



## Russellville Connected Trail System Benefit-Cost Analysis Narrative



The Benefits Cost Analysis (BCA) is an important tool that helps to determine the estimated value of a project in relation to the costs of implementing it over a specified time period. In the case of the Russellville Connected Trail System project, the BCA has been utilized to assess the potential benefits of the proposed multi-use infrastructure. To carry out the analysis, the project team used the Benefit Cost Analysis Guidance 2023 Update for Discretionary Grant Programs as a basis. This guidance provides a framework for evaluating the costs and benefits of transportation projects, including factors such as safety, health, environmental sustainability, and economic competitiveness.

By quantifying these factors, the BCA helps to determine whether the proposed project is a good investment of public funds. The City of Russellville collaborated with BBC Research and Consulting to perform the analysis, and their report is included on the following pages. They considered the safety benefits of the trail system to estimate the potential reduction in accidents and injuries that may result from providing a dedicated trail for pedestrians and cyclists.

Similarly, by assessing the health benefits of the trail system, an estimated potential increase in physical activity among residents who use the trail, which can lead to reduced rates of chronic diseases such as obesity and diabetes, was calculated. Arkansas ranks high in obesity rates among students and adults. Nationally, Arkansas is typically among the top three worst states in obesity. According to the Behavioral Risk Factor Surveillance System data provided by the Centers for Disease Control and Prevention, **44 percent** of students and **72 percent** of adults in Pope County are overweight or obese. About **33 percent** of adults in Pope County are physically inactive. To combat health and morbidity problems in Russellville and the entire micropolitan area this project will provide easier access to recreational exercise and amenities.

Environmental sustainability is another key factor that has been considered. By providing alternative modes of transportation, the trail system can reduce greenhouse gas emissions and improve air quality. According to the Environmental Protection Agency (EPA), Russellville has experienced some fluctuations in air quality over the years, particularly in relation to ozone and particulate matter. The primary sources of air pollution in the area include transportation, industry, and natural sources such as dust and wildfires. The construction of a new connected trail system can offer alternative transportation options and promote active lifestyles, which can lead to a reduction in vehicle use and related emissions. A study done in 2022 by the Arkansas Department of Transportation showed that many of the state and city roads that intersect with the primary route of the Russellville Connected Trail System have daily traffic estimates ranging from 1,000 to 24,000 vehicles. Reducing this environmental impact will help create a sustainable system for a growing city.

Finally, the BCA has also taken into account the economic competitiveness benefits of the trail system. By connecting key destinations within the community, such as schools, parks, and businesses, the trail system can increase access to these resources, potentially attracting new residents and businesses to the area.



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Various factors are taken into consideration during the evaluation of the Russellville Connected Trail System project, including property values, proximity to the trail, and willingness to pay for trail amenities, as well as other financial benefits. Studies conducted by the National Association of Realtors have shown that properties located near trails or greenways experience an average increase in property values of 3 to 5 percent, and in some cases, even up to 15 percent. It is noteworthy that 41 percent of residents live within a half-mile of the proposed trail alignment, and 25 percent of residents live within a quarter-mile of the alignment. The project is aligned with the Neighborhood Unit

Structures near Trails	Number of	
<b>Total Rooftops in town</b>	19,627	
<b>Total Rooftops 1/2 mile</b>	8,034	41%
<b>Total Rooftops 1/4 mile</b>	4,892	25%

Concept, which aims to provide citizens living within a half-mile of trails better access to alternative modes of. This will contribute to promoting public health, as well as considering the safety and welfare of the citizens. As a result, there will be a significant improvement in the quality of life, and the extent of trail usage is likely to increase, although currently it is not yet quantifiable.

The Quantified Annual Benefits Table below displays the results of the benefit-cost analysis and illustrates a positive net benefit to the community of \$5,991,204. The analysis was conducted on an annual timeframe to assess categorical benefits, and a discount rate of seven percent was applied to the health benefits category.

Overall, the Benefits Cost Analysis evaluating potential benefits of the Russellville Connected Trail System project and clearly demonstrates that the RCTS project is a sound investment for the community.

QUANTIFIED ANNUAL BENEFITS	
<b>Health</b>	\$765,000.00
<b>Mortality</b>	\$285,000.00
<b>Safety</b>	\$448,000.00
<b>Economic Competitiveness</b>	\$44,000.00
<b>Environmental Sustainability</b>	\$4,000.00
<b>TOTAL QUANTIFIED ANNUAL BENEFITS</b>	\$1,546,000.00
<b>20-YEAR BENEFITS TOTAL</b>	\$30,920,000.00
<b>TOTAL PROJECT COSTS</b>	\$24,928,795.37
<b>BCA RATIO</b>	1.24
<b>NET BENEFIT</b>	\$5,991,204.63



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# MEMORANDUM

To: Sara Jondahl  
City Planner  
City of Russellville, Arkansas  
From: BBC Research & Consulting  
Re: Impacts of Potential Bicycle Infrastructure  
Date: February 14, 2023

This memorandum provides technical documentation of the model used to estimate the benefits of the expansion of bike trails in Russellville Arkansas in support of the City of Russellville’s 2023 RAISE grant application.

## Background

The City of Russellville, Arkansas proposes to add 13.8 miles of bike trails to their existing 14.4-mile trail network. Following the guidance provided by the Department of Transportation’s “Benefit-Cost Analysis Guidance for Discretionary Grant Programs,” BBC has quantified the Safety, Health, and Environmental Sustainability benefits from the proposed bicycle infrastructure. All benefits quantified in the analysis are detailed in the following sections. Wherever possible, BBC applied conservative assumptions to ensure that the results of this analysis represent the lower bound of the possible benefits.

## Summary of Benefits

As discussed in more detail in this memo, the projected benefits derived from increased bicycling due to the project include:

- \$765,000 in avoided health care costs;
- \$285,000 in reduced mortality benefits;
- \$448,000 in safety benefits;
- \$44,000 in benefits from decreased transportation costs; and
- \$4,000 in benefits from reduced pollution.

## Health Benefits

The health benefits analysis includes analysis of the health benefits of bicycling as measured by the Health Economic Assessment Tool (HEAT) and the avoided health care costs related to bicycling.





**HEAT Health benefits of bicycling.** The HEAT tool produces estimates of the reduction in all-cause mortality and the reduction in the number of deaths resulting from bicycling. It also estimates the following economic health benefits from reduced mortality:

- Annual health benefits;
- Total health benefits over the evaluation period (in this case, 20 years);
- Current value of annual health benefits (time-adjusted using the seven percent discount rate); and
- Current value of the total health benefits over the evaluation period (again using the seven percent discount rate).

BBC used USDOTs guidance on the HEAT tool to determine the health benefit of cycling to new users. BBC estimated current ridership in Russellville using data on bicycle commuting from the American Community Survey and a sample of Arkansas Strava bicycle ridership data. Assuming that Strava captures 10% of bicycle riders, that the protected bicycle path will result in a 75% increase, and that 10% would have made the trip by another mode and 1% would not have made the trip at all, BBC estimates that the proposed bike lanes will result in approximately 8,000 trips per year. BBC used the median distance travelled per activity, 2.38 miles, suggested by USDOT. The value of a statistical life used for the HEAT model is derived from the Department of Transportation's "Benefit-Cost Analysis Guidance for Discretionary Grant Programs." The HEAT model output puts the current value of the average annual benefit, averaged across 20 years, at \$285,000 when future benefits are discounted by 7% per year.

**Avoided health care costs.** The health benefit includes a calculation of the avoided health care costs for chronic health conditions linked to physical inactivity. Those chronic diseases and conditions include heart disease, stroke, diabetes, cancer, and poor mental health.<sup>1</sup> These costs are different than costs included in the HEAT model as it deals with morbidity, whereas the HEAT model accounts for mortality only. The direct costs associated with the chronic diseases and other health conditions consist of the marginal medical costs associated with treating that specific condition and are only associated with those individuals that have the chronic disease or condition. Indirect costs included costs associated with absenteeism and presenteeism<sup>2</sup> of both the individual and caretaker. The indirect costs associated with each condition are costs to employers, the government, the individual, and the national or local economy.

The US Departments of Health and Human Services recommends 150 minutes of moderately intense physical activity per week for health benefits that can lead to a lower risk of chronic health conditions. Using those guidelines, BBC assumed that bicycle commuters have the highest possibility of health protection from biking. BBC assumed 25% of new bicyclists are commuters or frequent cyclists based on the percentage of Strava activities that are reported as commutes. BBC determined Arkansas specific incidence rates of the five chronic conditions linked to physical inactivity (using data from the U.S. Centers for Disease Control [CDC]). BBC applied the incidence rates of the five chronic conditions to the estimated number of new commuters or frequent cyclists to determine the number of the bicyclists that could avoid chronic disease by staying physically active. The number of new commuters is multiplied by the Arkansas specific total annual direct and indirect costs associated with the five chronic conditions (based on estimates from the Milken Institute's *An Unhealthy America: The Economic Impact of Chronic Disease*) to determine the estimated total amount of avoided health care costs contributed to bicycling. Based on these calculations, BBC determined that the annual potential avoided healthcare costs are \$765,000.



## Safety Benefits

BBC calculated the monetary value of bicycle crashes that will be prevented by the expansion of Russellville's bicycle trail system. Based on the monetized value of on-street and off-street bicycle injuries per mile traveled, BBC estimated that the proposed bicycle paths will prevent bicycle crashes worth approximately \$448,000 annually based on the estimated current bicycle ridership and the estimated future ridership in Russellville.

## Economic Competitiveness Benefits

BBC determined the economic competitiveness benefits of the proposed bicycle lanes by determining vehicle operating cost savings using the annual reduced vehicle-miles of travel (VMT) detailed above. BBC used per mile vehicle operating cost values for light duty vehicles from the Department of Transportation's "Benefit-Cost Analysis Guidance for Discretionary Grant Programs." After multiplying per mile vehicle operating costs by the VMT savings, BBC determined that the proposed bicycle lanes would result in an annual \$44,000 in decreased transportation costs.

## Environmental Sustainability Benefits

BBC quantified the environmental sustainability benefit of the proposed paths by determining the annual reduction of vehicle-miles of travel (VMT) and emissions resulting from bicycle trips induced by the project. Monsere et. al. (2014) found that after the installation of a protected bicycle lane, bicycle counts increased by an average of 75%.<sup>3</sup> In an intercept survey of bicyclists, Monsere found that 10% would have made the trip by another mode and 1% would not have made the trip at all. Using the estimated bicycle trips induced by the installation of the bicycle paths, BBC was able to estimate the annual VMT savings that will result from the proposed bicycle paths.

The environmental sustainability benefit is the monetary value of the reduced emissions that would result from the annual VMT savings. BBC assumed that 50% of the VMT savings would be from passenger cars and 50% would be from light trucks. Running emissions, grams per mile of travel, for passenger cars and light trucks were taken from the Arkansas Department of Environmental Quality.<sup>4</sup> The running emissions were multiplied by the passenger car and light truck VMT, converted into short tons, and monetized using values provided in Department of Transportation. The proposed bicycle paths would cause emissions reductions worth approximately \$4,000 annually.

## Quantified Results

Based on the Safety, Health, and Environmental Sustainability benefits calculated as part of the benefit analysis BBC determined that the annual benefit of the proposed expansion of Russellville's bicycle trail system is approximately \$1.5 million or approximately \$31 million over twenty years.

<sup>1</sup> World Health Organization

<sup>2</sup> Presenteeism is defined as employees working while ill which results in reduced productivity.

<sup>3</sup> Chris Monsere et al., "Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S.," NITC-RR-583. Portland, OR. <http://dx.doi.org/10.15760/trec.115>

<sup>4</sup> Cars and Air Pollution. Arkansas Department of Environmental Quality. <https://www.adeq.state.ar.us/air/planning/ozone/cars.aspx>