Beckett Bridge Replacement

Tarpon Springs, FL

A. Benefit-Cost Analysis Technical Memorandum

Bridge Investment Program (BIP)
Grant Application

SEPTEMBER 2022

Contact

Pinellas County Board of County Commissioners

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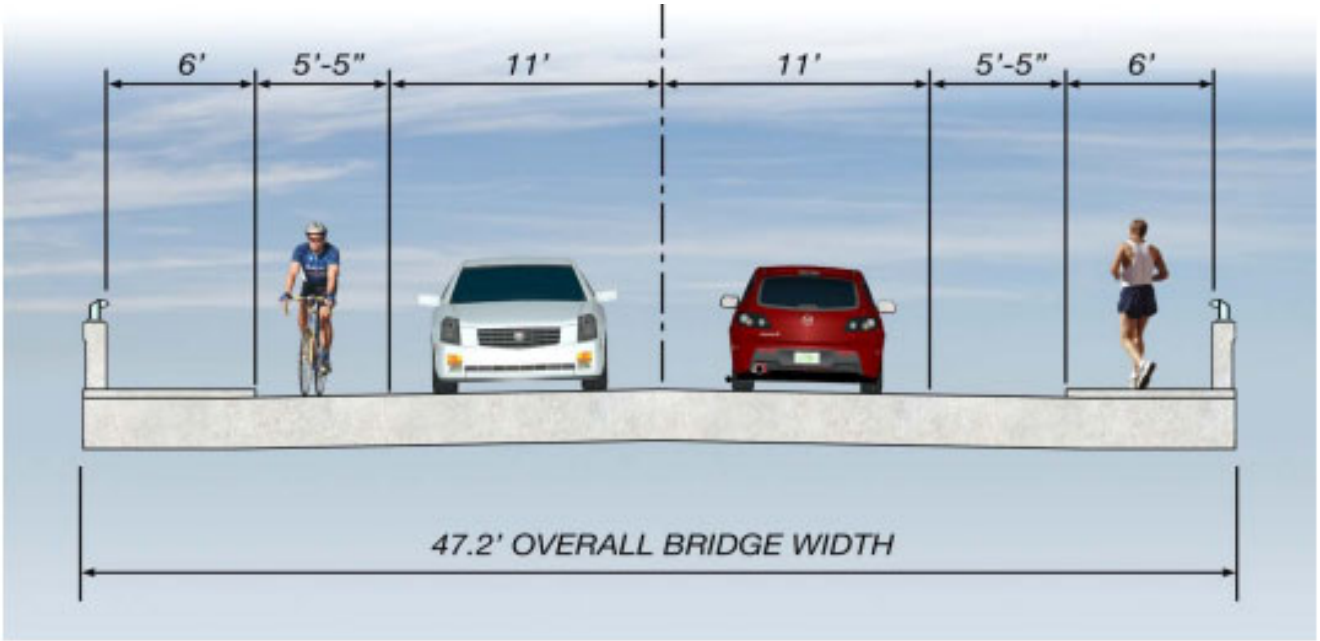
BECKETT BRIDGE REPLACEMENT PROJECT

BENEFIT-COST ANALYSIS SUPPLEMENTARY DOCUMENTATION



FY2022 BRIDGE INVESTMENT PROGRAM DISCRETIONARY GRANT PROGRAM

PREPARED FOR: PINELLAS COUNTY, FLORIDA
DATE: SEPTEMBER 8, 2022

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Executive Summary

A benefit-cost analysis (BCA) was conducted for the Beckett Bridge Replacement Project (the Project) for submission to the U.S. Department of Transportation (U.S. DOT) as a requirement of a discretionary grant application for the 2022 Bridge Investment Program (BIP). The analysis was conducted in accordance with the benefit-cost methodology as outlined by U.S. DOT in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs, released in March 2022. The period of analysis corresponds to 36 years which includes 6 years of design and construction and 30 years of benefits after operations begin in 2026.

The Project entails the replacement of an existing bascule bridge in Tarpon Springs, Florida. The existing bridge, which was originally built in 1924, has seen major repairs in 1956, 1979, 1997, and 2012, but requires replacement in order to stay open to traffic. The existing bridge is 28 feet and ½ inch wide with one-10' lane per direction, and 2'-2" sidewalks separated by a curb on both sides of the bridge. When closed, the vertical clearance of the bridge is 6' with a navigational width of 25'. The crossing has an annual average daily traffic (AADT) of approximately 6,000 vehicles per day, but traffic is restricted to 12-ton Single Unit Trucks and 15-ton Combination Trucks, limiting emergency response vehicles, school buses, and larger trucks. According to preliminary engineering reports, which were conducted in 2015, the existing bridge has a useful life of about 10 years. Thus, past 2025 in a no-action case, it is assumed that there would be no crossing available for any vehicular traffic.

The preferred alternative, a replacement of the existing bridge with a new one-lane-per-direction bascule bridge, would maintain the road connection for a 75 year service life. The new bridge would have a width of 48.58 feet, with one 10' travel lane per direction, one 6.5' bike shoulder per direction, and two 6.5' sidewalks. The vertical clearance would improve from 6' to 7.8' when closed with a navigational width of 25'. All roadway restrictions would be lifted, allowing access for trucks, emergency vehicles, and school buses.

COSTS

The capital cost for this Project is expected to be $20.4 million in undiscounted 2020 dollars through 2025.[1] At a seven percent real discount rate, these costs are $16.0 million. Table ES-1 shows how these costs are allocated across time and major expense category.

Table ES-1: Project Costs by Category and Year, in Undiscounted Millions of 2020 Dollars

Cost Category	2021 & Prior	2022	2023	2024	2025	Total
Planning and Design	$0.9	$0.9				
Construction			$6.4	$6.2	$6.1	
Total	$0.9	$0.9	$6.4	$6.2	$6.1	$20.4
Total, Discounted 7%	$0.9	$0.8	$5.2	$4.7	$4.3	$16.0

Source: Pinellas County

In addition to capital costs, the Build Case has different assumed operations and maintenance costs. According to Pinellas County, the current O&M costs of the No-Build bridge are $0.3 million in undiscounted 2020 dollars, while the expected O&M for the Build Case is $0.14 million in undiscounted 2020 dollars. However, because the No-Build Case assumes the bridge will not be functional post-2025, the O&M assumptions in the No-Build case are modeled at $0 for the entirety of the 30-year benefit analysis

[1] Note that these costs differ from those reported in the Project Narrative due to the use of 2019 dollars rather than year-of-expenditure dollars.

period which begins in 2026. Thus, the total O&M costs of the No-Build are a disbenefit of -$4.2 million in undiscounted 2020 dollars, or -$1.2 million in discounted terms.

BENEFITS

In 2020 dollars, the Project is expected to generate $30.7 million in discounted benefits using a seven percent discount rate. The project primarily derives benefits from the inclusion of emergency vehicle access on the new Beckett bridge, which is not available in the No-Build case. Travel time savings for auto drivers and health and active transportation benefits also add value to the Build case. This leads to an overall project Net Present Value of $14.8 million and a Benefit Cost Ratio (BCR) of 1.9[2]. The overall project benefit matrix can be seen in Table ES-2.

[2] Per USDOT guidance, operations and maintenance costs are included in the numerator along with other project benefits when calculating the benefit-cost ratio.

Table ES-2: Project Impacts and Benefits Summary, Monetary Values in Millions of 2020 Dollars

Current Status/Baseline & Problem to be Addressed	Change to Baseline/ Alternatives	Type of Impact	Population Affected by Impact	Economic Benefit	Summary of Results (at 7% discount rate)	Page Reference in BCA Appendix
Emergency Service Vehicles Cannot Access the Beckett Bridge to respond to calls	New bridge will provide access to emergency service vehicles, speeding up response times to critical events	A reduction in mortality in cardiac arrest incidents due to faster emergency service response time	Approximately 25% of Tarpon Springs population	Mortality Reduction	$23.7	Pg. 9
Auto users will not be able to use the Beckett bridge for east-west travel, adding to congestion on other roadways	New bridge will provide access and congestion management	Travel time delay would increase in the No-Build Case	Drivers in the Build Case	Travel Time Savings	$4.4	Pg. 11
Pedestrians and cyclists have inadequate access	Improved pedestrians and cyclists access		Bike/Ped users in the Build Case	Active Transportation Improvements, Health Improvement from Walking and Cycling	$3.0	Pg. 9
The current bridge has a useful life period that is projected to be met in the next 10 years	New bridge has a projected useful life of 75 years, outpacing the No-Build and analysis periods	Residual value of the Build case results in monetized benefits at the end of the analysis period	Pinellas County	Residual Value	$0.8	Pg. 12

The overall Project impacts can be seen in Table ES-3, which shows the magnitude of change and direction of the various impact categories.

Table ES-3: Project Impacts for Project, Cumulative 2026-2055

Category	Unit	Quantity	Change
Vehicle-Hours Traveled	VHT	919,384	▼
Avoided Cardiac Arrest Deaths	#	7	▲
Added Cyclists	#	657,000	▲
Added Pedestrians	#	1,095,000	▲

In addition to the monetized benefits presented in Table ES-2, the Project would provide access to school buses and commercial vehicles that are restricted from using the bridge in the No-Build case, which has time savings, vehicle operating costs, and emissions benefits from more direct connections. The new bascule bridge will have a higher and wider clearance for boats, which is expected to reduce the number of bridge openings, reducing travel delays and reliability for road users and minimizing operating costs. Finally, the new facility will meet design standards and more sustainable materials, alleviating worker safety and environmental concerns of the existing bridge. While these benefits are not easily quantifiable, they do provide real advantages and improvements that will be experienced by individuals and businesses in the region.

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1 INTRODUCTION

A benefit-cost analysis (BCA) was conducted for the Beckett Bridge Replacement Project (the Project) for submission to the U.S. Department of Transportation (U.S. DOT) as a requirement of a discretionary grant application for the Bridge Investment 2022 program. The following section describes the BCA framework, evaluation metrics, and report contents.

BCA FRAMEWORK

A BCA is an evaluation framework to assess the economic advantages (benefits) and disadvantages (costs) of an investment alternative. Benefits and costs are broadly defined and are quantified in monetary terms to the extent possible. The overall goal of a BCA is to assess whether the expected benefits of a project justify the costs from a national perspective. A BCA framework attempts to capture the net welfare change created by a project, including cost savings and increases in welfare (benefits), as well as disbenefits where costs can be identified (e.g., project capital costs), and welfare reductions where some groups are expected to be made worse off as a result of the proposed project.

The BCA framework involves defining a Base Case or "No Build" Case, which is compared to the "Build" Case, where the grant request is awarded and the project is built as proposed. The BCA assesses the incremental difference between the Base Case and the Build Case, which represents the net change in welfare. BCAs are forward-looking exercises which seek to assess the incremental change in welfare over a project life-cycle. The importance of future welfare changes are determined through discounting, which is meant to reflect both the opportunity cost of capital as well as the societal preference for the present.

The analysis was conducted in accordance with the benefit-cost methodology as recommended by the U.S. DOT in the 2022 Benefit-Cost Analysis Guidance for Discretionary Grant Programs.[3] This methodology includes the following analytical assumptions:

- Defining existing and future conditions under a No Build base case as well as under the Build Case;
- Assessing the independent utility of each project if the overall application contains multiple separate projects linked together in a common objective;
- Estimating benefits and costs during project construction and operation, including 30 years of operations beyond the Project completion when benefits accrue;
- Using U.S. DOT recommended monetized values for reduced fatalities, injuries, property damage, travel time savings, and emissions, while relying on best practices for monetization of other benefits;
- Presenting dollar values in real 2020 dollars. In instances where cost estimates and benefits valuations are expressed in historical or future dollar years, using an appropriate inflation factor to adjust the values;
- Discounting future benefits and costs with a real discount rate of seven percent consistent with U.S. DOT guidance.

[3] U.S. Department of Transportation, Benefit-Cost Analysis Guidance for Discretionary Grant Applications, March 2022. https://www.transportation.gov/sites/dot.gov/files/2022-03/Benefit%20Cost%20Analysis%20Guidance%202022%20%28Revised%29.pdf Access March 18, 2022.

REPORT CONTENTS

Section 0 of this report contains a description of the Project, information on the general assumptions made in the analysis, and a description of the base case compared to the Build case. Section 0 provides a summary of the anticipated project costs. Section 0 reviews the expected economic benefits the Project would generate, including a review of the assumptions and methodology used to calculate the benefits. Finally, Section 0 reports the high-level results of the benefit-cost analysis.

2 PROJECT OVERVIEW

DESCRIPTION

A benefit-cost analysis (BCA) was conducted for the Beckett Bridge Replacement Project (the Project) for submission to the U.S. Department of Transportation (U.S. DOT) as a requirement of a discretionary grant application for the 2022 Bridge Investment Program (BIP). The analysis was conducted in accordance with the benefit-cost methodology as outlined by U.S. DOT in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs, released in March 2022. The period of analysis corresponds to 36 years which includes 6 years of design and construction and 30 years of benefits after operations begin in 2026.

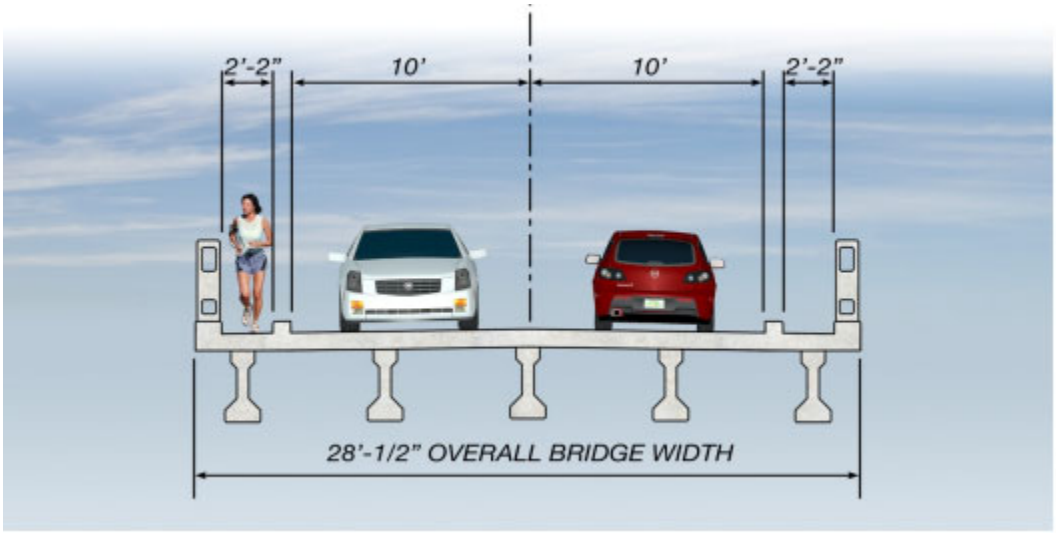
The Project entails the replacement of an existing bascule bridge in Tarpon Springs, Florida. The existing bridge, which was originally built in 1924, has seen major repairs in 1956, 1979, 1997, and 2012, but requires replacement in order to stay open to traffic. The existing bridge is 28 feet and ½ inch wide with one-10' lane per direction, and 2'-2" sidewalks separated by a curb on both sides of the bridge. When closed, the vertical clearance of the bridge is 6' with a navigational width of 25'. The crossing has an annual average daily traffic (AADT) of approximately 6,000 vehicles per day, but traffic is restricted to 12-ton Single Unit Trucks and 15-ton Combination Trucks, limiting emergency response vehicles, school buses, and larger trucks. According to preliminary engineering reports, which were conducted in 2015, the existing bridge has a useful life of about 10 years. Thus, past 2025 in a no-action case, it is assumed that there would be no crossing available for any vehicular traffic.

The preferred alternative, a replacement of the existing bridge with a new one-lane-per-direction bascule bridge, would maintain the road connection for a 75 year service life. The new bridge would have a width of 48.58 feet, with one 10' travel lane per direction, one 6.5' bike shoulder per direction, and two 6.5' sidewalks. The vertical clearance would improve from 6' to 7.8' when closed with a navigational width of 25'. All roadway restrictions would be lifted, allowing access for trucks, emergency vehicles, and school buses.

Figure 1. Project Location in Tarpon Springs, Pinellas County

Source: Beckett Bridge Preliminary Engineering Report, February 2015

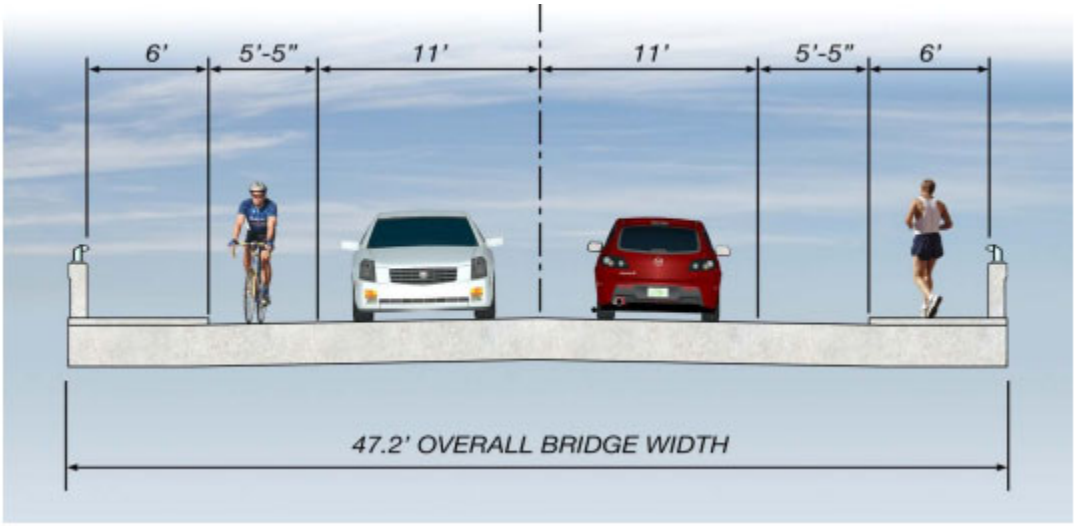
Figure 2. Existing Bridge Cross Section



Source: Beckett Bridge Preliminary Engineering Report, February 2015

The Project proposes the replacement of the existing bridge with a new one-lane-per-direction bascule bridge, which would maintain the road connection for a 75-year service life. Based on the 2015 Bridge Report, the new bridge would have a width of 47.2', with one 11' travel lane per direction, one 5.5' bike lane per direction, and two 6' sidewalks. Engineering design was completed in 2021 to improve the bridge with revised typical section to include one 10' travel lane per direction with 6.5' bike shoulders and 6.5' sidewalks in both directions. The new overall width is 48.58 feet. The vertical clearance would be an improvement from 6' to 7.8' when closed with a navigational width of 25'. All roadway restrictions would be lifted, allowing access for trucks, emergency vehicles, and school buses.

Figure 3. Preferred Alternative Cross-Section



Source: Beckett Bridge Preliminary Engineering Report, February 2015

The completion of this project will ensure an important east-west connection in Tarpon Springs, while providing easier access for boats into the Whitcomb Bayou. Because the useful life of the existing bridge is not expected to go beyond 2025 in the No-Build Case, the Build Case creates all the benefits of an existing connection, while providing additional benefits to other users. The Build Case will provide safer connections for multi-modal users and ensure a critical point of connection for emergency vehicles across Tarpon Springs, who currently experience an 8.5 minute delay on some medical emergency and fire response calls due to lack of access on the current crossing.

GENERAL ASSUMPTIONS

The evaluation period for this project includes a 6-year design and construction period, from 2020-2025, during which capital expenditures are undertaken, plus 30 years of operations beyond Project completion within which benefits accrue (through 2055).

Dollar figures in this analysis are expressed in constant 2020 dollars (2020$). Capital costs, which were provided in year-of-expenditure terms, were converted to 2020 dollars using federal reserve guidance for years 2020-2022 and then an annual inflation rate of 2.48% for years 2023 and beyond, which reflect a blended average of inflation rates from 2010-2022.[4]

[4] 2022 USDOT BCA Guidance for historic inflation rate, CPI estimates for 2022, and Minneapolis Fed historic

The real discount rate used for this analysis was 7.0 percent, consistent with USDOT guidance for 2022 RAISE grants and OMB Circular A-94.[5]

BASE CASE AND BUILD CASE

The Base (or No-Build Case) is defined as the continual maintenance of the existing bridge until the end of useful life is met. Per the 2015 Preliminary Engineering Report, there was an expected 10 additional years of useful life. This assumption means that beginning in 2026, the No-Build case assumes that there is no connection where the current bridge exists. Operations and Maintenance (O&M) costs are similarly reduced from $0.3 million per year in undiscounted 2020 dollars to $0.

The Build Case assumes that beginning in 2026, the new bridge (as defined above) will open, maintaining existing traffic conditions while expanding safer access to cyclists, pedestrians, trucks, buses, and emergency access vehicles. The Build Case has a 75-year life span, which means benefits will accrue throughout the 30-year analysis period as well as generate residual value for the remaining period of its useful life.

[5] 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://obamawhitehouse.archives.gov/sites/default/files/omb/assets/a94/a094.pdf. Accessed March 18, 2022.

3 - PROJECT COSTS

CAPITAL COSTS

The project costs include planning, design, and construction costs, outlined in the 2015 Preliminary Engineering Report in year-of-expenditure terms. These costs were converted to 2020 dollars, and equate to $20.4 million in undiscounted terms, or $16.0 million in discounted terms.

Table 1: Project Costs by Category and Year, in Undiscounted Millions of 2020 Dollars

Cost Category	2021 & Prior	2022	2023	2024	2025	Total
Planning and Design	$0.9	$0.9				
Construction			$6.4	$6.2	$6.1	
Total	$0.9	$0.9	$6.4	$6.2	$6.1	$20.4
Total, Discounted 7%	$0.9	$0.8	$5.2	$4.7	$4.3	$16.0

Source: Pinellas County

OPERATIONS AND MAINTENANCE COSTS

In addition to capital costs, the Build Case has different assumed operations and maintenance costs. According to Pinellas County, the current O&M costs of the No-Build bridge are $0.3 million in undiscounted 2020 dollars, while the expected O&M for the Build Case is $0.14 million in undiscounted 2020 dollars. However, because the No-Build case assumes the bridge will not be functional starting in 2026, the O&M assumptions in the No-Build case are modeled at $0 for the entirety of the 30-year analysis period. Thus, the total O&M costs of the No-Build are a disbenefit of -$4.2 million in undiscounted 2020 dollars, or -$1.2 million in discounted terms.

Table 2. Annual O&M Costs in Millions of 2020 Dollars

Year	No Build	Build
	O&M	**O&M**
2024	$0.3	$0.0
2025	$0.3	$0.0
2026	$0.0	$0.14
…	…	…
2055	$0.0	$0.14

4 - PROJECT BENEFITS

The Build Case is expected to generate numerous benefits related to maintaining access to passenger vehicles and the expansion of access to multi-modal users, school buses, trucks, and emergency access vehicles. In that regard, the Build Case will provide travel time savings, generate health benefits for cyclists and pedestrians, increase survival rates from cardiac arrest due to improved emergency response times, and generate other benefits related to active transportation.

Table 3: Project Benefits

Benefit (Disbenefit) Category	Description	Monetized	Quantified	Qualitative
Travel Time Savings		√		
Health Benefits		√		
Commuter Mobility Benefits		√	√	

Source: WSP, 2022

DEMAND PROJECTIONS

The benefits of the Project rely on maintaining existing access for automobiles across the Whitcomb Bayou, while also expanding access to multi-modal users, trucks, and emergency service vehicles. These benefits will produce travel time savings for auto users, as well as health benefits for cyclists, pedestrians, and improved mortality rates for cardiac arrest victims who will see improved response times.

Table 4: Demand Projection Assumptions and Sources

Variable	Unit	Value	Source
Beckett Bridge Traffic	AADT	6,000	FDOT Traffic Online (2021)[6]
Intersection Average Delay per Vehicle– 2018 Model Year	Seconds/vehicle	20	WSP analysis of 2012 Traffic Study[7]
Intersection Average Delay per Vehicle– 2035 Model Year	Seconds/vehicle	45	WSP analysis of 2012 Traffic Study
Average Response Delay	Minutes/Emergency Response	8.5	Tarpon Springs Fire Department Letter of Support
OHCA Survival Rate – Build	Factor	9.92%	FEMA BCA Guidance[8]

[6] FDOT 2021. https://tdaappsprod.dot.state.fl.us/fto/

[7] Beckett Bridge Project Development and Environment (PD&E) Study Design Traffic Technical Memorandum 2012

[8] FEMA BCA Guidance (p. 17, formula (19): https://files.hudexchange.info/course-content/ndrc-nofa-benefit-cost-analysis-data-resources-and-expert-tips-webinar/FEMA-BCAR-Resource.pdf

Variable	Unit	Value	Source
OHCA Survival Rate – No Build	Factor	3.74%	FEMA BCA Guidance[9]
Bicyclist Usage Rate – Build	Factor	1%	Conservative Assumption
Pedestrian Usage Rate – Build	Factor	3%	Conservative Assumption

Source: WSP review of various sources

The resulting demand projections are presented in the following table. These results show the estimated annual changes in the project's opening year and final year of analysis. In the project's total operations period, it is expected that the build case will reduce 7 cardiac arrest deaths, save over 900,000 hours in travel time for auto users, and generate over 3,000,000 bike and pedestrian trips on the new bridge.

Table 5: No Build and Build Demand Projections

Variable	Project Opening Year		Final Year of Analysis	
	No Build	**Build**	**No Build**	**Build**
Avoided Cardiac Arrest Deaths	0	0.23	0	0.23
Travel Time Savings	0 hours	~19,600 hours		~33,700 hours
Annual Cyclists	0 cyclists	21,900 cyclists	0 cyclists	21,900 cyclists
Annual Pedestrians	0 pedestrians	65,700 pedestrians	0 pedestrians	65,700 pedestrians

Source: WSP, 2022

SAFETY

The Build Case meets the current bridge design and safety standards and adds wide bike lanes/shoulders and wide sidewalks. The inclusion of pedestrian and bicycle infrastructure especially improves conditions for these users. Based on the latest data, there are minimal safety incidents that would be mitigated with the Build Case. As such, safety benefits were not quantified.

QUALITY OF LIFE

This project will create health, active transportation, and emergency response benefits in the Build Case by allowing access for new types of traffic that are currently barred from using the current bridge. The largest of these benefits, emergency response benefits, is quantified by the expected reduction in deaths from cardiac arrests due improved emergency response times. The inclusion of sidewalks and bike lanes similarly have health benefits from the long-term reduction in mortality from increased active transportation trips. Finally, there are inherent benefits of active transportation facilities that can be monetized for the purposes of this BCA.

As demonstrated from existing datasets, cyclists and pedestrians use the existing facilities on the Beckett Bridge a minimal amount due to lack of proper facilities. With the No-Build case, it is assumed there would be zero bike and pedestrian users during the analysis period. The Build Case adds facilities that will

[9] FEMA BCA Guidance (p. 18, formula (24): https://files.hudexchange.info/course-content/ndrc-nofa-benefit-cost-analysis-data-resources-and-expert-tips-webinar/FEMA-BCAR-Resource.pdf

encourage a growth in pedestrian and cyclists. It is conservatively assumed that there will be 1% of existing AADT as cyclists (or 60 daily cyclists) and 3% of existing AADT as pedestrians (or 180 daily pedestrians).

Overall, it is estimated that about 21,900 annual cyclists will use the bridges in the Build case by the final operations analysis year (2058), and another 65,700 pedestrians will use the facilities annually. This generates about $3.0 million in total discounted benefits related to the health benefits of walking and cycling, and another $0.05 million in inherent benefits of active transportation, both in 2020$ discounted terms.

Finally, the estimated benefit of emergency response was calculated for the Build Case. It is assumed that the Build scenario creates access for all emergency vehicles across the Beckett Bridge during the analysis period. According to the Tarpon Springs Fire Department, the lack of access on the Beckett Bridge leads to an 8.5 minute delay for emergency response vehicles that could use the bridge if allowed. Emergency response access was monetized based on the value of avoided out-of-hospital cardiac arrest deaths only. A cardiac arrest rate of 58.5 people per a population of 100,000 was used to estimate the number of potential cardiac arrest incidents. This rate was applied to the residential population of Tarpon Springs (25,560 people). To account for the fact that the bridge may not be the most efficient route for all responses in the city, it is conservatively assumed that only 25% of the population would benefit from increased emergency response times. This estimate results in approximately 4 cardiac arrest events per year.

American Heart Association estimates on emergency services response times and survival rates was used to estimate the number of avoided deaths per year between the No-Build and Build Case. In the No-Build Case, it is assumed that response time would be 8.5 minutes (average response time) plus half of the expected delay, or an additional 4.25 minutes. This equates to a 12.75 minute total response time, associated with a 4% survival rate.[10] The Build-case maintains an average response time of about 8.5 minutes, consistent with a survival rate of 10%. The estimate of avoided deaths between the No-Build and Build cases is estimated at approximately 0.23 deaths per year. This equates to an annual benefit of approximately $1.8 million in discounted benefits in 2026, the project opening year. The total No-Build benefit of access for emergency service vehicles is assumed to be $15.3 million in 2020$ discounted terms. Please note that this case only quantifies health benefits associated with cardiac arrest in order to not overinflate the expectation of benefits. Many other emergency calls, including fire, stroke, and car crash injuries, also require critical emergency response but are not quantified to normalize benefits.

Table 6: Travel Time Savings Assumptions and Sources

Variable	Unit	Value	Source
Average Response Delay	Minutes/Emergency Response	8.5	Tarpon Springs Fire Department Letter of Support
OHCA Survival Rate – Build	Factor	9.92%	FEMA BCA Guidance[11]
OHCA Survival Rate – No Build	Factor	3.74%	FEMA BCA Guidance[12]

[10] American Heart Association. "Shortening Ambulance Response Time Increases Survival in Out-of-Hospital Cardiac Arrest". Oct 2020. https://www.ahajournals.org/doi/10.1161/JAHA.120.017048

[11] FEMA BCA Guidance (p. 17, formula (19): https://files.hudexchange.info/course-content/ndrc-nofa-benefit-cost-analysis-data-resources-and-expert-tips-webinar/FEMA-BCAR-Resource.pdf

[12] FEMA BCA Guidance (p. 18, formula (24): https://files.hudexchange.info/course-content/ndrc-nofa-benefit-cost-analysis-data-resources-and-expert-tips-webinar/FEMA-BCAR-Resource.pdf

Variable	Unit	Value	Source
Cardiac Arrest Rate (population per 100,000)	Factor	58.5/100,000 (0.006%)	FEMA BCA Guidance[13]
Tarpon Springs Population	People	25,560	Census QuickFacts[14]
Bicyclist Usage Rate – Build	Factor	1%	Conservative Assumption
Pedestrian Usage Rate – Build	Factor	3%	Conservative Assumption

Source: WSP, 2022

Table 7: Quality of Life Benefits, Millions of 2020 Dollars

Benefit	Project Opening Year		Project Lifecycle	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Active Transportation Benefits	<$0.01	<$0.01	$0.2	$0.05
Bike and Pedestrian Health Benefits	$0.3	$0.2	$11.8	$3.0
Emergency Response Benefits	$2.7	$1.8	$80.3	$23.7

ECONOMIC COMPETITIVENESS AND OPPORTUNITY

This project would contribute to increasing economic opportunity through increased travel time savings of auto users and freight delivery, who will otherwise have to divert to other east-west roadways that may be less efficient.

TRAVEL TIME SAVINGS

Because the Beckett Bridge will no longer provide a connection between across the Whitcomb Bayou, approximately 6,000 daily vehicles will need to divert to other roadways in order to travel east-west in Tarpon Springs. While in practical terms this would lead to an expected increase in vehicle-miles traveled and associated increases in carbon emissions, this analysis conservatively applied a travel time reduction cost to the No-Build Case. Traffic analysis for two intersections southeast of the Whitcomb Bayou were used to estimate the increased delay in the Build vs No Build Case. This approach thus ignores other potential areas where increased delay may happen, conservatively estimating travel time savings for which traffic modeling has been done during the peak hours.

Traffic models were run for conditions in 2018 and a future year of 2038. Travel time savings for the project opening year through 2037 were interpolated based on the model results, and conservatively held at 2038 traffic levels in post-2038 years. Overall, this led to an estimated 19,600 hours in travel time savings between the Build and No Build Case in the project opening year, and over 900,000 hours saved during the 30-year analysis period. This equates to about $0.2 million in opening year benefits in 2020 dollars at a

[13] FEMA BCA Guidance (p. 17, formula (14): https://files.hudexchange.info/course-content/ndrc-nofa-benefit-cost-analysis-data-resources-and-expert-tips-webinar/FEMA-BCAR-Resource.pdf

[14] https://www.census.gov/quickfacts/fact/table/tarponspringscityflorida/AGE775221

discounted rate. For the project lifetime, travel time savings are expected to be $4.4 million. Analysis was not conducted for time savings related to trucks or other vehicles who currently have to divert, therefore giving a conservative estimate for future travel time savings.

Table 8: Travel Time Savings Assumptions and Sources

Variable	Unit	Value	Source
Intersection Average Delay per Vehicle– 2018 Model Year	Seconds/vehicle	20	WSP analysis of 2012 Traffic Study[15]
Intersection Average Delay per Vehicle– 2035 Model Year	Seconds/vehicle	45	WSP analysis of 2012 Traffic Study
Alt. US 19 at Meres + Alt US 19 at Tarpon 2018 peak hour volumes	AADT	8,512	WSP analysis of 2012 Traffic Study
Alt. US 19 at Meres + Alt US 19 at Tarpon 2035 peak hour volumes	AADT	10,156	WSP analysis of 2012 Traffic Study
Assumed Post-2035 Traffic Growth	Factor	0%	Conservative Assumption

Source: WSP, 2022

Table 9: Travel Time Savings, Millions of 2020 Dollars

Benefit	Project Opening Year		Project Lifecycle	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Travel Time Savings - Auto	$0.3	$0.2	$16.4	$4.4

STATE OF GOOD REPAIR

The state of good repair condition benefits assessed in this analysis include changes in O&M costs.

The assumptions used in the estimation of state of good repair benefits are presented in the following table. The current annual O&M costs of the No-Build bridge are $0.3 million in undiscounted 2020 dollars, while the expected annual O&M for the Build Case is $0.14 million in undiscounted 2020 dollars. However, because the No-Build Case assumes the bridge will not be functional post 2025, the O&M assumptions in the No-Build Case are modeled at $0 for the entirety of the 30-year analysis period. Thus, the total O&M costs of the No-Build are a disbenefit of -$4.2 million in undiscounted 2020 dollars, or -$1.2 million in discounted terms.

[15] Beckett Bridge Project Development and Environment (PD&E) Study Design Traffic Technical Memorandum 2012

The project also generates residual benefits, which consider the remaining value of the project past the analysis period. Applied during the final year in the analysis period, the discounted residual value is $0.8 million.

Table 10: State of Good Repair Benefits, Millions of 2020 Dollars

Benefit	Project Opening Year		Project Lifecycle	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
O&M Disbenefit	-$0.1	-$0.1	-$4.2	-$1.2
Residual Value	-	-	$8.1	$0.8

5 SUMMARY OF RESULTS

EVALUATION MEASURES

The benefit-cost analysis converts potential gains (benefits) and losses (costs) from the Project into monetary units and compares them. The following common benefit-cost evaluation measures are included in this BCA:

- **Net Present Value (NPV):** NPV compares the net benefits (benefits minus costs) after being discounted to present values using the real discount rate assumption. The NPV provides a perspective on the overall dollar magnitude of cash flows over time in today's dollar terms.
- **Benefit Cost Ratio (BCR):** The evaluation also estimates the benefit-cost ratio; the present value of incremental benefits is divided by the present value of incremental costs to yield the benefit-cost ratio. The BCR expresses the relation of discounted benefits to discounted costs as a measure of the extent to which a project's benefits either exceed or fall short of the costs.
- **Internal Rate of Return (IRR):** The IRR is the discount rate which makes the NPV from the Project equal to zero. In other words, it is the discount rate at which the Project breaks even. Generally, the greater the IRR, the more desirable the Project.
- **Payback Period**: The payback period refers to the period of time required to recover the funds expended on a Project. When calculating the payback period, the time value of money (discounting) is not taken into account.

BCA RESULTS

The table below presents the evaluation results for the project. Results are presented in undiscounted and discounted at seven percent as prescribed by the U.S. DOT. All benefits and costs were estimated in constant 2020 dollars over an evaluation period extending 30 years beyond system completion in 2026.

The discounted benefits amount to $30.7 million, outweighing discounted costs of $16.0 million. This leads to a BCR of 1.9 and a NPV of $14.8 million, demonstrating that the project is cost-effective and a worthwhile investment. The internal rate of return (IRR) is expected to be 13%, while the payback period is 12 years.

Table 11: Benefit Cost Analysis Results, Millions of 2020 Dollars

BCA Metric	Undiscounted	Discounted (7%)
Total Benefits	$112.7	$30.7
Travel Time Savings	$16.4	$4.4
Quality of Life Benefits	$92.2	$26.7
Residual Value	$8.1	$0.8
O&M Disbenefit	$4.2	$1.2
Total Costs	$20.4	$16.0
Net Present Value (NPV)	$70.9	$11.7
Benefit Cost Ratio (BCR)	5.5	1.9
Internal Rate of Return (IRR)	13%	
Payback Period (Years)	12	

SENSITIVITY TESTING

This analysis relies on many assumptions that, while based on the best available knowledge, are uncertain. This sensitivity analysis evaluates the impact of adjusting key assumptions on the BCR and NPV. Specifically, the impact of emergency response, which is by far the highest area of benefit for the Project, was treated with more conservative assumptions to understand the overall elasticity of cost effectiveness to this input. In the base case, the benefit of improved emergency response (which changes the estimated survival rate from 3.7% to 9.9%) was only applied to 25% of the population because it is not assumed that every emergency response call would take the bridge. A sensitivity test was conducted that applied this benefit to just 10% of the population. The annual expected reduction in mortalities changes from approximately 0.23 avoided deaths per year to 0.09. The corresponding BCR changes from 1.9 to 1.0. The test demonstrates that while the benefits are very sensitive to the emergency response input, the project is still cost effective even under very conservative assumptions.

Table 12: Benefit Cost Analysis Sensitivity Analysis

Sensitivity Variable	Sensitivity Value	New BCR	New NPV	% Change in NPV	Source / Notes
Base results	Build (7% Discount Rate)			-	No Change to the Model
Emergency Response – Reduction in Population Benefiting	10% (25% in Build Case)	1.0	$0.5 million	-96%	

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Draft Memo Original	Draft Memo v1		
Date	8/16/2022	8/29		
Prepared by	Bryan Kiel & Jack Carey	Bryan Kiel & Jack Carey		
Checked by	NA	Shannon Alex, Becky Prado, Kate Ko, Christine Fanchi		
Authorized by		Alfonso Hernandez		