Benefit Cost Narrative

Bridging the Gap: Multimodal Connections over the Oklahoma River

Oklahoma Department of Transportation

RAISE Grant Application

February 28, 2024

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Executive Summary

This Benefit Cost Analysis (BCA) supports Oklahoma Department of Transportation's (ODOT's) Fiscal Year (FY) 2024 RAISE Grant application to construct a new free-standing "shared use" multimodal bridge (the Project) that will be adjacent to the proposed new I-35 vehicular bridge.

The new multimodal bridge and enhancements to existing bike-ped trails along the Oklahoma River will provide multimodal access to nearby disadvantaged populations, while providing much enhanced access to the full regional bike and ped network. It will provide a much needed and currently absent downtown river crossing for active transportation users.

Project benefits accrue to active transportation users (cyclists, moped and scooter users, and pedestrians). Benefits monetized in the BCA specifically include travel time savings for existing bike and pedestrian commuters, as well as mortality reduction benefits for induced bike and pedestrian recreational users who will modestly increase their rate of use because of the new river crossing. These benefits reflect populations within a one-mile radius of the bridge.

There is a relatively small discounted residual value counted as benefit as the new bridge is expected to have at least a fifty-year service life, leaving 40 percent of the initial construction cost as a residual value at the end of the thirty-year period of analysis.

Results: The Project yields an overall Benefit-Cost Ratio (BCR) of 0.96, rounding to 1.0 (**Table 4**).

Overview

This BCA has been conducted following the USDOT's 2024 Updated Benefit-Cost Analysis Guidance for Discretionary Grant Programs (December 2023.) The following general parameters and assumptions were used in the BCA:

- A real discount rate of 3.1 percent is applied to all costs and benefits except for carbon emissions reductions, which are discounted at 2.0 percent.
- Pre-construction activities have been underway and will continue through 2028. Construction is assumed to commence in 2029 and end in 2031 with operation commencing in 2032.
- In addition to the construction period, the analysis covers a 30-year period of operation for new fixed infrastructure, extending through 2061.
- All costs and benefits are in 2022 constant dollars.
- The year 2022 was used as the base year for discounting; that is, 2022 is year zero for discounting.

The following data sources were used:

- 2024 Updated Benefit-Cost Analysis Guidance for Discretionary Grant Programs
- US GDP Price Deflator, as reported by the Bureau of Labor Statistics and the Federal Reserve
- Tract-specific pedestrian commuting (journey to work) rates from American Community Survey (ACS) Census data
- Google Maps speed and travel time estimates

- US DOT prescribed hourly value for "Walking, Cycling, Waiting, Standing, and Transfer Time"
- Recreational bicycle and pedestrian rates estimated form national research published by the firm Statista, derived based on US and other data sources
- Observed economic and real estate benefits of recreational trails from the US Forest Service Southern Research Station

Project Description

The Project is for a separate free-standing multimodal bridge that connects to the Oklahoma River trails on both sides of the Oklahoma River. It would be constructed parallel to a proposed I-35 vehicular bridge replacing the current highway bridge.

The Project will provide a new and much needed downtown river crossing and help complete the Oklahoma River trails network located north and south of I-35, connecting this rich cultural and recreational area of Oklahoma City to the entire Oklahoma City trails system that offers a network of 10 inter-connected trails that cover over 80 miles and can access almost every point in Oklahoma City.

Costs

Capital Cost

ODOT estimated costs based on quantities and bid prices from recent similar projects. The total capital cost of the Project is $21.6 million in fourth quarter 2023 dollars (**Table 1**). The total cost is $20.8 million in 2022 dollars. The adjustment to 2022 dollars is based on the US GDP Price Deflator, as reported by the Bureau of Labor Statistics and the Federal Reserve.[1]

[1] https://fred.stlouisfed.org/series/GDPDEF/

Table 1: Project Cost by Item (2022 $s)

Description	Total Cost (Q4 2023 $s	Total Cost 2022 $s
Approach Slab	$43,500	$41,679
Concrete Parapet	$178,500	$171,028
Structural Steel	$6,900,000	$6,611,166
Stainless Steel Fixed Bearing Assembly Stainless Steel Expansion Bearing Assembly	$22,500	$21,558
Class AA Concrete	$364,000	$348,763
Class A Concrete	$231,000	$221,330
Epoxy Coated Reinforcing Steel	$389,500	$373,196
Drilled Shafts	$200,000	$191,628
Type 1-A Plain Riprap	$48,000	$48,000
MSE Retaining Wall (North Bank)	$3,400,000	$3,257,676
Multimodal Trail (North Bank)	$244,000	$233,786
Multimodal Ramp (North Bank)	$650,000	$622,791
Multimodal Trail (South Bank)	$97,600	$93,514
Multimodal Ramp (South Bank)	$650,000	$622,791
Multimodal Ramp (South Bank OKANA Extension)	$109,800	$105,204
Handrailing	$84,000	$80,484
Construction Total	$13,612,400	$13,044,593
30% Contingency	$4,083,720	$3,912,775
Bridge Aesthetics	$4,000,000	$3,832,560
Multimodal Bridge Total	**$21,696,120**	**$20,789,928**

Source: ODOT, (Q4 2023 Dollars)

Maintenance Costs

ODOT estimates an annual routine maintenance cost of $5,000 for the multimodal bridge. Over time, some more substantial upkeep interventions will be required: ODOT estimates a $500,000 major maintenance cost in 2050.

Active Transportation Benefits

The ability to fully measure the benefits of the multimodal bridge is limited by a lack of current and comprehensive bike and pedestrian utilization data, as well as by the fact that the proposed multimodal bridge does not now exist and thus no crossing data at that location are currently available, as bikes and pedestrians are not permitted on the existing I-35 vehicular bridge. As a result, there is no information about bike and ped utilization following this routing and bike and ped use is not forecast in the OKC Council of Governments (ACOG) regional travel demand model.

However, to the extent possible, this analysis endeavors to estimate (within the limits of the data) those benefits based on techniques available in the NCHRP literature related to prospective bike and pedestrian use of new and/or improved bike-ped facilities, US Census data on bike and pedestrian commuter mode shares in Census tracts close to the new multimodal bridge, national and regional data on recreational bike and pedestrian trip making rates, and monetization values for bike and pedestrian use found in the USDOT BCA Guidance for 2024.

Pedestrian and Cycling Benefits

To begin our analysis, we obtained data on the potential market for bike-ped facilities, comprised of the residential population in Census tracts located within an approximately one-mile radius of the bridge, and within the age ranges prescribed in the US DOT BCA guidance. Those data are shown in the top two rows of **Table 2**.

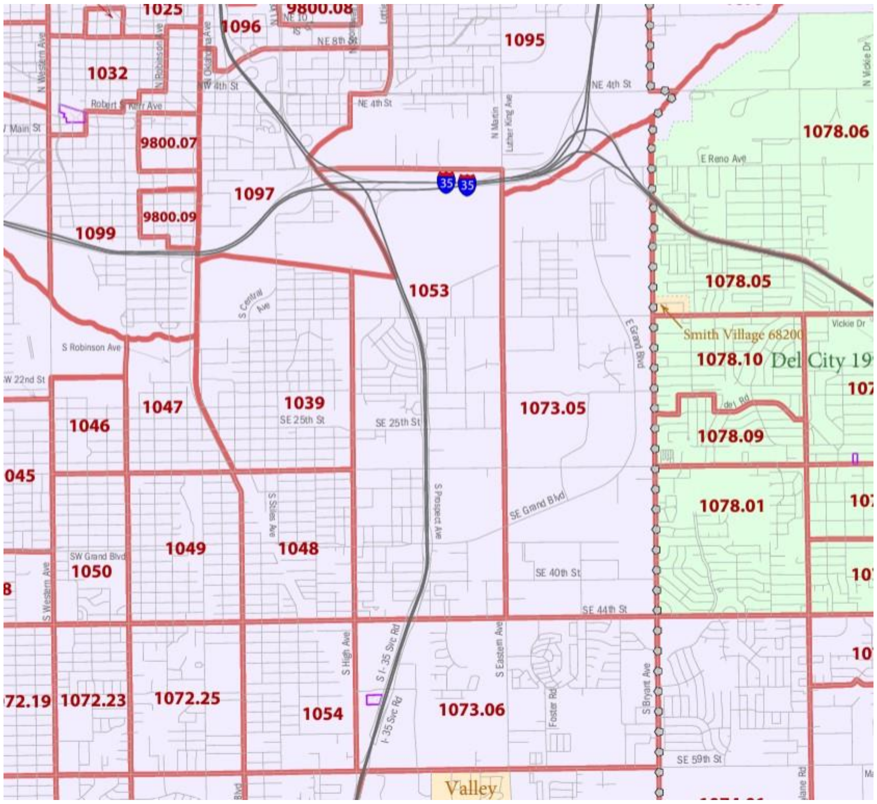
Table 2: Active Transportation Market Analysis - Existing Commuter and Induced Recreational Trip Estimates

EXISTING ACTIVE TRANSPORTATION COMMUTER MARKET	CENSUS TRACT 1039	CENSUS TRACT 1053	CENSUS TRACT 1073.05	CENSUS TRACT 1095	CENSUS TRACT 1097	TOTAL
WALKING (AGES 20-74)	2,465	2,044	806	2,519	1,666	9,500
CYCLING (AGES 20-64)	2,299	1,970	742	2,237	1,376	8,624
NO-BUILD WALKING COMMUTE RATE (CENSUS TRACT RATES)	2.70%	0.40%	0.90%	1.10%	8.7%	tract specific rates
NO-BUILD CYCLING COMMUTE RATE (REGIONAL RATES)	0.30%	0.30%	0.30%	0.30%	0.30%	Oklahoma County rates
NO-BUILD EXISTING COMMUTER PEDESTRIANS	67	8	7	28	145	255
NO-BUILD EXISTING COMMUTER CYCLISTS	7	6	2	7	4	26
ANNUAL TRIPS (52 WEEKS * 5 ROUND TRIPS *25% VIA BRIDGE FOR PED; 50% VIA BRIDGE FOR BIKE)						
NO-BUILD EXISTING COMMUTER PEDESTRIAN TRIPS	8,652	1,063	943	3,602	18,842	33,103
NO-BUILD EXISTING COMMUTER CYCLISTS TRIPS	1,793	1,537	579	1,745	1,073	6,727
ESTIMATED INDUCED RECREATIONAL TRIPS	CENSUS TRACT 1039	CENSUS TRACT 1053	CENSUS TRACT 1073.05	CENSUS TRACT 1095	CENSUS TRACT 1097	TOTAL
TOTAL WALKING POPULATION	2,465	2,044	806	2,519	1,666	
TOTAL CYCLING POPULATION	2,299	1,970	742	2,237	1,376	
BUILD RECREATIONAL WALKING RATE (NATIONAL RATES)	35.00%	35.00%	35.00%	35.00%	35.00%	
BUILD RECREATIONAL CYCLING RATE (NATIONAL RATES)	11.00%	11.00%	11.00%	11.00%	11.00%	
ANNUAL INDUCED RECREATIONAL PEDESTRIAN TRIPS PER YEAR (ONE INDUCED REC TRIP PER MONTH)	10,353	8,585	3,385	10,580	6,997	39,900
ANNUAL INDUCED RECREATIONAL CYCLIST TRIPS PER YEAR (ONE INDUCED REC TRIP PER MONTH)	3,035	2,600	979	2,953	1,816	11,384

Source: US Census, ODOT, EBP analysis

The Census tracts included are also shown in Figure 1 below.

Figure 1: Census Tracts within One Mile of the Project End Points



Source:https://www2.census.gov/geo/maps/DC2020/PL20/st40_ok/censustract_maps/c40109_oklahoma/

Existing Bike and Pedestrian Commuters: To estimate existing pedestrian commuters from those tracts, we obtained tract-specific pedestrian commuting (journey to work) rates from American Community Survey (ACS) Census data. For bike commuting rates, the Census tract-specific rates appeared inconsistent and were shown as zero for some tracts; as an alternative to missing data at the tract level, we utilized the overall bike commuting rate for Oklahoma County to obtain bike commuting estimates. The bike and ped commuter rates utilized in the analysis are shown in the next two rows of Table 2. A summary of the Census journey to work rates is shown in Table 3.

Table 3: Census Journey to Work

	CENSUS TRACT 1039	CENSUS TRACT 1053	CENSUS TRACT 1073.05	CENSUS TRACT 1095	CENSUS TRACT 1097	OKLAHOMA COUNTY
CAR, TRUCK, OR VAN	94.80%	90.00%	80.10%	93.10%	86.70%	91.30%
PUBLIC TRANSPORTATION (EXCLUDING TAXICAB)	0.00%	3.40%	0.60%	3.60%	0.70%	0.50%
WALKED	2.70%	0.40%	0.90%	1.10%	8.70%	1.60%
BICYCLE	0.00%	0.00%	0.00%	0.00%	0.50%	0.30%
TAXICAB, MOTORCYCLE, OR OTHER MEANS	1.60%	4.50%	16.10%	0.00%	0.60%	1.20%
WORKED FROM HOME	0.90%	1.70%	2.20%	2.10%	2.80%	5.20%

Source: US Census ACS data

Based on the populations by tract and the assumed bike and ped commuting rates, we estimated bike and ped commuters and annual commute trips that could utilize the new multimodal bridge. We assumed that commuters averaged 480 trips per year (10 round trips per week for 48 weeks) and that 25 percent of pedestrian commute trips would use the multimodal bridge, while 50 percent of bike commuters would use the multimodal bridge.

Because these are commuter trips, we further assumed that ***travel time savings*** would be the relevant benefit for those trips. The study team estimated bike and pedestrian time savings for selected cross river trips. The results of that analysis are shown in Table 4 and selectively illustrated in Figures 2 and 3. Figures 2 and 3 show bike and pedestrian routes and trip times under the No Build (i.e., without the new multimodal bridge) for the 740 SE 10th Street to McClendon Whitewater trip. Without the new multimodal bridge, pedestrian and bike trip times are 21 minutes and 8 minutes as shown in the figures; those trip times fall to 10 minutes and 5 minutes respectively with the multimodal bridge in place. Other route and time savings maps are available upon request.

Table 4: Cross Oklahoma River Trip Time Savings for the Multimodal Bridge

ROUTE	PEDESTRIAN CURRENT TRAVEL TIME	BIKE CURRENT TRAVEL TIME	PED. TRAVEL TIME WITH NEW BRIDGE	BIKE TRAVEL TIME WITH NEW BRIDGE	PED. TIME SAVINGS	BIKE TIME SAVINGS
740 SE 10th street – McClendon Whitewater	21 mins	8 mins	10 mins	5 mins	11 mins	3 mins
S High Ave – McClendon Whitewater	25 mins	9 mins	15 mins	5 mins	10 mins	4 mins
First Americans Museum – Centennial Land Run Monument	54 mins	25 mins	25 mins	15 mins	29 mins	10 mins
Family Dollar (900 SE 15th street) – McClendon Whitewater	32 mins	13 mins	22 mins	8 mins	10 mins	5 mins

Source: Google Maps, High Street Consulting and Poe Engineering

Table 3 is a combination of real travel time versus predicted travel time with the multimodal bridge in place. The current travel time is based on likely bike and pedestrian routes and distances and average walking and biking speeds. The proposed travel times were generated by taking the miles traveled and incorporating the future multimodal bridge route, utilizing the same walking and biking speeds.

Figure 2: Bike Route 740 SE 10th - Whitewater

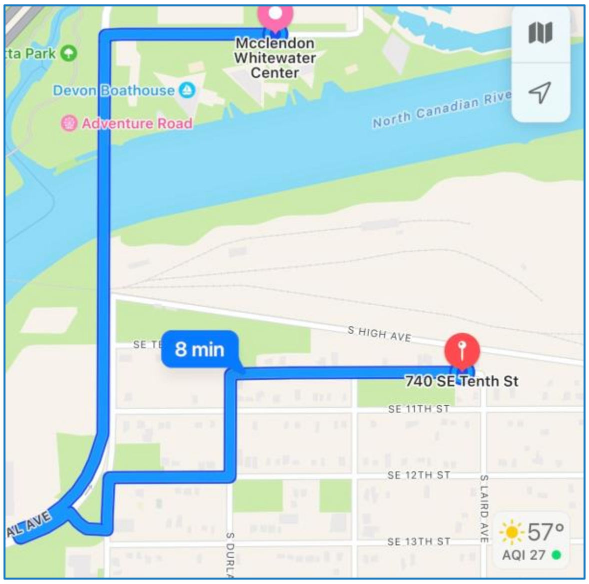
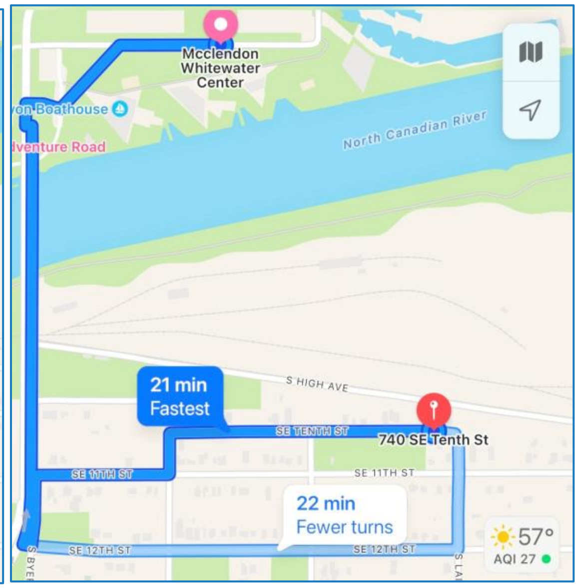


Figure 3: Ped Route 740 SE 10th -Whitewater



Source: Google Maps, High Street Consulting and Poe Engineering

To complete this analysis, we calculated the average bike and ped trip time savings in Table 3 for all the O-D combinations and applied those time savings to the estimated annual bike and pedestrian commuting trips in Table 2. This multiplication resulted in the annual travel hours saved for bike and ped commuters. That product was further multiplied by the US DOT prescribed hourly value of $35.80 for “Walking, Cycling, Waiting, Standing, and Transfer Time” to obtain the value of annual bike and ped commuter time savings.

Induced Bike and Pedestrian Recreational Trips: To estimate the benefits of induced recreational travel, we first estimated the share of the population in each of the Census tracts that engage in biking and pedestrian activity for recreational purposes. National research published by the firm Statista, derived based on US and other data sources, indicates that about 35 percent of Americans between 20 and 74 sometimes walk for recreational purposes (about 115 million Americans in 2021), while 11 percent of people between 20 and 64 sometimes engage in biking (about 54 million in 2022).[2] We then applied those rates to the Census tract

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[2] Statista, USA.
https://www.statista.com/forecasts/227415/number-of-cyclists-and-bike-riders-usa
https://www.statista.com/statistics/191984/participants-in-walking-for-fitness-in-the-us-since-2006/

populations, and assumed that those individuals would increase their walk and bike recreational activity by only one additional trip per month because of the attractive opportunity for safe and dedicated bike and pedestrian activity, as well as the new access across the river provided by the new multimodal bridge. See Table 1 for induced recreational trip estimates.

To monetize the estimated additional bike and pedestrian recreational trips per year, we multiplied those trips by US DOT's prescribed valuation of such trips based on mortality reduction. Those values are reproduced in Figure 4 below, from the 2024 BCA guidance document.

Figure 4: USDOT Values for Induced Active Transportation

Table A-13: Mortality Reduction Benefits of Induced Active Transportation Values

Mode	Applicable Age Range[3]	Recommended Value per Induced Trip (2022 $)[4]
Walking[1]	Ages 20-74	$7.63
Cycling[2]	Ages 20-64	$6.80

Source: USDOT 2024 BCA Guidance

Option Value - New Bike and Ped Facilities

In addition to our estimates of benefits realized by existing and induced bike and ped users for commuting and recreational purposes, there is well documented research indicating that proximity to high quality and well-connected recreational trails carries significant *option* value to area homeowners that may be reflected in higher housing values.[3] Typical of these research studies is one conducted in North Carolina indicating that houses adjacent to a regional greenway sold for a premium of about $5,000 above comparable homes that were not located near the recreational trail amenity. Similar studies found premiums in land values per acre and in property tax revenues associated with proximity to recreational trails and bikeways.

Use of such "hedonic" price effects in Benefit Cost Analysis is well established by economic researchers. These benefits would not necessarily comprise a "capitalization" of travel time savings into the value of a home (and thus a double counting of benefits). Instead, such a one-time increase in house values would reflect the "option value" of proximity to a major quality of life amenity – the Oklahoma City trail network. Area residents may rarely use the enhanced bike and pedestrian opportunities provided by the multimodal bridge, but the economic research suggests that people would be willing to pay a premium to have that opportunity (the option to use), whether realized or not.

To capture the potential benefits of the much-enhanced bike-ped access arising from the Project, we have gone back into the Census data from the one-mile radius tracts around the bridge to determine the number of housing units that may experience a benefit. The Census indicates over 6,000 housing units located within the one-mile radius. As a conservative estimate, this analysis assumes about 1,000 of those 6,000 housing units are close enough to the bike and ped enhancements to see significant property value impacts. The analysis

[3] Rails to Trails Conservancy, "The Economic Benefits of Recreational Trails," online research monograph: https://urbanforestrysouth.org/products/fact-sheets/economic-benefits/the-economic-benefits-of-recreational-trails/index_html

estimates a modest one-time aggregate option value boost (as reflected in house value increases) of $5,000,000. This one-time increase in economic value is assumed to occur midway during the construction period, in 2030, as housing markets anticipate future projects that have broken ground.

BCA Results

Based on the assumptions, methodology, and other information presented earlier, the I-35 multimodal bridge project yields an overall Benefit-Cost Ratio of 0.96, rounding to 1.0 (**Table 10**).

Table 2: BCA Results

Discounted Costs - Build	**Present Value**
Capital Costs	$16,472,508
Maintenance Costs	$336,857
Total Discouted Costs	**$16,809,365**
Discounted Benefits	
Salvage Value	$2,275,231
Active Transportation Benefits	
Bike	$1,437,531
Ped	$8,495,839
Option Value for House Price Appreciation	$3,916,523
Total Discounted Benefits	**$16,125,125**
Summary Metrics	
Benefit Cost Ratio	**0.96**
Net Present Value	**($347,383)**

Source: EBP