,448,250.00	\$ 5,961,602.74
16	2037	\$ 16,448,250.00	\$ 5,571,591.35
17	2038	\$ 16,448,250.00	\$ 5,207,094.72
18	2039	\$ 16,448,250.00	\$ 4,866,443.66
19	2040	\$ 16,448,250.00	\$ 4,548,078.19
20	2041	\$ 16,448,250.00	\$ 4,250,540.36
21	2042	\$ 16,448,250.00	\$ 3,972,467.63
22	2043	\$ 16,448,250.00	\$ 3,712,586.57
23	2044	\$ 16,448,250.00	\$ 3,469,707.07
Totals		\$ 328,965,000.00	\$ 142,242,349.71



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

Project Year	Analysis Year	ADT ¹ x 365 (No-Build)	365*ADT After (20% Reduction ²)	Reduction Benefit	12th Ave Annual VMT Savings	ADT ¹ x 365 (No-Build)	365*ADT After (20% Reduction ²)	Reduction Benefit	15th Ave Annual VMT Savings	Total Annual VMT Savings	\$/Mile ³	Cost Savings Undiscounted	Total VMT Benefits @ 7% Discount
1	2015	2,741,880				385,440							
2	2016	2,769,299	2,193,504	548,376	762,243	389,294	311,436	77,859	58,394	820,637	0.545		
3	2017	2,796,992	2,215,439	553,860	769,865	393,187	314,550	78,637	58,978	828,843	0.545		
4	2018	2,824,962	2,237,593	559,398	777,564	397,119	317,695	79,424	59,568	837,132	0.545		
5	2019	2,853,211	2,259,969	564,992	785,339	401,090	320,872	80,218	60,164	845,503	0.545		
6	2020	2,881,743	2,282,569	570,642	793,193	405,101	324,081	81,020	60,765	853,958	0.545		
7	2021	2,910,561	2,305,395	576,349	801,125	409,152	327,322	81,830	61,373	862,498	0.545		
8	2022	2,939,666	2,328,449	582,112	809,136	413,244	330,595	82,649	61,987	871,122	0.545		
9	2023	2,969,063	2,351,733	587,933	817,227	417,376	333,901	83,475	62,606	879,834	0.545		
10	2024	2,998,754	2,375,251	593,813	825,400	421,550	337,240	84,310	63,233	888,632	0.545		
11	2025	3,028,741	2,399,003	599,751	833,654	425,766	340,612	85,153	63,865	897,518	0.545	\$ 489,147.52	\$ 232,390.46
12	2026	3,059,029	2,422,993	605,748	841,990	430,023	344,019	86,005	64,503	906,494	0.545	\$ 494,038.99	\$ 219,359.22
13	2027	3,089,619	2,447,223	611,806	850,410	434,323	347,459	86,865	65,149	915,559	0.545	\$ 498,979.38	\$ 207,058.70
14	2028	3,120,515	2,471,695	617,924	858,914	438,667	350,933	87,733	65,800	924,714	0.545	\$ 503,969.18	\$ 195,447.94
15	2029	3,151,720	2,496,412	624,103	867,503	443,053	354,443	88,611	66,458	933,961	0.545	\$ 509,008.87	\$ 184,488.24
16	2030	3,183,238	2,521,376	630,344	876,178	447,484	357,987	89,497	67,123	943,301	0.545	\$ 514,098.96	\$ 174,143.10
17	2031	3,215,070	2,546,590	636,648	884,940	451,959	361,567	90,392	67,794	952,734	0.545	\$ 519,239.95	\$ 164,378.07
18	2032	3,247,221	2,572,056	643,014	893,789	456,478	365,183	91,296	68,472	962,261	0.545	\$ 524,432.35	\$ 155,160.61
19	2033	3,279,693	2,597,777	649,444	902,727	461,043	368,834	92,209	69,156	971,884	0.545	\$ 529,676.67	\$ 146,460.01
20	2034	3,312,490	2,623,754	655,939	911,755	465,654	372,523	93,131	69,848	981,603	0.545	\$ 534,973.44	\$ 138,247.30
21	2035	3,345,615	2,649,992	662,498	920,872	470,310	376,248	94,062	70,547	991,419	0.545	\$ 540,323.17	\$ 130,495.12
22	2036	3,379,071	2,676,492	669,123	930,081	475,013	380,011	95,003	71,252	1,001,333	0.545	\$ 545,726.40	\$ 123,177.63
23	2037	3,412,862	2,703,257	675,814	939,382	479,763	383,811	95,953	71,964	1,011,346	0.545	\$ 551,183.67	\$ 116,270.48
24	2038	3,446,990	2,730,289	682,572	948,776	484,561	387,649	96,912	72,684	1,021,460	0.545	\$ 556,695.50	\$ 109,750.64
25	2039	3,481,460	2,757,592	689,398	958,263	489,407	391,525	97,881	73,411	1,031,674	0.545	\$ 562,262.46	\$ 103,596.40
26	2040	3,516,275	2,785,168	696,292	967,846	494,301	395,440	98,860	74,145	1,041,991	0.545	\$ 567,885.08	\$ 97,787.25
27	2041	3,551,437	2,813,020	703,255	977,524	499,244	399,395	99,849	74,887	1,052,411	0.545	\$ 573,563.93	\$ 92,303.85
28	2042	3,586,952	2,841,150	710,287	987,300	504,236	403,389	100,847	75,635	1,062,935	0.545	\$ 579,299.57	\$ 87,127.94
29	2043	3,622,821	2,869,561	717,390	997,173	509,278	407,423	101,856	76,392	1,073,564	0.545	\$ 585,092.57	\$ 82,242.26
30	2044	3,659,049	2,898,257	724,564	1,007,144	514,371	411,497	102,874	77,156	1,084,300	0.545	\$ 590,943.50	\$ 77,630.54
VMT Savings along 12th Avenue (1.39 miles)					VMT Savings along 15th Avenue (0.75 miles)							\$ 10,770,541.16	\$ 2,837,515.77

¹ Average Daily Traffic (ADT) values were averaged along both 12th Avenue and 15th Avenue with Illinois DOT AADT Maps. 1% annual increase in traffic was applied.

(<http://www.gettingaroundillinois.com/gai.htm?mt=aadt>).

² 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).

³ 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 @ 25 MPH	Total VMT Savings/Yr @ 35 MPH	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	61,987	809,136	490.61		1.58		1.57		0.028		0.008				
2	2023	62,606	817,227	495.51		1.60		1.59		0.029		0.009				
3	2024	63,233	825,400	500.47		1.62		1.60		0.029		0.009				
4	2025	63,865	833,654	505.47	\$ 505.47	1.63	\$ 3,774.34	1.62	\$ 15,354.80	0.029	\$ 12,520.54	0.009	\$ 480.44	\$ 32,130.12	\$ 385.62	\$ 24,897.53
5	2026	64,503	841,990	510.53	\$ 510.53	1.65	\$ 3,812.08	1.64	\$ 15,508.34	0.030	\$ 12,645.75	0.009	\$ 485.24	\$ 32,451.42	\$ 364.00	\$ 23,501.41
6	2027	65,149	850,410	515.63	\$ 515.63	1.66	\$ 3,850.20	1.65	\$ 15,663.43	0.030	\$ 12,772.20	0.009	\$ 490.09	\$ 32,775.93	\$ 343.59	\$ 22,183.57
7	2028	65,800	858,914	520.79	\$ 520.79	1.68	\$ 3,888.71	1.67	\$ 15,820.06	0.030	\$ 12,899.93	0.009	\$ 495.00	\$ 33,103.69	\$ 324.32	\$ 20,939.64
8	2029	66,458	867,503	526.00	\$ 526.00	1.70	\$ 3,927.59	1.69	\$ 15,978.26	0.031	\$ 13,028.93	0.009	\$ 499.95	\$ 33,434.73	\$ 306.14	\$ 19,765.45
9	2030	67,123	876,178	531.26	\$ 531.26	1.71	\$ 3,966.87	1.70	\$ 16,138.04	0.031	\$ 13,159.21	0.009	\$ 504.95	\$ 33,769.07	\$ 288.97	\$ 18,657.11
10	2031	67,794	884,940	536.57	\$ 536.57	1.73	\$ 4,006.54	1.72	\$ 16,299.43	0.031	\$ 13,290.81	0.009	\$ 509.99	\$ 34,106.76	\$ 272.77	\$ 17,610.91
11	2032	68,472	893,789	541.94	\$ 541.94	1.75	\$ 4,046.60	1.74	\$ 16,462.42	0.031	\$ 13,423.71	0.009	\$ 515.09	\$ 34,447.83	\$ 257.47	\$ 16,623.39
12	2033	69,156	902,727	547.36	\$ 547.36	1.77	\$ 4,087.07	1.76	\$ 16,627.04	0.032	\$ 13,557.95	0.009	\$ 520.25	\$ 34,792.31	\$ 243.03	\$ 15,691.23
13	2034	69,848	911,755	552.83	\$ 552.83	1.78	\$ 4,127.94	1.77	\$ 16,793.31	0.032	\$ 13,693.53	0.010	\$ 525.45	\$ 35,140.23	\$ 229.40	\$ 14,811.35
14	2035	70,547	920,872	558.36	\$ 1,116.71	1.80	\$ 4,169.22	1.79	\$ 16,961.25	0.032	\$ 13,830.47	0.010	\$ 530.70	\$ 35,491.64	\$ 433.08	\$ 14,197.35
15	2036	71,252	930,081	563.94	\$ 1,127.88	1.82	\$ 4,210.91	1.81	\$ 17,130.86	0.033	\$ 13,968.77	0.010	\$ 536.01	\$ 35,846.55	\$ 408.80	\$ 13,401.24
16	2037	71,964	939,382	569.58	\$ 1,139.16	1.84	\$ 4,253.02	1.83	\$ 17,302.17	0.033	\$ 14,108.46	0.010	\$ 541.37	\$ 36,205.02	\$ 385.87	\$ 12,649.77
17	2038	72,684	948,776	575.28	\$ 1,150.55	1.86	\$ 4,295.55	1.84	\$ 17,475.19	0.033	\$ 14,249.54	0.010	\$ 546.78	\$ 36,567.07	\$ 364.24	\$ 11,940.43
18	2039	73,411	958,263	581.03	\$ 1,162.06	1.88	\$ 4,338.51	1.86	\$ 17,649.94	0.034	\$ 14,392.04	0.010	\$ 552.25	\$ 36,932.74	\$ 343.81	\$ 11,270.88
19	2040	74,145	967,846	586.84	\$ 1,173.68	1.89	\$ 4,381.89	1.88	\$ 17,826.44	0.034	\$ 14,535.96	0.010	\$ 557.77	\$ 37,302.07	\$ 324.53	\$ 10,638.86
20	2041	74,887	977,524	592.71	\$ 1,185.41	1.91	\$ 4,425.71	1.90	\$ 18,004.71	0.034	\$ 14,681.32	0.010	\$ 563.35	\$ 37,675.09	\$ 306.33	\$ 10,042.29
21	2042	75,635	987,300	598.63	\$ 1,197.27	1.93	\$ 4,469.97	1.92	\$ 18,184.75	0.035	\$ 14,828.13	0.010	\$ 568.98	\$ 38,051.84	\$ 289.16	\$ 9,479.17
22	2043	76,392	997,173	604.62	\$ 1,209.24	1.95	\$ 4,514.67	1.94	\$ 18,366.60	0.035	\$ 14,976.41	0.010	\$ 574.67	\$ 38,432.36	\$ 272.94	\$ 8,947.63
23	2044	77,156	1,007,144	610.67	\$ 1,221.33	1.97	\$ 4,559.81	1.96	\$ 18,550.27	0.035	\$ 15,126.18	0.011	\$ 580.42	\$ 38,816.68	\$ 257.64	\$ 8,445.89
Totals					\$ 16,971.67		\$ 83,107.21		\$ 338,097.31		\$ 275,689.85		\$ 10,578.77	\$ 707,473.14	\$ 6,401.70	\$ 305,695.12



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	2	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	22.5	2018 \$ Value	
0	0.000000	\$ -	0.46874	\$ -	0.0000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
1	0.000000	\$ -	1.37892	\$ 39,712.90	0.0000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
2	0.000000	\$ -	0.12782	\$ 57,672.38	0.0000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
3	0.000000	\$ -	0.02142	\$ 21,591.36	0.0000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
4	0.000000	\$ -	0.00284	\$ 7,252.22	0.0000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
5	0.000000	\$ -	0.00026	\$ 1,480.13	0.0000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
Fatality	0.000000	\$ -	0.000000	\$ -	0.0000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
	0.0	\$ -	2.0	\$ 27,708.99	0.0	\$ -	0.0	\$ -	0.0	\$ -	0.0	\$ -	3.5	\$ 15,400.00	\$ 143,108.99

Notes: This case assumes that improvements are NOT built and crash/injury stays consistent with historical data given by Illinois Department of Transportation crash data from 2015-2019.

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% ¹		No Injury		Possible Injury		Incapacitating		Killed		Injured Severity Unknown		Property Damage Only			
AIS Accident Scale	0	2018 \$ Value	0.8	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	0	2018 \$ Value	9	2018 \$ Value	
0	0.000000	\$ -	0.187496	\$ -	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
1	0.000000	\$ -	0.551568	\$ 15,885.16	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
2	0.000000	\$ -	0.051128	\$ 23,068.95	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
3	0.000000	\$ -	0.008568	\$ 8,636.54	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
4	0.000000	\$ -	0.001136	\$ 2,900.89	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
5	0.000000	\$ -	0.000104	\$ 592.05	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
Fatality	0.000000	\$ -	0.000000	\$ -	0.000000	\$ -	0.00	\$ -	0.000000	\$ -	0.00	\$ -	N/A	N/A	
	0.0	\$ -	0.8	\$ 51,083.60	0.00	\$ -	0.00	\$ -	0.0	\$ -	0.00	\$ -	1.4	\$ 5,663.60	\$ 56,747.20

¹ 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)



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	\$ 56,747.20	\$ 40,459.97
6	2026	\$ 56,747.20	\$ 37,813.05
7	2027	\$ 56,747.20	\$ 35,339.30
8	2028	\$ 56,747.20	\$ 33,027.39
9	2029	\$ 56,747.20	\$ 30,866.72
10	2030	\$ 56,747.20	\$ 28,847.40
11	2031	\$ 56,747.20	\$ 26,960.19
12	2032	\$ 56,747.20	\$ 25,196.43
13	2033	\$ 56,747.20	\$ 23,548.07
14	2034	\$ 56,747.20	\$ 22,007.54
15	2035	\$ 56,747.20	\$ 20,567.80
16	2036	\$ 56,747.20	\$ 19,222.24
17	2037	\$ 56,747.20	\$ 17,964.71
18	2038	\$ 56,747.20	\$ 16,789.45
19	2039	\$ 56,747.20	\$ 15,691.07
20	2040	\$ 56,747.20	\$ 14,664.55
21	2041	\$ 56,747.20	\$ 13,705.19
22	2042	\$ 56,747.20	\$ 12,808.59
23	2043	\$ 56,747.20	\$ 11,970.64
24	2044	\$ 56,747.20	\$ 11,187.52
Totals		\$ 1,134,943.98	\$ 458,637.83



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	\$ 10,000,000.00	\$ -	\$ 10,000,000.00	\$ 9,345,794.39
2	2019	\$ 1,687,000.00	\$ -	\$ 1,687,000.00	\$ 1,473,491.13
3	2020	\$ -	\$ -	\$ -	\$ -
4	2021	\$ -	\$ -	\$ -	\$ -
5	2022	\$ 8,324,714.00	\$ -	\$ 8,324,714	\$ 6,350,884
6	2023	\$ 10,101,018.00	\$ -	\$ 10,101,018	\$ 7,201,886
7	2024	\$ 6,406,784.00	\$ -	\$ 6,406,784	\$ 4,269,111
8	2025	\$ -	\$ -	\$ -	\$ -
9	2026	\$ -	\$ -	\$ -	\$ -
10	2027	\$ -	\$ -	\$ -	\$ -
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	\$ -	\$ -	\$ -	\$ -
Totals		\$ 36,519,516	\$ -	\$ 36,519,516	\$ 28,641,167

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.



Average New Property Value Table (2018 Dollars)

New Commercial/Residential Properties	Square Feet	Value/Square Foot	Increased Property Value	Increased Average Increased Property Value (10yr)
THE BEND				
Hotel	80,000.00	\$ 300.00	\$ 24,000,000.00	\$ 2,400,000.00
Healthcare Clinic	7,000.00	\$ 325.00	\$ 2,275,000.00	\$ 227,500.00
Bank	6,000.00	\$ 350.00	\$ 2,100,000.00	\$ 210,000.00
Pharmacy	15,000.00	\$ 250.00	\$ 3,750,000.00	\$ 375,000.00
Retail	11,000.00	\$ 250.00	\$ 2,750,000.00	\$ 275,000.00
Restaurant	7,000.00	\$ 275.00	\$ 1,925,000.00	\$ 192,500.00
Restaurant	7,000.00	\$ 275.00	\$ 1,925,000.00	\$ 192,500.00
Retail	11,000.00	\$ 250.00	\$ 2,750,000.00	\$ 275,000.00
Apartment Complex 100 units	83,000.00	\$ 150.00	\$ 12,450,000.00	\$ 1,245,000.00
Apartment Complex 100 units	83,000.00	\$ 150.00	\$ 12,450,000.00	\$ 1,245,000.00
Grocery Store	74,000.00	\$ 225.00	\$ 16,650,000.00	\$ 1,665,000.00
Office Building	45,000.00	\$ 300.00	\$ 13,500,000.00	\$ 1,350,000.00
Office Building	45,000.00	\$ 300.00	\$ 13,500,000.00	\$ 1,350,000.00
Office Building	45,000.00	\$ 300.00	\$ 13,500,000.00	\$ 1,350,000.00
Condo	30,000.00	\$ 150.00	\$ 4,500,000.00	\$ 450,000.00
Condo	30,000.00	\$ 150.00	\$ 4,500,000.00	\$ 450,000.00
Condo	30,000.00	\$ 150.00	\$ 4,500,000.00	\$ 450,000.00
Retail/Bar	8,000.00	\$ 275.00	\$ 2,200,000.00	\$ 220,000.00
THE QUARTER				
Townhomes	49,400.00	\$ 100.00	\$ 4,940,000.00	\$ 494,000.00
Townhomes	26,600.00	\$ 100.00	\$ 2,660,000.00	\$ 266,000.00
Townhomes	30,400.00	\$ 100.00	\$ 3,040,000.00	\$ 304,000.00
Trailer Park Condos	45,000.00	\$ 125.00	\$ 5,625,000.00	\$ 562,500.00
Trailer Park Condos	45,000.00	\$ 125.00	\$ 5,625,000.00	\$ 562,500.00

New Commercial/Residential Properties	Square Feet	Value/Square Foot	Increased Property Value	Increased Average Increased Property Value (10yr)
DOWNTOWN 15TH AVE				
Retail	4,000.00	\$ 250.00	\$ 1,000,000.00	\$ 100,000.00
Retail	4,000.00	\$ 250.00	\$ 1,000,000.00	\$ 100,000.00
Retail	4,000.00	\$ 250.00	\$ 1,000,000.00	\$ 100,000.00
Retail	4,000.00	\$ 250.00	\$ 1,000,000.00	\$ 100,000.00
Retail	4,000.00	\$ 250.00	\$ 1,000,000.00	\$ 100,000.00
Retail	4,500.00	\$ 250.00	\$ 1,125,000.00	\$ 112,500.00
Retail	4,500.00	\$ 250.00	\$ 1,125,000.00	\$ 112,500.00
Retail	4,000.00	\$ 250.00	\$ 1,000,000.00	\$ 100,000.00
Office Building	5,000.00	\$ 300.00	\$ 1,500,000.00	\$ 150,000.00
Office Building	5,000.00	\$ 300.00	\$ 1,500,000.00	\$ 150,000.00
Office Building	6,000.00	\$ 300.00	\$ 1,800,000.00	\$ 180,000.00
Office Building	6,000.00	\$ 300.00	\$ 1,800,000.00	\$ 180,000.00
Restaurant	6,000.00	\$ 275.00	\$ 1,650,000.00	\$ 165,000.00
Restaurant	6,000.00	\$ 275.00	\$ 1,650,000.00	\$ 165,000.00
Restaurant	6,000.00	\$ 275.00	\$ 1,650,000.00	\$ 165,000.00
Restaurant	6,000.00	\$ 275.00	\$ 1,650,000.00	\$ 165,000.00
Apartment Complex 8 units	7,200.00	\$ 175.00	\$ 1,260,000.00	\$ 126,000.00
Apartment Complex 8 units	7,200.00	\$ 175.00	\$ 1,260,000.00	\$ 126,000.00
Apartment Complex 12 units	10,800.00	\$ 175.00	\$ 1,890,000.00	\$ 189,000.00
Apartment Complex 12 units	14,400.00	\$ 175.00	\$ 2,520,000.00	\$ 252,000.00
Apartment Complex 16 units	14,400.00	\$ 175.00	\$ 2,520,000.00	\$ 252,000.00
Apartment Complex 20 units	20,000.00	\$ 175.00	\$ 3,500,000.00	\$ 350,000.00
Converted from 2019 values to 2018 dollar values:			\$ 195,515,000.00	\$ 16,111,500.00



Total New Property Benefits Table (2018 Dollars)

Total New Commercial/Residential Property Value Benefits			
Project Year	Analysis Year	Property Protection (2018 Dollars)	Total Benefits @ 7% Discount
1	2018	\$ -	\$ -
2	2019	\$ -	\$ -
3	2020	\$ -	\$ -
4	2021	\$ -	\$ -
5	2022	\$ -	\$ -
6	2023	\$ -	\$ -
7	2024	\$ -	\$ -
8	2025	\$ 16,111,500.00	\$ 9,377,039.69
9	2026	\$ 16,111,500.00	\$ 8,763,588.49
10	2027	\$ 16,111,500.00	\$ 8,190,269.62
11	2028	\$ 16,111,500.00	\$ 7,654,457.59
12	2029	\$ 16,111,500.00	\$ 7,153,698.68
13	2030	\$ 16,111,500.00	\$ 6,685,699.70
14	2031	\$ 16,111,500.00	\$ 6,248,317.48
15	2032	\$ 16,111,500.00	\$ 5,839,549.05
16	2033	\$ 16,111,500.00	\$ 5,457,522.47
17	2034	\$ 16,111,500.00	\$ 5,100,488.29
18	2035	\$ -	\$ -
19	2036	\$ -	\$ -
20	2037	\$ -	\$ -
21	2038	\$ -	\$ -
22	2039	\$ -	\$ -
23	2040	\$ -	\$ -
24	2041	\$ -	\$ -
25	2042	\$ -	\$ -
26	2043	\$ -	\$ -
Totals		\$ 161,115,000.00	\$ 70,470,631.06

