

**Benefit-Cost Analysis Supplementary
Documentation**

BUILD Grant Program

**I-75 and Overpass Rd.
Interchange**

Pasco County, FL

July 11, 2018

Benefit-Cost Analysis Supplementary Documentation

1. Introduction

This document provides detailed technical information on the economic analysis conducted in support of the grant application for the I-75 and Overpass Rd. Interchange in Pasco County, Florida project.

Section 2, Methodological Framework, introduces the conceptual framework used in the Benefit-Cost Analysis (BCA). Section 3, Project Overview, provides an overview of the project, including a summary of cost estimates and schedule; and a description of the types of effects that the proposed I-75 Interchange project is expected to generate. Section 4, General Assumptions, discusses the general assumptions used in the estimation of project costs and benefits, while estimates of travel demand/traffic growth can be found in Section 5, Travel Demand Projections. Specific data elements and assumptions pertaining to the merit selection criteria are presented in Section 6, Benefits Measurement, Data and Assumptions, along with associated benefit estimates. Estimates of the project's Net Present Value (NPV), its Benefit-Cost ratio (BCR) and other project evaluation metrics are introduced in Section 7, Summary of BCA Findings. Next, Section 8, BCA Sensitivity Analysis, provides the outcomes of the sensitivity analysis reflective of a lower discount rate. Additional data tables are provided in Section 9, Aggregate Annual Benefits and Costs, including annual projections of benefits and costs to assist USDOT in its review of the application.¹

2. Methodological Framework

The BCA conducted for this project includes the monetized benefits and costs measured using USDOT guidance. Some of the merits of the project could not be quantified. They are outlined qualitatively where applicable. A BCA provides projections of the benefits that are expected to accrue from a project over a specified period, and compares them to the anticipated costs of the project. Costs include both the resources required to develop the project and the costs of maintaining the new or improved asset over time. Benefits are based on the forecasted impacts of the project on both users and non-users of the facility, valued in monetary terms.²

¹ While the calculations/models themselves do not accompany this appendix, they are provided separately as part of the application.

² USDOT, Benefit-Cost Analysis Guidance for Discretionary Grant Programs, June 2018.

The specific methodology used for this application was developed with the BCA guidance prepared by USDOT, and is consistent with the BUILD program guidelines. In particular, the methodology involves:

- Establishing existing and future conditions under the Build and No-build scenarios;
- Assessing benefits with respect to each of the key long-term merit criteria identified in the Notice of Funding Opportunity (NOFO);
- Measuring benefits in dollar terms, whenever possible, and expressing benefits and costs in a common unit of measurement;
- Using USDOT guidance for the valuation of travel time savings, vehicle operating costs savings, safety benefits and reductions in air emissions, while relying on industry best practice for the valuation of other effects; and
- Discounting future benefits and costs with the real discount rates recommended by USDOT (7 percent, and 3 percent for sensitivity analysis).

3. Project Overview

This project will result in the reconstruction of the existing Overpass Road overpass at I-75 (No-Build) to a full diamond interchange at I-75 (Build). The project is located in Pasco County, Florida, which is part of the larger Tampa Bay region. A more detailed description of the project is provided in the main body of this application.

3.1 Types of Benefits/Impacts

The proposed I-75 Interchange at Overpass Road is expected to result in a number of changes impacting the regional population. These are broadly summarized in Table 1 below.

Table 1: Summary of the Transportation Improvements and Associated Impacts and Benefits

| Current Status or Baseline & Problems to Be Addressed | Changes to Baseline / Alternatives | Type of Impacts | Population Affected by Impacts | Benefits |
|--|---|--|--|--|
| The existing I-75 interchanges in the vicinity of Overpass Rd. are congested, which will be exacerbated by the expected population growth. | Reconfiguration of Overpass Rd. into a full interchange. | Congestion relief and changes in vehicle hours and vehicle miles traveled | Area residents and businesses, freight carriers, and travelers passing through the area. | Travel time savings, and vehicle operating cost savings. |
| Growing delays across the area road network generate air emissions. | The project alleviates delays by redistributing traffic to the new interchange. | Congestion relief and changes in vehicle speeds and vehicle miles traveled | All residents. | Reduced emission costs. |
| Growing traffic volumes across the area road network generate accidents | The reduced distance traveled by redistributing traffic to the new interchange. | Changes in vehicle miles traveled. | Area residents and businesses, freight carriers, and travelers passing through the area. | Reduced accident costs. |

3.2 Project Cost³ and Schedule

The proposed interchange reconfiguration project is estimated to cost \$63.2 million in total upfront investment. This amount is scheduled to be expended over a four-year timeframe, with the first year (2019) allocated to design-build proposal and concept plan completion as well as some right-of-way acquisition (at \$13.4 million), while the remainder through 2022 are allocated to the design/build activities (at \$49.8 million) of the project⁴. The table below shows an estimated cost and annual schedule related to the project.

³ All cost estimates in this section are in expressed in 2017 constant dollar terms, unless otherwise noted.

⁴ I-75 and Overpass Road Interchange Project, Florida Job Growth Grant Fund Public Infrastructure Grant Proposal, 2017

Table 2: Summary of the Project’s Estimated Investment Costs (in millions of 2017\$)

| | 2019 | 2020 | 2021 | 2022 | 4-year Total |
|-------------|---------|---------|---------|---------|--------------|
| Annual Cost | \$ 13.4 | \$ 14.9 | \$ 19.9 | \$ 14.9 | \$ 63.2 |

Starting from the first full year of the interchange operations in 2023, there will also be an increase in the operating and maintenance (O&M) costs for the improved facility relative to the No-Build scenario. The change in O&M costs was computed based on the difference between the current O&M costs (using the average per lane mile cost of \$14.3 thousand, and the current length of about 2 lane miles), and the Build configuration (based on the per mile cost of \$20.4 thousand, and length of about 7 lane miles). This incremental cost is projected to be \$103.8 thousand per year, for a 20-year operations total of \$2.08 million. As per the latest Benefit-Cost Analysis Guidance documents, O&M costs are included (as a negative value in this case) in the numerator of the benefit-cost ratio.

3.3 Disruptions Due to Construction

The construction of the proposed I-75 Interchange at Overpass Rd. is not expected to cause any significant disruption to existing traffic in the area. As most of the construction is envisioned, as practicable, to take place in the lightly-traveled overnight hours, and will be combined with various mitigating measures such as appropriate safety signage, the impact on traffic flow is expected to be minimal, and hence are assumed to be \$0 in the BCA.

3.4 Effects on Key Selection Criteria

The main benefit categories associated with the project are mapped into the key selection criteria set forth by USDOT in the table below.

Table 3: Benefit Categories and Expected Effects on the Key Selection Criteria

| Key Selection Criteria | Benefit or Impact Categories | Description | Monetized | Quantified | Qualitative |
|------------------------------|-----------------------------------|--|-----------|------------|-------------|
| State of Good Repair | Residual value of investment | Residual value of the project investment at the end of the period of analysis | Yes | Yes | No |
| Economic Competitiveness | Change in travel time costs | Change in travel time due to lower congestion in the area stemming from the new interchange | Yes | Yes | No |
| | Change in vehicle operating costs | Change in vehicle operating cost due to lower vehicle miles traveled in the region | Yes | Yes | No |
| | Job creation | Temporary construction jobs, and permanent jobs associated with development around the new interchange | No | No | Yes |
| | Improved land access | Improved access to developable land locations around the new interchange | No | No | Yes |
| Quality of Life | Improved access to jobs | Improved access to jobs in locations around the region | No | No | Yes |
| Environmental Sustainability | Change in emissions | Change in emission volumes due to lower vehicle miles traveled in the region | Yes | Yes | No |
| Safety | Safety benefits | Change in the number of accidents due to decreased vehicle miles traveled in the region | Yes | Yes | No |

4. General Assumptions

The BCA measures benefits against costs throughout the 24-year period of analysis beginning at the start of construction in year 2019, and including 20 years of operations from 2023 through 2042⁵.

The monetized benefits and costs are estimated in constant dollars of 2017 with future dollars discounted in compliance with BUILD requirements using a seven percent real rate, and sensitivity testing at three percent.

The methodology makes several important assumptions and seeks to avoid overestimation of benefits and underestimation of costs. Specifically:

- Input prices are expressed in 2017 dollars;
- The period of analysis begins in 2019 and ends in 2042. It includes project development and construction years (2019 - 2022), and 20 years of operations (2023 - 2042);
- A constant seven percent real discount rate is assumed throughout the period of analysis. A three percent real discount rate is used for sensitivity analysis; and
- Opening year demand is an input to the BCA, and is assumed to be fully realized in Year 1 (no ramp-up).

5. Travel Demand Projections

Travel demand projections serve as a critical input to forecasting the key benefits included in this BCA. The travel demand model deployed in this analysis was the Tampa Bay Regional Planning Model (TBRPM). This model was developed for the planning activities of the Tampa Bay Area. The model is a result of cooperative and combined planning efforts of the Florida Department of Transportation (FDOT) District 7 and the Metropolitan Planning Organizations (MPOs) in the Tampa Bay Area. The study area for the TBRPM corresponds with the jurisdiction of FDOT District 7 and includes Pasco, Hillsborough, Pinellas, Hernando, and Citrus Counties of Florida. TBRPM version 8.2 was used to develop the vehicle hours traveled (VHT) and vehicle miles traveled (VMT) forecast with and without the project. The regional VMT and VHT values were estimated for the base year 2010 without the proposed Overpass Road interchange. The future year 2040 model forecasts were produced for both No-Build and Build (with the interchange) conditions.

⁵ 2040 is the horizon year of the Tampa Bay Regional Planning Model that was used for quantification of the VHT and VMT differentials between the Build and N-Build scenarios.

5.1 Demand Projections Summary

The resulting projections for vehicle hours traveled and vehicle miles traveled by vehicle type for the Build and No-Build scenarios are presented in the Table 4 below.

Table 4: Travel Demand Projections, Average Daily VMT and VHT

| Year/Scenario | VMT Auto | VMT Truck | VHT Auto | VHT Truck |
|---------------|-------------|-----------|-----------|-----------|
| 2010 Base | 62,960,550 | 3,131,145 | 1,954,841 | 87,712 |
| 2040 No-Build | 100,183,439 | 5,231,318 | 3,533,712 | 172,915 |
| 2040 Build | 100,140,716 | 5,231,158 | 3,530,315 | 172,863 |

6. Benefits Measurement, Data and Assumptions

The proposed interchange project will yield various benefits for the traveling public and the larger economy. These are based most heavily on the reductions of times and distance traveled by motorists in the area. The following subsections describe the measurement approach used for each benefit or impact category identified in Table 3 (Benefit Categories and Expected Effects on Primary Selection Criteria), and provides an overview of the associated methodology, assumptions, and estimates.

6.1 State of Good Repair

To quantify the benefits associated with maintaining the existing transportation network in a state of good repair, the residual value of the project's initial investment in the interchange structure was estimated. The proposed interchange is expected to retain some value beyond the 2042 time horizon for which the various benefits described in this document are computed. The residual value of the proposed project was estimated based on the assumption of a useful life of 50 years for the structure.

Based on the initial value of \$49.8 million, and assuming straight-line depreciation, the combined residual value of the interchange in place in year 2042 is projected to be \$42.3 million (including \$12.4 in land/Row, which is assumed not to depreciate over time), with a discounted value of \$8.3 million in present value terms.

6.2 Economic Competitiveness

The proposed project would contribute to enhancing the economic competitiveness of the area and potentially beyond through improvements in the mobility of people and goods within and across the region. In this analysis, two measures of mobility are presented: travel-time savings, and vehicle operating cost savings.

6.2.1 TRAVEL TIME SAVINGS

Travel time savings are a function of vehicle hours traveled. The analysis of the reduction in VHT was based on the data from the TBRPM, as described in Section 5 above.

A summary of the VHT saved with the proposed interchange (Build), relative to the No-Build scenario, by major vehicle class for the first year of operations (2023) and the horizon year of 2042 is presented in Table 5 below. These changes are based on an annualization factor of 300 days.

Table 5: Projected VHT Savings (annualized)

| | Auto | Truck | Total |
|------|-----------|--------|-----------|
| 2023 | 315,865 | 4,613 | 320,478 |
| 2042 | 1,130,885 | 17,453 | 1,148,338 |

As can be seen in Table 5, VHT reductions are projected to amount to about 320 thousand in year 2023, increasing to 1.15 million in 2040, with the great majority (i.e., 98 percent) of the savings captured by automobile users.

The hours saved with the interchange build scenario were monetized with the motorist’s value of travel time (VOTT). This analysis recognizes that the economic VOTT varies by trip purpose, with derivations accounting for personal and business trip purposes in the automobile class. For each of the two (auto and truck) vehicle classes, the travel time benefits were derived by multiplying VHT savings by the appropriate VOTT (using the latest BCA Guidance for Discretionary Grants), and applicable vehicle occupancy rates. It should be noted that there is no induced demand in the travel demand model used as the number of trips under the Build and No-Build scenarios is the same. As such, the results pertain only to existing users, and not any induced travel demand.

Travel time savings are expected to be about \$6.6 million in the first year of operations (2022), increasing to \$23.7 million in year 2042, for a 20-year total of about \$286.2 million (before discounting), and \$100.1 million in discounted terms, as summarized in Table 6.

Table 6: Projected Total Travel Time Savings (in millions of 2017\$)

| | 2023 | 2042 | 20-year Total Before Discounting | 20-year Total Discounted at 7% |
|--------------|--------------|---------------|----------------------------------|--------------------------------|
| Automobiles | \$6.5 | \$23.2 | \$280.3 | \$98.0 |
| Trucks | \$0.1 | \$0.5 | \$5.9 | \$2.1 |
| Total | \$6.6 | \$23.7 | \$286.2 | \$100.1 |

6.2.2 VEHICLE OPERATING COST SAVINGS

Vehicle operating costs are a function of vehicle miles traveled. The new interchange at Overpass Rd. is projected to also result in reductions in travel distances in the area. This is expressed in the savings in VMT as per the results from the TBRPM, extrapolated through the 2042 analysis horizon year. A summary of the annualized VMT saved with the project, for autos and trucks, is presented in Table 7 below.

Table 7: Projected VMT Savings (annualized)

| | Auto | Truck | Total |
|------|------------|--------|------------|
| 2023 | 4,269,183 | 15,481 | 4,284,664 |
| 2042 | 14,101,114 | 52,745 | 14,153,859 |

As shown in Table 7, reductions in VMT are expected to reach about 4.3 million in 2023 rising to 14.2 million in 2042, with the vast majority of these reductions accrued to passenger vehicle users.

The vehicle operating cost savings related to this project were derived using the savings in VMT and the average operating costs per mile for passenger and commercial vehicles, as per the latest US DOT BCA Guidance. The resulting annualized vehicle operating cost savings are projected to amount to about \$1.7 million in year 2023, rising to \$5.5 million by 2042. The corresponding 20-year operations period total is \$69.1 million, and \$24.4 million after discounting at seven percent, as summarized in Table 8.

Table 8: Projected Vehicle Operating Cost Savings (in millions of 2017\$)

| | 2023 | 2042 | 20-year Total Before Discounting | 20-year Total Discounted at 7% |
|--------------|--------------|--------------|----------------------------------|--------------------------------|
| Automobiles | \$1.7 | \$5.5 | \$68.6 | \$24.2 |
| Trucks | \$0.01 | \$0.05 | \$0.6 | \$0.2 |
| Total | \$1.7 | \$5.5 | \$69.1 | \$24.4 |

6.2.3 JOB CREATION

Injection of capital infrastructure spending, such as that related to the proposed I-75 interchange, into the area economy will lead to direct construction and related professional services jobs, as well as indirect jobs supporting the suppliers of materials and equipment. In turn, these direct and indirect jobs support, through re-spending of earnings, additional jobs within the economy (induced impacts).

Additionally, the new interchange is expected to aid further business (with the related jobs) attraction and retention that would not otherwise occur, especially when combined with the Pasco County's economic development initiatives⁶. However, these impacts were not quantified as part of this application.

6.2.4 LAND ACCESS

The new interchange will also improve access to the nearby land that is slated for development. Proposed developments in the area, such as the Connected Cities high-tech pilot community, and the Industrial Park will become more accessible with the interchange access to I-75, and may be better positioned to realize their full potential⁷. This land access benefit was not quantified, and hence, is not incorporated in the project outcomes monetization included in this application.

6.3 Quality of Life

The project would contribute to enhancing the quality of life in the study area through improved access to job opportunities. With a new interchange option that provides generalized cost (time and money) savings, residents of Pasco County will have improved access to the larger job market within the County as well as elsewhere in the Tampa Bay region. This may result in associated productivity and income gains, improving the overall quality of life in the area. This effect is not, however, included in the project outcomes quantification.

6.4 Environmental Protection

The proposed project would contribute to environmental protection through reductions in air pollution and CO₂ emissions. These environmental benefits were calculated as the product of tons of emissions saved by pollutant and their unit value per ton. The unit values for VOCs, NO_x, PM, and SO₂ reflect the US DOT recommendations from the latest BCA Guidance, while the CO₂ unit values are based on a 2009 publication by the National Highway Traffic Safety Administration ("Corporate Average Fuel Economy for MY 2011 Passenger Cars and Light Trucks," page VIII-32). Tons of emissions saved by pollutant are a function of emissions rates and changes in VMT by vehicle type and speed. The emission rates were based on the EPA's MOVES (Motor Vehicles Emission Simulator) model specific to the District Seven region in Florida, while changes in VMT by speed bin were obtained from the TBRPM.

⁶ I-75 and Overpass Road Interchange Project, Florida Job Growth Grant Fund Public Infrastructure Grant Proposal, 2017

⁷ *ibid*

The resulting emission cost savings are summarized in Table 9. These savings are projected to average about \$0.2 million annually, totaling \$3.7 million over the 20-year operations timeframe (before discounting), or \$1.6 million in present value terms (discounted at seven percent). They include savings related to carbon dioxide and the other four pollutants.

Table 9: Projected Total Air Emissions Savings (in millions of 2017\$)

| Pollutant | 2023 | 2042 | 20-year Total Before Discounting | 20-year Total Discounted at 7% |
|--------------|--------------|--------------|----------------------------------|--------------------------------|
| NOX | \$0.05 | \$0.00 | \$0.58 | \$0.28 |
| CO2 | \$0.05 | \$0.13 | \$1.74 | \$0.63 |
| VOC | \$0.00 | \$0.00 | \$0.02 | \$0.01 |
| PM | \$0.13 | \$0.02 | \$1.35 | \$0.63 |
| SO2 | \$0.00 | \$0.00 | \$0.05 | \$0.02 |
| Total | \$0.2 | \$0.2 | \$3.7 | \$1.6 |

6.5 Safety Benefits

Vehicle crashes are often very costly in terms of loss of life, productivity losses due to injury, and vehicle or other property damage. The proposed project would contribute to promoting US DOT's safety long-term outcome through reductions in the number of accidents on the area highway network.

The monetized safety benefits of the proposed interchange were calculated based on reductions in the number of crashes and unit cost of crashes estimates by severity. The reductions in crashes by severity were computed as a function of annualized vehicle miles traveled reductions and crash rates by severity. The crash rates specific to FDOT District 7, are in turn based on the numbers of reported accidents (from the Florida Integrated Exchange Report System) and the area vehicle miles traveled (from FDOT's highway mileage reports) for the recent five years. The unit costs of crashes, by severity, are based on the KABCO-level monetized values from the latest BCA Guidance for Discretionary Grants. They were adjusted for the average number of vehicles involved per accident (based on CalTrans, TASAS data), and applicable injuries per injury crash and fatalities per fatal crash (based on the University of Florida's Signal Four Analytics' data for the last five years specific to the vicinity of the proposed interchange).

Table 10 summarizes the resulting safety benefits, which are projected to be valued at about \$1.6 million in year 2023, increasing to \$5.3 million in year 2042, for the 20-year total of \$66.4 million (before discounting), or \$23.4 million after discounting.

Table 10: Projected Accident Cost Savings (in millions of 2017\$)

| Crash Type | 2023 | 2042 | 20-year Total Before Discounting | 20-year Total Discounted at 7% |
|---------------------------|--------------|--------------|---|---------------------------------------|
| No Injury | \$0.0 | \$0.2 | \$2.0 | \$0.7 |
| Possible Injury | \$0.3 | \$0.8 | \$10.5 | \$3.7 |
| Non-Incapacitating Injury | \$0.3 | \$0.9 | \$11.8 | \$4.2 |
| Incapacitating Injury | \$0.4 | \$1.4 | \$17.4 | \$6.2 |
| Fatality | \$0.6 | \$1.8 | \$23.0 | \$8.1 |
| Non-Traffic Fatality | \$0.0 | \$0.1 | \$1.6 | \$0.6 |
| Total | \$1.6 | \$5.3 | \$66.4 | \$23.4 |

7. Summary of BCA Findings

The tables below summarize the BCA findings. Annual costs and benefits are computed over the full period of analysis (24 years). As stated earlier, the initial four-year investment is expected to be completed in 2022, with the benefits accruing during the full 20-year period of operations, through year 2042.

The total benefits and costs, expressed in 2017 dollars, for the analysis period are shown in Table 11. This table reflects a summation of the annualized benefits and costs for each year between 2019 and 2042. In accordance with the USDOT guidance for economic analysis, the annualized benefits and costs were discounted to reflect the time value of money. Consistent with the OMB Circulars A-94, a real discount rate of seven percent was used in the discounting of the benefits and costs. An alternative real discount rate of three percent was also applied in the sensitivity analysis (presented in the next section).

Table 11: Benefit-Cost Analysis Results (in millions of 2017\$)*

| Benefit and Cost Metrics | 2019-2042 Totals | |
|--|------------------|--------------------|
| | Discounted at 7% | Before Discounting |
| <i>Project Benefits</i> | | |
| Travel Time Savings | \$100.1 | \$286.2 |
| Vehicle Operating Cost Savings | \$24.4 | \$69.1 |
| Emission Savings (Carbon) | \$0.6 | \$1.7 |
| Emission Savings (non-Carbon) | \$0.9 | \$2.0 |
| Safety | \$23.4 | \$66.4 |
| Residual Value | \$8.3 | \$42.3 |
| Total Benefits | \$157.8 | \$467.7 |
| <i>Project Costs</i> | | |
| Capital | \$53.2 | \$63.2 |
| O&M Costs | \$0.8 | \$2.1 |
| Total Project Costs | \$54.1 | \$65.3 |
| Total Benefits less Total Costs (NPV) | \$103.7 | NA |
| Benefit-Cost Ratio** | 2.95 | |
| Internal Rate of Return | 18.3% | |
| Breakeven Year | 2030 | |

* Unless specified otherwise. **Note that the Benefit-Cost Ratio was calculated as: $(\text{Benefits} - \text{O\&M Costs}) / \text{Capital Costs}$, in compliance with the latest BCA Guidance for Discretionary Grant Programs

Considering all monetized benefits and costs, the estimated internal rate of return of the project is 18.3 percent. Applying a seven percent real discount rate, the investment in the proposed interchange can be expected to yield a net present value of \$103.7 million, and a Benefit-Cost ratio of 2.95, indicating that the project returns \$2.95 in benefits for every dollar of capital costs. The breakeven year for this investment is 2030.

Among the project benefits totaling \$157.8 million (in present value terms), the travel time savings (at \$100.1 million) are projected to be the largest category, followed by savings in vehicle operating costs (\$24.4 million), then safety benefits (\$23.4 million), residual value (\$8.3 million), and emission savings (\$1.6 million overall).

8. BCA Sensitivity Analysis

The key assumption in this benefit cost analysis was the real discount rate of seven percent (as per the US DOT BCA Guidance documentation).

The higher the discount rate, the less influential/valued future long-range costs and benefits become when compared to near-term costs and benefits. As the bulk of the

costs of this project are projected to be borne upfront, in the early years of the project, while benefits grow over time, the use of a higher discount rate reduces the project's NPV and BCR. As an alternative assumption of a lower interest rate was tested, the BCA results using a lower, three percent, real discount rate are presented in Table 12.

Table 12: Benefit-Cost Analysis Results, Discounted at 3% (in millions of 2017\$)*

| Benefit and Cost Metrics | 2019-2042 Totals |
|--|------------------|
| | Discounted at 3% |
| <i>Project Benefits</i> | |
| Travel Time Savings | \$177.7 |
| Vehicle Operating Cost Savings | \$43.1 |
| Emission Savings (Carbon) | \$1.1 |
| Emission Savings (non-Carbon) | \$1.4 |
| Safety | \$41.4 |
| Residual Value | \$20.8 |
| Total Benefits | \$285.4 |
| <i>Project Costs</i> | |
| Capital | \$58.6 |
| O&M Costs | \$1.4 |
| Total Project Costs | \$60.0 |
| Total Benefits less Total Costs (NPV) | \$225.4 |
| Benefit-Cost Ratio** | 4.85 |
| Internal Rate of Return | 18.3% |
| Breakeven Year | 2028 |

* Unless specified otherwise. **Note that the Benefit-Cost Ratio was calculated as: $(\text{Benefits} - \text{O\&M Costs}) / \text{Capital Costs}$, in compliance with the latest Benefit-Cost Guidance for Discretionary Grant Programs

With a three percent real discount rate, the net present value of the project would substantially increase to \$225.4 million (or by about \$128 million relative to the seven percent discounting), for a Benefit/Cost ratio of 4.85, and also with an earlier breakeven year of 2028.

9. Aggregate Annual Benefits and Costs

This section reports the aggregate benefits and costs associated with the proposed I-75 Interchange at Overpass Road project in annual terms. Table 13 shows the total benefits and costs in undiscounted terms (2017\$), as well the net benefits (the difference between the total benefits and total costs) both in undiscounted and discounted (at seven percent) terms. As can be seen in the table, the net discounted benefits start in the minus \$11.4 million to \$16.3 million range in the initial four years of investment before the benefits

start accruing. The net benefits then increase to a positive range of \$6.9 million to \$7.7 million per year from 2023 to 2041, and with the \$15.2 million value in 2042, including the residual value, for the 24-year total (NPV) of \$103.7 million.

Table 14 presents the aggregate monetized annual benefits, before discounting, in terms of the key monetized outcome criteria (State of Good Repair, Economic Competitiveness, Environmental Protection, and Safety). Please note that some of the expected benefits, such as those pertaining to improved jobs access under the quality of life category are not monetized, and hence not included in the table below.

User benefits for travelers in the region (travel time savings and vehicle operating cost savings), amounting to \$355.4 million, account for the large majority of total monetized benefits, and are included in the economic competitiveness category. Safety benefits, at \$66.4 million, are projected to be the second largest category of benefits generated by this project, followed by state of good repair (with the residual value of \$42.3 million), and environmental protection, totaling about \$3.7 million.

Table 13: Annual Projections of Total Project Benefits and Costs (in millions of 2017\$)

| Calendar Year | Project Year | Total Benefits | Total Costs | Net Benefits Before Discounting | Net Benefits Discounted at 7% |
|---------------------------|---------------------|-----------------------|--------------------|--|--------------------------------------|
| 2019 | 1 | \$0.0 | \$13.4 | (\$13.4) | (\$12.6) |
| 2020 | 2 | \$0.0 | \$14.9 | (\$14.9) | (\$13.0) |
| 2021 | 3 | \$0.0 | \$19.9 | (\$19.9) | (\$16.3) |
| 2022 | 4 | \$0.0 | \$14.9 | (\$14.9) | (\$11.4) |
| 2023 | 5 | \$10.1 | \$0.1 | \$10.0 | \$7.2 |
| 2024 | 6 | \$11.1 | \$0.1 | \$11.0 | \$7.3 |
| 2025 | 7 | \$12.1 | \$0.1 | \$12.0 | \$7.5 |
| 2026 | 8 | \$13.1 | \$0.1 | \$13.0 | \$7.6 |
| 2027 | 9 | \$14.1 | \$0.1 | \$14.0 | \$7.6 |
| 2028 | 10 | \$15.2 | \$0.1 | \$15.1 | \$7.7 |
| 2029 | 11 | \$16.3 | \$0.1 | \$16.2 | \$7.7 |
| 2030 | 12 | \$17.5 | \$0.1 | \$17.4 | \$7.7 |
| 2031 | 13 | \$18.7 | \$0.1 | \$18.6 | \$7.7 |
| 2032 | 14 | \$20.0 | \$0.1 | \$19.9 | \$7.7 |
| 2033 | 15 | \$21.2 | \$0.1 | \$21.1 | \$7.7 |
| 2034 | 16 | \$22.6 | \$0.1 | \$22.5 | \$7.6 |
| 2035 | 17 | \$23.9 | \$0.1 | \$23.8 | \$7.5 |
| 2036 | 18 | \$25.3 | \$0.1 | \$25.2 | \$7.5 |
| 2037 | 19 | \$26.8 | \$0.1 | \$26.7 | \$7.4 |
| 2038 | 20 | \$28.3 | \$0.1 | \$28.2 | \$7.3 |
| 2039 | 21 | \$29.8 | \$0.1 | \$29.7 | \$7.2 |
| 2040 | 22 | \$31.4 | \$0.1 | \$31.3 | \$7.1 |
| 2041 | 23 | \$33.1 | \$0.1 | \$32.9 | \$6.9 |
| 2042 | 24 | \$77.0 | \$0.1 | \$76.9 | \$15.2 |
| Totals (2019-2042) | | \$467.7 | \$65.3 | \$402.4 | \$103.7 |

Table 14: Annual Projections of Total Project Monetized Benefits by Major Outcome Category (before discounting, in millions of 2017\$)

| Calendar Year | Project Year | State of Good Repair | Economic Competitiveness | Environmental Protection | Safety | Total Monetized Benefits |
|---------------------------|--------------|----------------------|--------------------------|--------------------------|---------------|--------------------------|
| 2019 | 1 | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 |
| 2020 | 2 | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 |
| 2021 | 3 | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 |
| 2022 | 4 | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 |
| 2023 | 5 | \$0.0 | \$8.3 | \$0.2 | \$1.6 | \$10.1 |
| 2024 | 6 | \$0.0 | \$9.1 | \$0.2 | \$1.8 | \$11.1 |
| 2025 | 7 | \$0.0 | \$9.9 | \$0.2 | \$1.9 | \$12.1 |
| 2026 | 8 | \$0.0 | \$10.8 | \$0.2 | \$2.1 | \$13.1 |
| 2027 | 9 | \$0.0 | \$11.7 | \$0.2 | \$2.2 | \$14.1 |
| 2028 | 10 | \$0.0 | \$12.6 | \$0.2 | \$2.4 | \$15.2 |
| 2029 | 11 | \$0.0 | \$13.6 | \$0.2 | \$2.6 | \$16.3 |
| 2030 | 12 | \$0.0 | \$14.6 | \$0.2 | \$2.8 | \$17.5 |
| 2031 | 13 | \$0.0 | \$15.6 | \$0.2 | \$2.9 | \$18.7 |
| 2032 | 14 | \$0.0 | \$16.6 | \$0.2 | \$3.1 | \$20.0 |
| 2033 | 15 | \$0.0 | \$17.7 | \$0.2 | \$3.3 | \$21.2 |
| 2034 | 16 | \$0.0 | \$18.9 | \$0.2 | \$3.5 | \$22.6 |
| 2035 | 17 | \$0.0 | \$20.0 | \$0.2 | \$3.7 | \$23.9 |
| 2036 | 18 | \$0.0 | \$21.2 | \$0.2 | \$3.9 | \$25.3 |
| 2037 | 19 | \$0.0 | \$22.5 | \$0.2 | \$4.2 | \$26.8 |
| 2038 | 20 | \$0.0 | \$23.7 | \$0.2 | \$4.4 | \$28.3 |
| 2039 | 21 | \$0.0 | \$25.0 | \$0.2 | \$4.6 | \$29.8 |
| 2040 | 22 | \$0.0 | \$26.4 | \$0.2 | \$4.8 | \$31.4 |
| 2041 | 23 | \$0.0 | \$27.8 | \$0.2 | \$5.1 | \$33.1 |
| 2042 | 24 | \$42.3 | \$29.3 | \$0.2 | \$5.3 | \$77.0 |
| Totals (2019-2042) | | \$42.3 | \$355.4 | \$3.7 | \$66.4 | \$467.7 |