

# **Benefit-Cost Analysis (BCA)** for the **State Route 28 Corridor** **Safety Improvements, Shared Use Path, and** **Environmental Improvements Program**

*Prepared for*



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## CONTENTS

<b>Part I – Introduction</b>	<b>2</b>
A. Introduction	
B. Overall Summary of Results	
<b>Part II – Project Benefits</b>	<b>5</b>
A. Annual Safety Benefits	
B. Annual Vehicle Operating Cost Benefits	
C. Annual Mobility Benefits	
D. Annual Health Benefits	
E. Annual Recreation Benefits	
F. Annual User Expenditure Benefits	
G. One-Time Capital Cost-Savings Benefits	
H. Residual Value of the Project	
I. Other Benefits Not Quantified in the BCA	
J. Net Present Value of Quantified Project Benefits	
<b>Part III – Project Costs</b>	<b>10</b>
A. Capital Cost	
B. Annual Operations and Maintenance Cost	
C. Cost Summaries	
<b>Part IV – Conclusion</b>	<b>11</b>
<b>Appendix A – Supporting Calculations and Technical Tables</b>	

## Part I – INTRODUCTION

### A. Introduction

Wells Barnett Associates (WBA) has conducted a Benefit-Cost Analysis (BCA) of the Lake Tahoe State Route 28 Corridor Safety Improvements, Shared-Use Path, and Environmental Improvements Project (Project) in Washoe County, Carson City, and Douglas County in the State of Nevada. This BCA will support the Tahoe Transportation District's (TTD's) application to the U.S. Department of Transportation's BUILD Grant Program as well as other grant applications in future phases.

The Project being analyzed herein is referred to as the "Central Corridor" of the State Route (SR) 28 Corridor which stretches from approximately Sand Harbor to the intersection of SR 28 and US Highway 50 (Spoooner Junction). SR 28 is a two-lane mountainside road, which is the only access route for nearly three million recreationists and four million-plus vehicles per year. Use along the corridor continues to grow, with shoulder-parking projected to double in the next 20 years. Safety is a serious concern, as SR 28 along this segment has no sidewalks, multi-use paths, bike lanes, transit stops, or adequate areas for safe parking. Cyclists and pedestrians share the narrow highway space with vehicles, which has led to a high rate of collisions.

The Project as currently envisioned includes approximately 8.0 miles of shared use pathways, integration into a corridor-wide parking management system, a transportation hub in Incline Village, parking and transit facilities including a 250-vehicle park and ride lot, and various safety improvements along the existing alignment of SR 28. This Project is a component of the larger Stateline to Stateline Bikeway Project, consisting of shared use paths and similar improvements which will stretch along the entire eastern shore of Lake Tahoe, and takes an integrated approach to improving safety, mobility, water quality, and recreational access, as well as infrastructure preservation within the SR 28 Corridor.

The purpose of the BCA is to quantify all economic and financial benefits and costs over time and to determine whether the benefits outweigh the costs, and to what degree. The methodologies and data sources used in this BCA are consistent with the U.S. Department of Transportation's Benefit Cost Analysis Guidance for Discretionary Grant Programs, January 2020 (BCA Guidelines).

This memorandum includes the following sections:

- **Overall Summary of Findings (below)** provides the overall results of the BCA, including the monetized ratio of benefits to costs, using both 7-percent and 3-percent discount rates;

- **Project Benefits (Part II)** provides a description of the benefits that the Project will bring to the surrounding area, including monetized benefits such as reduced travel time, reduced vehicle emissions, and safety benefits, as well as other community benefits;
- **Project Costs (Part III)** describes and quantifies the costs that the Project will incur; and
- **Conclusion (Part IV)** reiterates the key conclusions of this BCA and describes in greater detail the methodologies and assumptions used to derive the benefit-cost ratio.

## B. Overall Summary of Results

WBA has found that the Project will provide substantial economic benefits to the surrounding area, including safety benefits, reduced vehicle operating costs, improved mobility, improved health, recreation benefits, user expenditure benefits, capital cost-savings benefits, and others.

**In summary, the magnitude of the economic benefits provided by the Project is greater than the costs that the Project requires over the long-term. When comparing the overall benefits to the overall costs for this program of projects, the combined total benefit to cost ratio is 1.40 using a 7% discount rate, or 2.33 using a 3% discount rate, as shown in Table 1 below.**

Table 1 Summary of BCA Results	
Land Use Type	Value
<b>Net Present Value at 7%</b>	
Total Project Benefits	\$117,737,129
Total Project Costs	\$83,915,636
<b>Benefit-Cost Ratio</b>	<b>1.40</b>
<b>Net Present Value at 3%</b>	
Total Project Benefits	\$239,259,685
Total Project Costs	\$102,593,702
<b>Benefit-Cost Ratio</b>	<b>2.33</b>

The remainder of this report highlights the key assumptions, data, and methodologies which were used to derive these results. **Tables A-1** through **A-12** contain backup tables showing the detailed calculations of costs and benefits and the calculation of Net Present Value (NPV), which is a useful measure to compare a series of cash flows over time, discounted to a common dollar year.

## Part II – Project Benefits

Total annual benefits of the Project are summarized in **Table 2** and are estimated at \$16.7 million for the Project annually. In addition to annual benefits that will occur each year after the Project is constructed, the Project will also be responsible for a one-time cost-savings on capital costs by allowing for additional construction staging and storage that would not otherwise be available along this narrow and topographically constrained corridor, and will also retain a residual value at the end of the thirty-year study period of this BCA, as shown in **Table 2**.

Table 2 Summary of Project Benefits (2020 \$)			
Category	Assumptions/ Backup Data	Annual Benefits	Years Applied
<b>Annual Benefits</b>			
Safety Benefits	Table A-1	\$10,895,100	2028 - 2050
Vehicle Operating Cost Savings	Table A-2	\$13,910	2028 - 2050
Mobility Benefits	Table A-3	\$352,300	2028 - 2050
Health Benefits	Table A-4	\$4,421,600	2028 - 2050
Recreation Benefits	Table A-5	\$345,440	2028 - 2050
User Expenditure Benefits	Table A-6	\$588,000	2028 - 2050
<b>Subtotal Annual Benefits</b>		<b>\$16,616,350</b>	
<b>One-Time Benefits</b>			
Capital Cost-Savings For Other SR 28 Improvements	Table A-7	\$12,150,000	2028
Residual Value	Table A-8	\$27,641,884	2050
Sources: TTD, Wood Rodgers, USDOT, and WBA			

Each of these benefits is estimated in separate backup tables (**Tables A-1** through **A-8**) located at the end of this report, which document the specific assumptions, data sources, and methodologies used to arrive at these results.

### A. Annual Safety Benefits

The Project is anticipated to have significant safety benefits since the corridor currently has a high rate of collisions, and the safety improvements of the Project (particularly the removal of on-highway parking and creation an off-highway shared use path) will create a much safer environment for vehicles, pedestrians, and bicyclists and improved emergency response times in the highest wildfire risk area of Lake Tahoe. WBA has obtained data documenting the number of collisions in the corridor from 2006 to 2013 (shown in **Table A-1**). Crash reduction factors supplied by Wood Rodgers were applied to these collisions

based on the safety improvements of the Project to estimate the reduced number of collisions that will occur once the Project is constructed.

As shown in **Table A-1**, the Project is estimated to prevent approximately 41.5 collisions per year, which equates to a value of approximately \$10.9 million annually, based on the values provided by U.S. Department of Transportation's *Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses*.

## **B. Annual Vehicle Operating Cost Reduction Benefits**

A key benefit provided by the Project to the surrounding community is the reduced operating costs resulting from fewer vehicle miles traveled (VMT) that will be accomplished once the Project is constructed and users shift from vehicle trips to other transportation modes. This benefit is quantified in **Table A-2**, which shows that the Project will result in a reduced vehicle operating costs of approximately \$13,900 per year. This amount was calculated by using the total reduction in VMT that was estimated in the Demand Model prepared by Alta Planning & Design, and by applying the entire 26-mile segment estimated in the Demand Model to the Project's proportionate share of mileage, which is approximately 31 percent of the total.

This reduction in VMT was applied to operating cost savings factor of \$0.42 per mile, which is based on costs obtained from the American Automobile Association, 2018 edition, inflated to 2020 dollars using the Bureau of Labor Statistics' Consumer Price Index (CPI).

## **C. Annual Mobility Benefits**

**Table A-3** summarizes the Project's mobility benefits, which are estimated at \$352,000. Mobility benefits are a quality of life benefit that would accrue to local and visiting users of the multi-use trail. The *National Cooperative Highway Research Program (NCHRP) Report 552: Guidelines for Analysis of Investments in Bicycle Facilities* is a commonly-accepted source used to calculate the economic benefits of enhanced mobility from bicycle use.

This benefit is calculated based on a working estimate of the number of new annual bicycle trips for the Project, which was prepared by using the usership estimated in the 2009 Alta Demand Study which were adjusted to reflect higher demand numbers observed at the newly-constructed Sand Harbor section of the multi-use trail. Total trips were then multiplied by a factor of \$5.18, which was derived by the NCHRP Report 552, adjusted to 30 weeks per year to reflect seasonal factors, and inflated to 2020 dollars using CPI.

## **D. Annual Health Benefits**

**Table A-4** shows the estimated value of the health benefits provided by the Project, which will accrue to new bicycle users. This benefit is estimated at \$4.4 million annually. This

benefit was calculated by assigning a value of \$128 per year-round trail user (per the NCHRP Report 552), which was inflated to 2020 dollars and then adjusted by the ratio of peak-summer day use (146.5 days) over a full-year.

#### **E. Annual Recreation Benefits**

**Table A-5** shows recreation benefits of the Project, which will accrue to new bicycle users of the multi-use trail. This benefit is estimated at \$345,000 annually. This benefit was calculated by applying a value of \$10 per year-round trail user (per the NCHRP Report 552), which was inflated to 2020 dollars and then adjusted by the ratio of peak-summer day use (146.5 days) over a full-year.

#### **F. Annual User Expenditure Benefits**

The Project is anticipated to draw new users to the new multi-use trail facilities, who will spend money within the local economy to purchase or rent bicycles, buy equipment, obtain food and drinks, stay in local lodging, etc.

The Alta Demand Model utilized a conservative estimate of \$7.00 per trail use (including walkers), which we have applied to the estimated number of new trail users at the Project. This calculation results in a very conservatively estimated \$588,000 per year in new local expenditures, as shown in **Table A-6**.

#### **G. One-Time Construction Cost-Savings Benefit**

According to project team members and other knowledgeable professionals, the multi-use trail and other elements of the project will allow for optimized use by coordinating efforts and allow for more efficient storage and staging that will represent a significant cost-savings for major improvements to SR 28. To state this in another way: if the multi-use trail, park and ride lot, and other facilities were not available during construction, the necessary costs to improve SR 28 would be considerably higher.

According to local experts, this storage and staging benefit can easily allow for a 10% to 20% cost-savings on the capital construction cost of the Project. Therefore, it is reasonable to conservatively quantify this cost-savings and include it as a project benefit in the BCA.

**Table A-7** shows the total estimated capital cost of the Project, including all elements and including soft costs. To remain conservative, we have removed “soft costs” such as design and engineering (conservatively estimated at 25%), and then applied a 10% cost-savings to the remainder. As shown, this represents a \$12.2 million one-time construction cost-saving. It is assumed for the purposes of this BCA that this savings is registered in the first year after the end of Project construction (2028).



## H. Residual Value of the Project

In accordance with the BCA Guidelines, this study covers a period of 30 years, beginning in 2021. The improvements that are part of the Project are estimated to be completed in 2027, and it is assumed that the Project's useful life extends 30 years after construction is complete (although it is likely that the actual life will last much longer). Therefore, the Project will have a remaining (residual) value at the end of the Study Period in 2050, which is included as a project benefit in this BCA and shown in **Table A-8**.

## I. Other Benefits of the Project that are Not Measured in the BCA

Aside from the benefits described above, there are other economic benefits that the Project is likely to generate, but that were not quantified in this BCA because of a lack of available data or other reasons. Among the most prominent benefits that the Project will provide will come in the form of reduced vehicle congestion, which will contribute to a considerable quantity (and economic value) of travel time saved. The SR 28 corridor between Incline Village and Spooner Junction becomes extremely congested, especially in summer months when usage peaks and beach and trails users search for parking along the narrow highway. Upon construction, Project improvements will facilitate easier access through the corridor, and will likely alleviate congestion significantly. The actual amount of time that will be saved by highway users is an important economic benefit that could be included in this BCA; however, at the current time, a reliable estimate of time savings is not readily-available and therefore, this benefit is not included in this BCA.

Similarly, reduced congestion and reduce VMT achieved by the Project will also result in a reduction in greenhouse gas emissions, which have an economic value but are not quantified in this BCA.

In addition, the Project could cause surrounding property values in the area to rise by providing an additional amenity to local residents and also alleviating traffic congestion impacts. However, given the difficulty in attempting to accurately quantify the degree to which property values could increase, plus the fact that the Project is mostly surrounded by publicly-owned properties, the impacts to property values are not included in the BCA.

If the value of travel time savings, emissions reductions, and property value impacts this BCA, these benefits would serve to further improve the benefit-cost ratio of the project.

## J. Net Present Value of Quantified Project Benefits

**Table A-9** shows the detailed calculation of net present value (NPV) for benefits of the Project over a 30-year period. To be conservative, this BCA assumes that project benefits only begin to accrue after the entire project is completed in 2027.

In order to provide a reasonable range under various discount rates, this calculation has been performed for both 7% and 3% discount rates. As shown, the NPV of the total benefits of the Project are \$117.7 million at a 7% discount rate, and \$239.2 million at a 3% discount rate.

## Part III – Project Costs

### A. Capital Costs

The estimated capital construction cost of the Project as defined in this BCA is approximately \$118.5 million, as shown in **Table A-10**. This capital cost estimate includes all anticipated land acquisition and capital construction costs associated with the Central Corridor of the Project, except for Tasks 3, 6, 11a, and 11b.

### B. Annual Operations and Maintenance Costs

Operations and maintenance costs of the Project were estimated based the budgeted expenditures for maintenance of the Incline Village to Sand Harbor segment of the multi-use trail, adjusted to a per-mile cost and applied to the approximate 8-mile segment associated with the Project. **Table A-11** summarizes the annual multi-use trail maintenance costs, which are estimated to be approximately \$28,000 per year. This BCA does not include the likely annual expenditures associated with the parking management system that is to be included as part of the Project, since it is anticipated that these costs will be funded from the system’s generation of user fees.

### C. Cost Summaries

**Table 3** shows a summary of these estimated capital construction and operations/ maintenance costs by year. **Table A-12** shows the estimated NPV of the capital construction and operations/ maintenance costs over 30 years.

Table 3 Summary of Estimated Project Costs By Year (2020 \$)			
Year	Estimated Capital Costs	Estimated Annual O&M Costs	Total Estimated Capital and O&M
2020	\$2,445,000	\$0	\$2,445,000
2021	\$1,706,005	\$0	\$1,706,005
2022	\$0	\$0	\$0
2023	\$16,569,212	\$0	\$16,569,212
2024	\$37,565,000	\$0	\$37,565,000
2025	\$14,500,000	\$0	\$14,500,000
2026	\$15,480,000	\$0	\$15,480,000
2027	\$30,200,000	\$0	\$30,200,000
2028 and beyond	\$0	\$28,000	\$28,000
<b>Total</b>	<b>\$118,465,217</b>	<b>\$28,000</b>	<b>\$118,493,217</b>

Sources: TTD and Wells Barnett Associates.

## Part IV – Conclusion

The total 30-year NPV of the Project’s benefits were compared to the total 30-year NPV of Project costs in **Table 4**, using both 7% and 3% discount rates. As shown, Project benefits are anticipated to exceed Project costs by a ratio of 1.40 using a 7% discount rate and a ratio of 2.33 using a 3% discount rate.

Table 4 Summary of BCA Results	
Land Use Type	Value
<b>Net Present Value at 7%</b>	
Total Project Benefits	\$117,737,129
Total Project Costs	\$83,915,636
<b>Benefit-Cost Ratio</b>	<b>1.40</b>
<b>Net Present Value at 3%</b>	
Total Project Benefits	\$239,259,685
Total Project Costs	\$102,593,702
<b>Benefit-Cost Ratio</b>	<b>2.33</b>



**WELLS BARNETT ASSOCIATES, LLC**

*Land Use Planning + Economics*

## **APPENDIX A**

## **TECHNICAL TABLES**

**Table A-1  
Calculation of Project Safety Benefits (2020 \$)**

Item	Injury			Total
	Fatality	(Non-Fatal)	PDO	
Crashes (8 Years, 2006 - 2013)	6	176	287	<b>469</b>
Countermeasure Applied	Shared Use Path/ Removal of Roadside Parking	Shared Use Path/ Removal of Roadside Parking	Removal of Roadside Parking	
Crash Reduction Factor [1]	80%	80%	65%	
Prevented Crashes (8 Years, 2006 - 2013)	4.8	140.8	186.6	<b>332.2</b>
Prevented Crashes (Annual)	0.6	17.6	23.3	<b>41.5</b>
Economic Value per Crash [2]	\$10,636,600	\$250,600	\$4,400	
<b>Total Safety Benefits</b>	<b>\$6,381,960</b>	<b>\$4,410,560</b>	<b>\$102,603</b>	<b>\$10,895,100</b>

Sources: TTD, Wood Rodgers, USDOT BCA Guidelines, and Wells Barnett Associates

[1] Historical crash data and crash reduction factors provided by Wood Rodgers based on Nevada Department of Transportation crash data.

[2] From the 2020 BCA Guidelines.

<b>Table A-2</b>	
<b>Calculation of Vehicle Operating Cost Reduction Benefits (2020 \$)</b>	
<b>Item</b>	<b>Value</b>
<b>Nevada Stateline-to-Stateline Bikeway Project</b>	
Stateline-to-Stateline Project Road Miles	26
Reduced VMT from Project [1]	<b>108,100</b>
<b>SR 28 Corridor Improvements</b>	
Sand Harbor to Spooner Road Miles	8.0
Mileage Ratio (% of Total Project)	31%
<b>Proportionate Reduced VMT</b>	<b>33,262</b>
<b>Total Operating Cost per Mile (Light Duty Vehicles)</b>	<b>\$0.42</b>
<b>Vehicle Operating Cost Savings</b>	<b>\$13,910</b>
Sources: TTD, Wood Rodgers, USDOT BCA Guidelines, and WBA	

[1] From the Alta Demand Study, 2009.

<b>Table A-3 Calculation of Mobility Benefits (2020 \$)</b>	
<b>Item</b>	<b>Value</b>
Number of New Bike Path Users [1]	<b>68,000</b>
Per-Trip Benefits [2]	<b>\$5.18</b>
<b>Annual Mobility Benefits</b>	<b>\$352,300</b>
Sources: TTD, Wood Rodgers, Alta Demand Model (2009), NCHRP, USDOT BCA Guidelines, and Wells Barnett Associates.	

[1] Estimated number of new bike path users (cyclists only) were estimated based on the 2009 Alta Demand model, adjusted to reflect the higher usership numbers on the Incline Village to Sand Harbor segment of the trail.

[2] The NCHRP report 552, page 39 estimates a mobility value of \$4.08 per bicycle trip, which is inflated to 2020 dollars.



Table A-4 Calculation of Health Benefits (2020 \$)	
Item	Value
Number of New Bike Path Users	68,000
Cost-Savings From Physical Activity [1]	\$65.02
<b>Annual Health Benefits</b>	<b>\$4,421,600</b>
Sources: TTD, Wood Rodgers, Alta Demand Model (2009), NCHRP, USDOT BCA Guidelines, and Wells Barnett Associates.	

[1] Estimated number of new bike path users (cyclists only) were estimated based on the 2009 Alta Demand model, adjusted to reflect the higher usership numbers on the Incline Village to Sand Harbor segment of the trail.

[2] According to the CHRP Report 552 (page 39), the annual health benefit per year-round trail-user is \$128. This is adjusted to reflect the ratio of annual summer-day use on Tahoe trails (approximately 40%), per the Lake Tahoe Region Bicycle and Pedestrian Master Plan. Inflated to 2020 dollars.

Table A-5 Calculation of Recreation Benefits (2020 \$)	
Item	Value
Number of New Bike Path Users	<b>68,000</b>
Per-User Benefit [1]	<b>\$5.08</b>
<b>Annual Recreation Benefits</b>	<b>\$345,440</b>
Sources: TTD, Wood Rodgers, Alta Demand Model (2009), NCHRP, USDOT BCA Guidelines, and Wells Barnett Associates.	

[1] Estimated number of new shared use trail path users (all types) were estimated based on the 2009 Alta Demand model, adjusted to reflect the higher usership numbers on the Incline Village to Sand Harbor segment of the trail.

**Table A-6**  
**Calculation of Visitor Expenditure Benefits (2020 \$)**

<b>Item</b>	<b>Value</b>
Estimated Number of Trail Users [1]	<b>84,000</b>
Per-User Benefit	<b>\$7.00</b>
<b>Annual Visitor Spending Benefits</b>	<b>\$588,000</b>

Sources: TTD, Wood Rodgers, Alta Demand Model (2009), NCHRP, USDOT BCA Guidelines, and Wells Barnett Associates.

Table A-7 Calculation of Cost-Savings Benefits (2020 \$)	
Item	Value
<b>Total Project Capital Construction Costs [1]</b>	\$162,000,000
Less Soft Costs [2]	-\$40,500,000
<b>Net Hard Construction Costs</b>	<b>\$121,500,000</b>
<b>Estimated Cost-Savings (One-Time) - 10% of Hard Costs [3]</b>	<b>\$12,150,000</b>
Sources: TTD, Mullen-Ehly Consultig, annd WBA	

[1] For all projected S.R. 28 improvements, as provided in the TTD Funding Program.

[2] Conservatively assumes 25% of total project costs are for design, engineering and other soft costs.

[3] Conservatively assumes that the Project improvements will reduce overall construction costs by 10% to allow for additional staging and storage. Therefore, this cost savings is shown as a one-time benefit attributable to the project.

**Table A-8**  
**Calculation of Residual Value Benefits (2020 \$)**

<b>Item</b>	<b>Value</b>
Estimated Useful Life of Project	30 Years
Remaining Service Life in 2050	7 Years
Estimated Capital Cost of Project (2020 \$)	<b>\$118,465,217</b>
<b>Residual Value</b>	<b>\$27,641,884</b>

Sources: TTD, USDOT BCA Guidelines, and WBA

**Table A-9**  
**Calculation of NPV of Benefits (2020 \$)**

<b>Year</b>	<b>Years in Future</b>	<b>Annual Benefits</b>	<b>7% Discount Factor</b>	<b>3% Discount Factor</b>	<b>NPV @ 7%</b>	<b>NPV @ 3%</b>
2020	0	\$0	1.000	1.000	\$0	\$0
2021	1	\$0	0.930	0.970	\$0	\$0
2022	2	\$0	0.865	0.941	\$0	\$0
2023	3	\$0	0.804	0.913	\$0	\$0
2024	4	\$0	0.748	0.885	\$0	\$0
2025	5	\$0	0.696	0.859	\$0	\$0
2026	6	\$0	0.647	0.833	\$0	\$0
2027	7	\$0	0.602	0.808	\$0	\$0
2028	8	\$28,766,350	0.560	0.784	\$16,097,126	\$22,545,436
2029	9	\$16,616,350	0.520	0.760	\$8,647,333	\$12,632,265
2030	10	\$16,616,350	0.484	0.737	\$8,042,019	\$12,253,297
2031	11	\$16,616,350	0.450	0.715	\$7,479,078	\$11,885,698
2032	12	\$16,616,350	0.419	0.694	\$6,955,543	\$11,529,127
2033	13	\$16,616,350	0.389	0.673	\$6,468,655	\$11,183,254
2034	14	\$16,616,350	0.362	0.653	\$6,015,849	\$10,847,756
2035	15	\$16,616,350	0.337	0.633	\$5,594,739	\$10,522,323
2036	16	\$16,616,350	0.313	0.614	\$5,203,108	\$10,206,654
2037	17	\$16,616,350	0.291	0.596	\$4,838,890	\$9,900,454
2038	18	\$16,616,350	0.271	0.578	\$4,500,168	\$9,603,440
2039	19	\$16,616,350	0.252	0.561	\$4,185,156	\$9,315,337
2040	20	\$16,616,350	0.234	0.544	\$3,892,195	\$9,035,877
2041	21	\$16,616,350	0.218	0.527	\$3,619,741	\$8,764,801
2042	22	\$16,616,350	0.203	0.512	\$3,366,360	\$8,501,857
2043	23	\$16,616,350	0.188	0.496	\$3,130,714	\$8,246,801
2044	24	\$16,616,350	0.175	0.481	\$2,911,564	\$7,999,397
2045	25	\$16,616,350	0.163	0.467	\$2,707,755	\$7,759,415
2046	26	\$16,616,350	0.152	0.453	\$2,518,212	\$7,526,633
2047	27	\$16,616,350	0.141	0.439	\$2,341,937	\$7,300,834
2048	28	\$16,616,350	0.131	0.426	\$2,178,002	\$7,081,809
2049	29	\$16,616,350	0.122	0.413	\$2,025,541	\$6,869,354
2050	30	\$44,258,234	0.113	0.401	\$5,017,444	\$17,747,865
<b>Total</b>		<b>\$421,967,933</b>			<b>\$117,737,129</b>	<b>\$239,259,685</b>

**Table A-10**  
**Summary of Estimated Capital Construction Costs (2020 \$)**

Task/ Segment	Estimated Capital Cost (2020 \$)	Year Complete
<b>Capital Construction Costs</b>		
Task 1: SR 28 Preliminary Design/ Construction of Parking Lots & Path	\$1,706,005	2021
Task 2: North Trailhead Parking Areas	\$269,212	2023
Task 4: South Park n Ride Lot, to Douglas Line	\$11,300,000	2023
Task 4a: Douglas Line to Skunk Harbor	\$19,990,000	2024
Task 5: Mobility Hub Acquisition	\$2,445,000	2020
Task 5a: Mobility Hub Construction	\$5,000,000	2023
Task 7: Skunk Harbor to Secret Harbor and Parking	\$17,575,000	2024
Task 8: Last Mile Skunk Harbor to Secret Harbor	\$14,500,000	2025
Task 9: Secret Harbor to Thunderbird Lodge	\$15,480,000	2026
Task 10: Thunderbird Lodge to Sand Harbor	\$30,200,000	2027
<b>Total Capital Construction Costs</b>	<b>\$118,465,217</b>	

Sources: TTD and Wells Barnett Associates.

**Table A-11**  
**Calculation of Annual Operations/ Maintenance Costs (2020 \$)**

Item	Formula	Value
Annual O&M Costs of Shared Use Trails Incline to Sand Harbor [1]	a	\$10,600
Incline to Sand Harbor Miles	b	3.0
Annual O&M Costs per Mile (Rounded)	$c = a / b$	\$3,500
Sand Harbor to SR28/ Highway 50 Junction Miles	d	8.0
<b>Estimated Annual O&amp;M Costs for Trail Maintenance</b>	<b><math>e = c * d</math></b>	<b>\$28,000</b>

Sources: TTD and Wells Barnett Associates.

[1] Costs provided by TTD.



**Table A-12**  
**Calculation of NPV of Costs (2020 \$)**

<b>Year</b>	<b>Years in Future</b>	<b>Annual Costs</b>	<b>7% Discount Factor</b>	<b>3% Discount Factor</b>	<b>NPV @ 7%</b>	<b>NPV @ 3%</b>
2020	0	\$2,445,000	1.000	1.000	\$2,445,000	\$2,445,000
2021	1	\$1,706,005	0.930	0.970	\$1,586,585	\$1,654,825
2022	2	\$0	0.865	0.941	\$0	\$0
2023	3	\$16,569,212	0.804	0.913	\$13,327,562	\$15,122,272
2024	4	\$37,565,000	0.748	0.885	\$28,100,574	\$33,256,024
2025	5	\$14,500,000	0.696	0.859	\$10,087,481	\$12,451,643
2026	6	\$15,480,000	0.647	0.833	\$10,015,408	\$12,894,407
2027	7	\$30,200,000	0.602	0.808	\$18,171,366	\$24,401,082
2028	8	\$28,000	0.560	0.784	\$15,668	\$21,945
2029	9	\$28,000	0.520	0.760	\$14,572	\$21,286
2030	10	\$28,000	0.484	0.737	\$13,552	\$20,648
2031	11	\$28,000	0.450	0.715	\$12,603	\$20,028
2032	12	\$28,000	0.419	0.694	\$11,721	\$19,428
2033	13	\$28,000	0.389	0.673	\$10,900	\$18,845
2034	14	\$28,000	0.362	0.653	\$10,137	\$18,279
2035	15	\$28,000	0.337	0.633	\$9,428	\$17,731
2036	16	\$28,000	0.313	0.614	\$8,768	\$17,199
2037	17	\$28,000	0.291	0.596	\$8,154	\$16,683
2038	18	\$28,000	0.271	0.578	\$7,583	\$16,183
2039	19	\$28,000	0.252	0.561	\$7,052	\$15,697
2040	20	\$28,000	0.234	0.544	\$6,559	\$15,226
2041	21	\$28,000	0.218	0.527	\$6,100	\$14,769
2042	22	\$28,000	0.203	0.512	\$5,673	\$14,326
2043	23	\$28,000	0.188	0.496	\$5,276	\$13,897
2044	24	\$28,000	0.175	0.481	\$4,906	\$13,480
2045	25	\$28,000	0.163	0.467	\$4,563	\$13,075
2046	26	\$28,000	0.152	0.453	\$4,243	\$12,683
2047	27	\$28,000	0.141	0.439	\$3,946	\$12,303
2048	28	\$28,000	0.131	0.426	\$3,670	\$11,933
2049	29	\$28,000	0.122	0.413	\$3,413	\$11,575
2050	30	\$28,000	0.113	0.401	\$3,174	\$11,228
<b>Total</b>		<b>\$119,109,217</b>			<b>\$83,915,636</b>	<b>\$102,593,702</b>