Howard Streetscape Project

San Francisco, California

Benefit-Cost Analysis

In Support of
2021 RAISE Grant Application
July 2021

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Executive Summary

This benefit-cost analysis (BCA) for the Howard Streetscape Project (Project) was prepared to support the San Francisco Municipal Transportation Agency's Grant Application under the USDOT's RAISE Program. This BCA was prepared in accordance with USDOT's 2021 Benefit-Cost Analysis Guidance for Discretionary Grant Programs, using the Active Transportation Benefit Cost Model (Version 7.1 dated February 2021 version) developed by the California Department of Transportation (Caltrans)[1]. For the benefit-cost analysis, following completion of construction, the life of the Project is assumed to be 20 years. The BCA results are summarized in Exhibit 1.

For comparison purposes, two discount rates were used to calculate the net present value of proposed project improvements. The 7% discount rate was used as required by DOT. In addition, a 3% discount rate was used because it more closely reflects the City and County of San Francisco's cost of capital. The 7% discount rate results in a benefit cost ratio of 3.0 while the 3% discount rate results in a benefit cost ratio of 4.8.

Exhibit 1. Howard Streetscape Project Benefit Cost Model Results ($ in Millions)

	Net Present Value @ 7% Discount Rate	Net Present Value @ 3% Discount Rate [2]
Project Benefits [1]	$144.1	$240.3
Project Costs (Capital and O&M)	$48.2	$50.4
Net Benefits	$95.8	$190.0
Benefit Cost Ratio	3.0	4.8

[1] Benefit categories: Health, Safety, Journey Quality, Environmental (emissions reductions)
[2] A 3% discount rate is used for illustrative purposes, because this lower rate more closely mirrors the marginal cost of capital for 30+ year investment by the City and County of San Francisco, based on market conditions as of June 2021

In addition to the monetized benefits identified in the BCA, the Project is expected to generate significant benefits that are not monetized in the areas of safety, quality of life, environmental sustainability and economic competitiveness.

[1] "*California Active Transportation Benefit/Cost Analysis Model for 2021 INFRA Applications (Cal-B/C AT) Version 7.1*" developed by the California Department of Transportation (Caltrans) Office of Transportation Economics and Data Management, February 2021.

Project Description

The Howard Streetscape Project is a transformative Complete Streets project that will improve traffic safety and livability on a high-injury corridor within one of San Francisco's densest and fastest-growing neighborhoods. The project will transform a three or four-lane, dangerous and heavily travelled arterial to a 2-lane street with permanent protected bike lanes, intersection improvements and green infrastructure that exemplifies the principles of safer and more sustainable complete street design.

Baseline Conditions

Exhibit 2, the Project Matrix, summarizes the current Baseline conditions in the Project Area, the proposed changes associated with the Project, and the types of impacts and benefits associated with the Project. Howard Street, between 4th and 11th streets has three travel lanes and two parking lanes. There is a Class IV bikeway from 6th St. to 11th St. and a Class II bikeway between 4th St. and 11th St. Bikeways are separated from vehicle travel lanes with either temporary vertical safety posts and green paint or with a lane of parking. The existing pavement is classified as in "good" condition and is not expected to be re-paved for another 10 years or more. Average daily traffic volumes range from slightly more than 8,000 vehicles per day between 9th and 10th streets to nearly 22,000 vehicles per day between 4th and 5th streets. Based on actual bike counts, 1,030 bikes travel the corridor daily and an estimated 7,300 pedestrians walk the corridor daily.

Howard Streetscape Project Area

Howard Street at 7th Street

Exhibit 2. Project Matrix

Project Area, Baseline Status and Problem to be Addressed	Changes to Baseline/Alternatives	Quantified Project Impacts/Benefits
The Project area is a 1-mile, 7-block segment of Howard Street from 4th Street to 11th Street in the South of Market Area of San Francisco. **Baseline Status:** Arterial street with 3 travel lanes and 2 parking lanes with a current PCI (Pavement Condition Index) of 75 -- good. The street was last paved in 2009. Average daily traffic ranges from 8,000 to 22,000, depending on the specific block. 12-foot sidewalks on each side of the street. A parking protected Class IV bike lane exists on the north side of the street between 6th Street and 11th Street, while an unprotected Class II bike lane exists between 4th Street and 6th Street. **Problems to be Addressed:** ***Safety:*** Howard Street is part of San Francisco's High Injury Network, where 75 percent of the City's severe and fatal traffic collisions occur on just 13 percent of the City's streets. Safety is a key problem to be addressed. ***Equitable access to mobility services:*** The Project Area is home to a high concentration of seniors, and residents with low incomes living in affordable housing or Single Room Occupancy hotels, many of whom rely on cycling and walking. Improving safety and journey quality for the people who live in the area is a key objective of the Project. ***Environmental sustainability:*** The City's Transportation Climate Action Strategy calls for increased investment in alternative transportation modes (transit, walking and bicycling) to reduce greenhouse gas emissions and increase speed and efficiency of the transit system.	**The Project redesigns the Howard Street by** a. ***Reducing vehicle lanes*** from three or four to two b. Replacing the existing bike lane with a ***two-way physically-protected bikeway*** on the south side of Howard Street from 4th Street to 11th Street c. ***Curb ramp*** upgrades to improve access for wheelchairs, strollers and bicycles. d. ***Raised crosswalks*** at intersections and crosswalks to slow down traffic and improve visibility of pedestrians e. ***Bulb-outs*** at intersections to shorten the distance from curb to curb f. New, upgraded ***traffic signals*** at 8 intersections and newly-added mid-block crosswalks g. ***Mixing zones*** at intersections that reduce conflicts between cyclists proceeding straight and vehicles turning right h. Improvements to the **public realm**, civic amenity zones	**Beneficial Impacts** ***a. Health***: Primarily reductions in injury and mortality ***Safety***: Reductions in cyclist and pedestrian injuries and fatalities from implementation of crash reduction mitigation measures ***Journey Quality:*** Value of mobility (and associated health impacts) gained by active transportation users from their sense of journey ambiance, ease of use, and perception of enhanced safety ***Emissions Reduction:*** Emissions reductions from the shift of travelers to active transportation modes

Project Costs

Project Design, Support and Construction Costs

Exhibit 3 presents SFMTA's estimates of the design, support and construction costs for the Howard Streetscape Project. There is no right of way acquisition cost associated with this Project because the right of way is already owned by the City and County of San Francisco and used for transportation purposes. Though engineering design is not complete, the estimated breakdown of construction costs are: new pavement (30%); two-way bike lane (5%); upgraded pedestrian infrastructure (8%); upgraded traffic signals (22%); upgraded water, sewer and stormwater management and other utilities and landscaping (26%) and new lighting (8%).

Exhibit 3. Project Design, Support and Construction Costs ($ millions)

Year	Project Design & Support	Right of Way	Construction	Total
1	$4.2	$0	$25.0	$29.2
2		$0	$2.9	$2.9
3		$0	$16.0	$16.0
4		$0	$1.1	$1.1
Total	$4.2	$0	$45.0	$49.2

Annual Incremental Maintenance Cost

Exhibit 4 presents the breakdown of SFMTA's estimated incremental annual operating and maintenance costs (i.e., costs above and beyond the cost of maintaining the No Build facility) used in the BCA Model. Total annual incremental maintenance costs are estimated to be $167,527.

Exhibit 4. Project O&M Costs

Cost Category	Annual Cost in Constant Dollars
Landscaping	$67,527
Roadway Maintenance	$100,000
Total	$167,527

Project Benefits

The Project's net present value benefits are summarized in Exhibit 5. The Caltrans BCA model results indicate that the greatest monetary benefits are related to the health and safety benefits. Over the 20-year analysis period, total health benefits resulting from the Project are $86 million and the total safety benefits are $47 million. Total benefits resulting from the Project equal $144.1 million at a 7% Discount Rate. Using a 3% Discount Rate, the Project's total benefits would increase to $240.3 million.

Exhibit 5. Net Present Value of Benefits by Category

at 7% Discount Rate ($ in millions)

	Total Over 20 Years	Annual Average
Health	$86.0	$4.3
Safety	$47.0	$2.4
Journey Quality	$10.9	$0.5
Emission Cost Savings	$0.1	$0.0
TOTAL BENEFITS	**$144.1**	**$7.2**

Health Benefits

The Project's Health Benefits are generated primarily by reductions in mortality for users who are induced to switch to an active transportation mode. Mortality benefits are driven by the reduction in the relative risk of death for people who improve their health increasing their cycling or walking. The estimated reduction in risk for cycling and walking is based on the distance traveled by mode. Using the estimates developed by Caltrans, for cycling, there is a 4.5% reduction in mortality risk for every 365 miles traveled per year, and for walking, the annual risk reduction per 365 miles traveled is 9%. The Caltrans Model caps the risk reduction at a maximum of 30% for cycling and 45% for walking[2]. Using a 7% discount rate, the present value of the Project's annual Health Benefits are estimated to range from $4.6 million in Year 1 to $3.4 million in Year 20. The net present value of health benefits is estimated to be $86.0 million.

Safety

Safety benefits are derived from two sources: 1) a reduction in collision rates because drivers shift to cycling or walking, resulting in fewer cars using the roadway; and 2) due to a reduction in collision risks at intersections. The economic value of the change in collision rates is estimated

[2] Caltrans Cal-B/C Active Transportation User's Guide and Technical Documentation, page 12.

using the average cost per collision by severity (severity categories are property damage only, injury collision or fatality)[3]. Regarding the data used in the BCA Model to generate the safety benefit estimates:

- The Model utilizes the average of six years of data on bike and pedestrian collisions (2014-2019) in the Project Area that is derived from SFMTA's Transbase collision database, which can be accessed online at: https://transbase.sfgov.org/dashboard/dashboard.php.
- The projected collision growth rates used in the Model are derived from the five-year historical average annual growth rate in citywide bike and pedestrian collisions (2013-2018), which were derived from data in the SFMTA Mobility Report, which is found online at: https://www.sfmta.com/sites/default/files/reports-and documents/2019/01/sfmta_mobility_trends_report_2018.pdf.

Using a 7% discount rate, the present value of the Project's annual Safety Benefits are estimated to range from $3.1 million in Year 1 to $1.8 million in Year 20. The net present value of safety benefits is estimated to be $47.0 million.

Journey Quality

Journey Quality represents the value of mobility gained by active transportation users and can be derived from their sense of journey ambiance, ease of use, and the perception of improved safety that is associated with improvements that provide greater separation from conflicting modes, other safety features and aesthetic enhancements. Using a 7% discount rate, the present value of the Project's annual Journey Quality are estimated to range from $0.6 million in Year 1 to $0.4 million in Year 20, but as discussed below in connection with unquantified Quality of Life benefits, this estimate may be understated. The net present value of Journey Quality benefits is estimated to be $10.9 million.

Emissions Reductions

This benefit category estimates the public benefits generated by reduced vehicle use due to shifts of travelers to active transportation modes, which reduce the externalities of air emissions. Using a 7% discount rate, the Project's annual Emissions Reduction Benefits are estimated to range from approximately $7,000 in Year 1 to $4,000 in Year 20, although as discussed below, there are strong reasons to believe that this estimate may be understated because the Caltrans BCA model does not take into account the benefits derived from reductions in travel lanes or road diets. The net present value of emissions reduction benefits is estimated to be $0.1 million.

[3] The Caltrans Cal B/C Active Transportation Model assumes the following values for collisions: Fatality cost = $12 million, injury collision cost = $169,000, property damage only cost = $16,200, as found in the Parameters Tab of the Excel BCA Model.

Unquantified Benefits

In addition to the monetized benefits identified in the BCA, the Project is expected to generate significant benefits that are not monetized:

1. **Additional Safety Benefits.** The BCA model is not designed to estimate the safety benefits of reducing the number of travel lanes along a roadway. Research has shown that "road diet" measures[4] such as those proposed for this project and described in Exhibit 2 could have substantial safety benefits due to a significant reduction in collisions on Howard Street, which is part of San Francisco's High Injury Network, where 75 percent of City's severe and fatal traffic collisions occur on just 13 percent of the City's streets.

2. **Significant Quality of Life Benefits**: a) Significant quality of life benefits will accrue to the disadvantaged residents in the Project area, which is home to a high concentration of seniors, and residents with low incomes living in affordable housing or Single Room Occupancy hotels, many of whom rely on cycling and walking; b) benefits will also accrue to cyclists, pedestrians and motorists who will feel safer using Howard Street; and c) from public realm improvements.

3. **Additional Environmental Benefits**: The BCA may understate environmental benefits because the reduction of one to two vehicle traffic lanes on Howard Street may result in a net reduction in VMT, which would generate additional emission reductions.

4) **Economic Competitiveness**. The BCA model does not address induced investment in the corridor or increased retail sales due to the streetscape improvements or the improved access to jobs in the area for neighborhood residents. However, previous experience has shown that streetscape improvements attract additional financial investment, such as additional construction and new business starts as well as increased retail sales for existing businesses.

[4] The Caltrans Active Transportation BCA Model is not designed to accommodate a change in the number of vehicle lanes in the project corridor under the Build Scenario, so the Model implicitly assumes that the Build Scenario's number of vehicle lanes is the same as under the No Build Scenario. As a result, the BCA omits the road diet-driven benefits associated with the 1/3 to 1/2 reduction in vehicle lanes that will be implemented by this Project. FHWA estimates that a road diet which converts a four-lane road into a three-lane road can reduce total crashes by 19 % to 47%. See https://safety.fhwa.dot.gov/provencountermeasures/road_diets/

Benefit-Cost Results

Exhibit 6 compares the net present value of the Project's Benefits and Costs using 7% and 3% Discount Rates. Although USDOT requires applicants to use a 7% discount rate, as noted above, the 3% rate more closely reflects the City and County of San Francisco's cost of capital.

Exhibit 6. Benefit-Cost Results Comparison ($ in millions)

Category	Net Present Value at 7%	Net Present Value at 3%
Benefits		
Health	$86.0	$144.3
Safety	$47.0	$77.6
Journey Quality	$10.9	$18.3
Environmental	$0.1	$0.2
Total Benefits	**$144.1**	**$240.3**
Costs		
Project Design & Construction Costs	$46.8	$48.1
Project Incremental O&M Costs	$1.4	$2.3
Total Project Costs	**$48.2**	**$50.4**
Benefit-Cost Ratio	**3.0**	4.8

Key Data Sources

In developing the Benefit Cost Analysis, SFMTA relied primarily on either Project Area-specific data or citywide data that is publicly available.

Biking

***No Build Scenario Daily Trips*:** The BCA Model uses a daily bike trip count of 1,030, based on an actual trip count on Howard Street.

No Build and Build Scenario Annual Growth Rates: The Model assumes that the average annual growth rate in biking will be the same under the No Build and Build Scenarios, even though it is quite possible that the growth rate on an improved facility would be higher than under the No Build Scenario. The Model uses an average annual growth rate of 4.1%, which is derived from the city-wide biking data for the period from 2013 – 2018 found in the SFMTA Mobility Trends Report 2018, page 3. *https://www.sfmta.com/sites/default/files/reports-and documents/2019/01/sfmta_mobility_trends_report_2018.pdf*

Build Scenario Year 1 Daily Trips: The Year 1 (post-construction) number of daily trips is 21% higher under the Build Scenario than under the No Build Scenario. This projected increase is based on SFMTA's actual experience on Folsom Street (one street south of Howard Street), where the implementation of similar safety improvements in late 2017 (parking protected bike lanes, doubling the number of yellow commercial loading zones and bus boarding islands, "daylighting" involving the removal of parking at intersections to increase the visibility of vehicles, pedestrians and bikes where crossings occur) resulted in a 21% increase in biking. https://www.sfmta.com/sites/default/files/reports-and-documents/2018/12/folsom_near_term_factsheet_final.pdf

***Biking Collision Rate*:** A projected average annual growth rate of 2.7% is used in the Model, based on the 5-year historical annual growth rate for the period from 2013-2018 in citywide bike severe injuries and fatalities. Source: San Francisco Department of Public Health "San Francisco's Severe Traffic Injury Trends, 2011-2018", page 12. https://www.visionzerosf.org/wp-content/uploads/2019/09/Severe-Injury-Trends_2011-2018_final_report.pdf

Pedestrians

***No Build Scenario Daily Trips*:** A projected daily trip count is used in the Model because an actual daily pedestrian count is not available. A peak period PM pedestrian count at the intersection of Howard Street and 7th Street yielded 997 peak period trips. The American Community Survey provides an estimate of total workers (16 years and over) in San Francisco and the share of workers that walk to work. The SFMTA Travel Decision Survey provides an estimate of the share of walk travel that is commute-related -- 18% of walk trips made in San Francisco are commute-related. Howard Street houses a combination of workplaces and residences, particularly for seniors and residents of single resident occupancy hotels, so it is

likely that a significant portion, but not all, of peak period trips are commute trips. For the purposes of this analysis, SFMTA assumes that 2/3 of PM peak walking trips are commute trips. This yields an estimate of 7,389 daily walking trips along this corridor, based on the calculations shown below:

Exhibit 7. Pedestrian Trip Estimate Calculations

PM peak pedestrian trip count =	997	PM peak trips
PM peak pedestrian trips are commute trips =	665	PM commute trips
PM commute trips x 2 = daily commute trips	1,330	Daily commute trips
If commute trips = 18% of total trips, total daily trips =	7,389	Daily pedestrian trips

No Build and Build Scenario Annual Growth Rates: The Model assumes that the average annual growth rate in walking will be the same under the No Build and Build Scenarios, even though it is quite possible that the growth rate on an improved facility would be higher than under the No Build Scenario. The 5-year average annual growth rate of 5.2% is derived from the city-wide walking data for the period from 2013 – 2018 found in the SFMTA Mobility Trends Report 2018, page 3. *https://www.sfmta.com/sites/default/files/reports-and documents/2019/01/sfmta_mobility_trends_report_2018.pdf*

***Build Scenario Year 1 Daily Trips*:** The Year 1 (post-construction) number of daily trips is 29% higher under the Build Scenario than under the No Build Scenario. This projected increase is based on SFMTA's actual experience on Folsom Street (one street south of Howard Street), where the implementation of similar safety improvements in late 2017 (parking protected bike lanes, doubling the number of yellow commercial loading zones and bus boarding islands, "daylighting" involving the removal of parking at intersections to increase the visibility of vehicles, pedestrians and bikes where crossings occur) resulted in a 29% increase in walking trips. https://www.sfmta.com/sites/default/files/reports-and-documents/2018/12/folsom_near_term_factsheet_final.pdf

***Pedestrian Collision Rate*:** A projected average annual growth rate of 5.5% is used in the Model, based on the 5-year historical annual growth rate for the period from 2013-2018 in citywide pedestrian severe injuries and fatalities. Source: San Francisco Department of Public Health "San Francisco's Severe Traffic Injury Trends, 2011-2018", page 12. https://www.visionzerosf.org/wp-content/uploads/2019/09/Severe-Injury-Trends_2011-2018_final_report.pdf