



RAISE Cleveland East Side Trails

Benefit-Cost Analysis February 28, 2024



Executive Summary

This benefit-cost analysis (BCA) was completed for the Cleveland Metroparks' application to the U.S. Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant program for the Cuyahoga Greenways: RAISE Cleveland East Side Trails (RAISE Cleveland) project. It is modeled primarily after guidance and values supplied in the National Cooperative Highway Research Program as described in their Report 552: Guidelines for Analysis of Investments in Bicycle Facilities and the Benefit-Cost Analysis Guidance for Discretionary Grant Programs (BCA Guidance), published by the US Department of Transportation in December 2023. The economic value was estimated for the proposed RAISE project in terms of improvements to safety, mobility, health, and recreation. The results are based on the stated 3.1 percent discount rate from the BCA Guidance and a proposed lifetime of 20 years for the project beginning in 2028, the first full year of operations.

The RAISE Cleveland project is comprised of two projects: construction of the ±1.7-mile Slavic Village Downtown Connector Phase 2 North (SVDC North) and the ±1.0-mile Morgana Run Booth Avenue Extension (MRBA). The total cost of the Cuyahoga Greenways: RAISE East Side Trails is \$19.5 million, comprised of \$11.5 million for the Slavic Village Downtown Connector North (SVDC North) and \$8.0 million for the Morgana Run Booth Avenue Extension (MRBA). Both projects have independent utility; however, they work best together to strengthen the overall active transportation network on the east side of Cleveland. The BCA narrative and associated spreadsheet present information on each project separately as well as their combined benefit.

In summary, the proposed \$19.5 million urban project will conservatively provide up to \$133.7 million in economic benefits in 2022 dollars at a 3.1 percent discount rate as shown in Table 1. This results in a benefit cost ratio of 6.64:1 as compared to the base case, no-build option. Benefits by category are listed in Table 2. The project is also expected to generate tourism and enhanced property values; however, these benefits are not included in the overall calculation of the BCA and are presented illustratively.

Sensitivity analysis conducted on these results using higher and lower levels of demand and the previous 7.0% discount rate are available within the BCA spreadsheet (see tabs names "BenefitsMatrixHigh" and "BenefitsMatrixLow" for SVDC, MRBA, and Both). The results presented are reasonably conservative and consistent with other past BCAs.

Table 1. Net Present Value Benefits and Benefit-Cost-Ratio at 3.1% Discount Rate

Project	Present Value of Benefits	Present Value of Costs	Net Present Benefits	Benefit-to-Cost Ratio
SVDC North	\$ 94,799,727	\$ 11,898,739	\$ 82,900,988	7.97
MRBA	\$ 38,853,838	\$ 8,234,553	\$ 30,619,285	4.72
Both Projects	\$ 133,653,565	\$ 20,133,292	\$ 113,520,273	6.64

Table 2. Present Value Benefits by Category

	Component 1: SVDC North	Component 2: MRBA	Both Components
Category	Benefits	Benefits	Benefits
Safety	\$ 82,190,824	\$ 33,094,512	\$ 115,285,336
Mobility	\$ 3,373,492	\$ 1,408,652	\$ 4,782,144
Health	\$ 868,739	\$ 663,454	\$ 1,532,193
Recreation	\$ 8,366,672	\$ 3,687,220	\$ 12,053,892
Total Project Costs	\$94,799,727	\$38,853,838	\$133,653,565

A Project Matrix on the following page describes the current baseline condition, proposed changes, types of impacts, population affected, and economic benefits for the project.

RAISE Cleveland Project Matrix						
Project	Current Status/Baseline & Problem to be Addressed	Change to Baseline/Alternatives	Type of Impacts	Population Affected by Impacts	Economic Benefit	Summary of Results
RAISE Project	Where there are no existing facilities, new bicycle and pedestrian shared-use paths will provide access in an urban area to a regional job center, transit, shopping and daily activities, and Cleveland Metroparks' park areas.	Provide 2.7 miles of new trail through construction of the SVDC North and MRBA projects, collectively the RAISE Cleveland projects. Included are Complete Streets treatments achieved through road diets, modifications to bridge decks, new lighting, new and modified traffic signals, and new street trees and landscaping. Construction will also allow connection to a broader network of trails in and around the city of Cleveland. The trail will provide a low-stress off-road facility for bicyclists and pedestrians where there are none.	Reduced bicycle and pedestrian accidents; increased bicycle commuting; new recreational access; improved health; mobility improvements	36,759 residents within one mile in an area with a median household income of \$20,976 and 30.5% of households without access to a personal vehicle; both projects are designated as Areas of Persistent Poverty and Historically Disadvantaged Communities.	Monetized value of improved safety, mobility, health, and recreation; qualitative discussion of tourism and enhance property value	Estimated value of increased safety, mobility, health, recreation

Project Costs

Cost estimates were developed by the RAISE Planning engineer in February 2024 as part of the feasibility studies. These are the initial capital costs for the project, expected to occur between July 2025 and June 2027. In addition, the BCA includes annual operation and maintenance costs based on Cleveland Metroparks’ experience as a manager of 125 miles of paved trails. These costs are applied between 2028 and 2047. More details are available in the Project Budget section of the application narrative.

Table 3. Initial Capital Costs

Component 1: SVDC North	Component 2: MRBA		Both Components
Capital Cost	Capital Cost	Capital Cost	
\$ 11,500,000	\$ 8,000,000	\$ 19,500,000	

Methodology for Calculating Existing & New Users

The Project follows the National Cooperative Highway Research Program (NCHRP) Report 552 recommendations for estimating existing and new users of a bicycle facility. A customized methodology for disaggregating ACS Block Group data (2016-2020 5-year estimate) into Cuyahoga County residential parcel data was used. Through this process, the population (and subsequently all of the counts for each demographic category) for each Block Group is distributed to residential parcels weighted by the type of residential parcel (e.g. 1-Fam, 2-Fam, 3-Fam, Apartment, etc.). This ensures that single family dwellings are not weighted the same as high rise apartments or similar.

The output from the above model serves as the input for summarizing population data for customized areas of interest. In this case, the areas of interest were 1/4-mile, 1/2-mile, and 1-mile buffers from the trail alignments. The buffers were generated using QGIS and then a simple intersection with the aforementioned parcel dataset was conducted followed by summing the individual weighted population counts contained in each parcel. Additionally, the parcels were attributed with Census Tract to summarize. All demographic information is available in the BCA spreadsheet.

Bicycle Users

Bicycle user populations were calculated using methodologies recommended by the NCHRP 552 Guidelines. “Existing” refers to 2028 without the Project, while “new” refers to 2028 with the Project. All multipliers, factors, and formulas are included in the “Inputs” tab of the BCA Spreadsheet or within the tabs themselves.

- Existing Bicycle Commuters: The methodology for estimating existing bicycle commuters involves multiplying the existing adult population (U.S. Census) by the existing share of bicycle commuters (U.S. Census ACS Journeys to Work).

- Existing Bicycle Recreation Users: Existing bicycle recreation users are calculated by subtracting the existing bicycle commuters from the existing bicycle total users, as recommended by NCHRP guidelines.
- Existing Bicycle Total Users: Total existing bicycle total users are calculated from NCHRP multipliers based on the National Household Travel Survey (NHTS) and the existing bicycle commuters. NCHRP forecasts low, moderate, and high total bicycle users.
- New Bicycle Commuters: The methodology for estimating new bicycle commuters involves multiplying the existing bicycle commuters by NCHRP multipliers.
- New Bicycle Recreation Users: New bicycle recreation users are calculated by subtracting the new bicycle commuters from the new bicycle total users, as recommended by NCHRP guidelines.
- New Bicycle Total Users: The methodology for estimating new bicycle total users involves multiplying the existing total bicycle users by NCHRP multipliers.

Pedestrian Users

NCHRP recommends that pedestrian users do not consider the same multipliers as bicycle users. Instead, NHTS data on commute lengths and time were utilized.

- Existing Pedestrian Commuters: The methodology for estimating existing pedestrian commuters involves multiplying the existing adult population (U.S. Census) by the existing share of pedestrian commuters, including those who walk to transit.
- Existing Pedestrian Recreation Users: NCHRP estimates that walking is 10 times as common as bicycling. Existing pedestrian recreational users are calculated by multiplying the existing bicycle recreation users by 10.
- Existing Pedestrian Total Users: Existing pedestrian total users are calculated by adding the existing pedestrian commuters and existing pedestrian recreational users.
- New Pedestrian Commuters: Because pedestrian facilities already commonly exist, new pedestrian commuters are not expected to be extensive. New pedestrian commuters are conservatively estimated to be equal to the new bicycle commuters.
- New Pedestrian Recreation Users: NCHRP estimates that walking is 10 times as common as bicycling. New pedestrian recreational users are calculated by multiplying the new bicycle recreation users in the project area by 10.
- New Pedestrian Total Users: New pedestrian total users are calculated by adding the new pedestrian commuters and new pedestrian recreational users.

Benefits

Reduction in Bicyclist and Pedestrian Injuries and Fatalities

Data on crashes involving bicycles and pedestrians within the SVDC North and MRBA project areas were gathered from the GIS Crash Analysis Tool (GCAT) tool within the ODOT Transportation Information Mapping System (TIMS) online data system using a one-mile buffer around the projects. Between 2018 and 2023, there were 216 recorded crashes involving a bicycle (pedalcycle) or pedestrian for the SVDC North project area, including seven fatal and 26 serious injury crashes. The accident numbers were then scaled using the KABCO formula provided in the *Benefit-Cost Analysis Guidance for Discretionary Grant Programs*. Using the values provided in that guide, the Estimated Total Value of Pedalcycle and Pedestrian Fatalities and Injuries were developed for the project area.

The SVDC North and MRBA will install a shared use path where there is none, creating safe, separated facilities for bicyclists and pedestrians. This is expected to reduce crashes by 25% based on Crash Modification Factor (CMF) ID 9250, which is the dominant CMF used in the Benefit-Cost Analysis though others will also be employed and will produce additional benefits.

The reduction in bicyclist and pedestrian injuries and fatalities benefit is estimated to be \$8,570,921 per year, beginning in 2028 and continuing for 20 years. The present value of the safety benefit is \$115,285,337 at a 3.1 percent discount rate. Calculations for the individual projects can be found in the “Safety” tabs of the supporting BCA spreadsheet.

Mobility

People are willing to travel to avoid biking in traffic. The NCHRP’s Report 552 states that average respondents are willing to travel about 19.4 additional minutes if an off-road bike path is available if the alternative is to bike in traffic. For the RAISE Cleveland project, the alternative to the proposed shared-use path is to bike in traffic largely on urban arterial roadways as there are limited bicycle and pedestrian facilities in the project area.

Using the methodology in the NCHRP Report 552 estimates of the mobility benefits are \$355,530 per year, beginning in 2028 and continue for 20 years. The present value of the mobility benefit is \$4,782,144 at a 3.1 percent discount rate. Calculations for the individual projects can be found in the “Mobility” tabs of the supporting BCA spreadsheet.

Health

People who are physically active have reduced health care costs. NCHRP Report 552 allows us to value the annual per-capita cost savings from physical activity of new bicyclists. The health benefits are estimated to be \$113,911 at the moderate model level. Health benefits begin accruing in 2028 and continue for 20 years. The present value of the health benefit is \$1,532,193 at 3.1 percent discount rate. Calculations for the individual projects can be found in the “Health” tabs of the supporting BCA spreadsheet.

Recreation

Many of the households within one mile of the RAISE Cleveland project have severely limited recreational access. Once completed, the RAISE Cleveland project will provide new recreational access. The total annual recreational value of the new access provided by the project will be \$896,150. Recreational benefits begin accruing in 2028 and last for 20 years. The present value of the recreational benefit is \$12,053,892 at a 3.1 percent discount rate. Calculations for the individual projects can be found in the “Recreation” tabs of the supporting BCA spreadsheet.

Tourism

Investments in the RAISE Cleveland project will support tourism economy in Northeast Ohio. Tourists visit parks and trails in Cuyahoga County to participate in a wide variety of activities. In *The Economic Benefits of Cleveland Metroparks*, The Trust for Public Land utilized information provided by Tourism Ohio to measure the value of parks and trails in Cuyahoga County’s tourism economy. The Trust for Public Land determined tourists spend over \$6.66 billion in Cuyahoga County each year, with approximately \$733 million in spending each year attributable to the parks and trails that make the outdoors accessible to tourists. Spending by these park-related visitors generates \$21.3 million and \$29.1 million in local and state tax revenues, respectively. While this analysis cannot estimate the additional tourism value that the trail connectors will provide, it can be conservatively assumed that it will generate additional visitor spending, helping to support local jobs and tax revenues.

Enhanced Property Values

Study after study has shown that trails and parks have a positive impact on nearby residential property values. All things being equal, most people are willing to pay more for a home close to a nice trail or park. The property value added by these assets is separate from the direct recreational use value gained; property value goes up even if the resident never visits the trail.

Based on previous studies, it is anticipated that the RAISE Cleveland project trails will have a positive impact on neighboring home values. Property values of homes in neighborhoods with trails have been shown to increase 2 percent to 14 percent.¹

¹ Greg Lindsey, Joyce Man, Seth Payton, and Kelly Dickson, “Property Values, Recreation Values, and Urban Greenways” (*Journal of Park and Recreation Administration* 22, no. 3, 2004, pp.69-90). Found a residential property value premium of 14 percent within one-quarter of a mile of a trail in Indianapolis, Indiana; Harrison Campbell and Darla Munroe, “Greenways and Greenbacks: The Impact of the Catawba Regional Trail on Property Values in Charlotte, North Carolina”

Benefit-Cost Ratio

Total Benefits

The RAISE Cleveland project will conservatively provide up to \$133.7 million in economic benefits from Safety, Mobility, Health, and Recreation gains (Table 4). The projects are also expected to generate tourism, enhanced property value, and economic competitiveness benefits, which are more difficult to quantify.

Table 4. Present Value Benefits by Category

Category	Component 1:	Component 2:	Both Components
	SVDC North	MRBA	
	Benefits	Benefits	Benefits
Safety	\$ 82,190,824	\$ 33,094,512	\$ 115,285,336
Mobility	\$ 3,373,492	\$ 1,408,652	\$ 4,782,144
Health	\$ 868,739	\$ 663,454	\$ 1,532,193
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Total Project Costs	\$94,799,727	\$38,853,838	\$133,653,565

Total Construction Costs

The proposed RAISE Cleveland projects will cost a total of \$x million and will have operations and maintenance costs over the 20-year period of \$648,442 at a 3.1 percent discount rate (Table 5).

Table 5. Capital and Operations & Maintenance Costs

Costs	Component 1:	Component 2:	Both Components
	SVDC North	MRBA	
Capital	\$ 11,500,000	\$ 8,000,000	\$ 19,500,000
Operations & Maintenance	\$ 398,739	\$ 234,553	\$ 633,292
Both Projects	\$ 11,898,739	\$ 8,234,553	\$ 20,133,292

Net Benefits

The proposed \$19.5 million urban project will conservatively provide up to \$133.7 million in economic benefits in 2022 dollars at a 3.1 percent discount rate as shown in Table 6. This results in a benefit cost ratio of 6.64:1 as compared to the base case, no-build option. For the SVDC North, the BCR is 7.97:1 and for MRBA the BCR is 4.72:1.

Table 6. Net Present Value Benefits and Benefit-Cost-Ratio at 3.1% Discount Rate

Project	Present Value of Benefits	Present Value of Costs	Net Present Benefits	Benefit-to-Cost Ratio
SVDC North	\$ 94,799,727	\$ 11,898,739	\$ 82,900,988	7.97
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