Montrose Boulevard
DCR Update – Preferred Alternative
Updated Typical Sections

WBS No. N-T27000-0005-7

Prepared for:

HOUSTON PUBLIC WORKS

MONTROSE
TAX INCREMENT REINVESTMENT ZONE 27

05-11-2023
Gauge Engineering, LLC
Firm No.: F-20017

Prepared By:

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May 2023

1. Introduction

Gauge Engineering, LLC (Gauge) was authorized by Tax Increment Reinvestment Zone No. 27 (TIRZ 27) to prepare a Design Concept Report (DCR) for full reconstruction of Montrose Boulevard within the TIRZ 27 boundary. The limits of full reconstruction are from IH-69 to Allen Parkway. An in-person community engagement meeting was conducted on January 23, 2023, where the design team shared the project improvements with the community. In general, members of the community were very appreciative and in support of the improvements, however, they requested to accommodate a bicycle facility along the entire corridor. To accommodate their request, the design team had to reevaluate the impacts of incorporating a bicycle facility. On April 3, 2023, Gauge met on Montrose Boulevard with City of Houston Urban Forestry where Forestry expressed support of the tree removal and replacement for the shared use path on the east side. This memorandum summarizes the changes in the Preferred Alternative typical sections from Westheimer Road to W Dallas Street and W Dallas Street to Allen Parkway compared to the ones originally presented in the full DCR submitted August 18, 2022. Please note that the typical section from IH-69 to Westheimer will be further evaluated and a separate memo will be provided summarizing the findings.

1.1. IH-69 to Westheimer Road

The typical section from I-69 to Westheimer is constrained by a 90-foot ROW. The challenges with this segment limit the design team's ability to provide a simple cross-section currently to satisfy all stakeholders and the community's request. Additionally, this section has more mature trees, that have not been impacted by utility conflicts, like the trees north of Westheimer. The design team will work to come up with creative solutions and provide these cross-sections and exhibits later before further design is conducted. Therefore, the southern typical section will not be modified at this time in the DCR.

1.2. Westheimer Road to W Dallas Street

Within the 100' right-of-way (ROW) segment, the initial recommendation was for a walkable corridor with first- and last-mile bike connections along Montrose Boulevard with parallel bikeways like Waugh Drive and Commonwealth, already constructed by TIRZ 27, and Stanford to be constructed later. Between Westheimer Road and W Dallas Street the Draft DCR showed a 10-foot-wide sidewalk north of Westheimer on both sides that narrows to preserve as many healthy existing trees and avoid major transmission line poles. This was presented at a community engagement meeting on January 23, 2023. Comments were received where members of the public expressed a desire to include a bicycle facility within the Montrose Boulevard project. Furthermore, the City of Houston Bike Plan calls for the design to look at strategies to accommodate a bikeway as feasible. The typical section for the segment from Westheimer Road to W Dallas Street has been modified to include a bicycle facility, which is proposed as a 10-ft shared-use path on the east side of the street, connecting to the proposed path north of W Dallas Street. See **Figure 1** below for what is in the Houston Bike Plan.

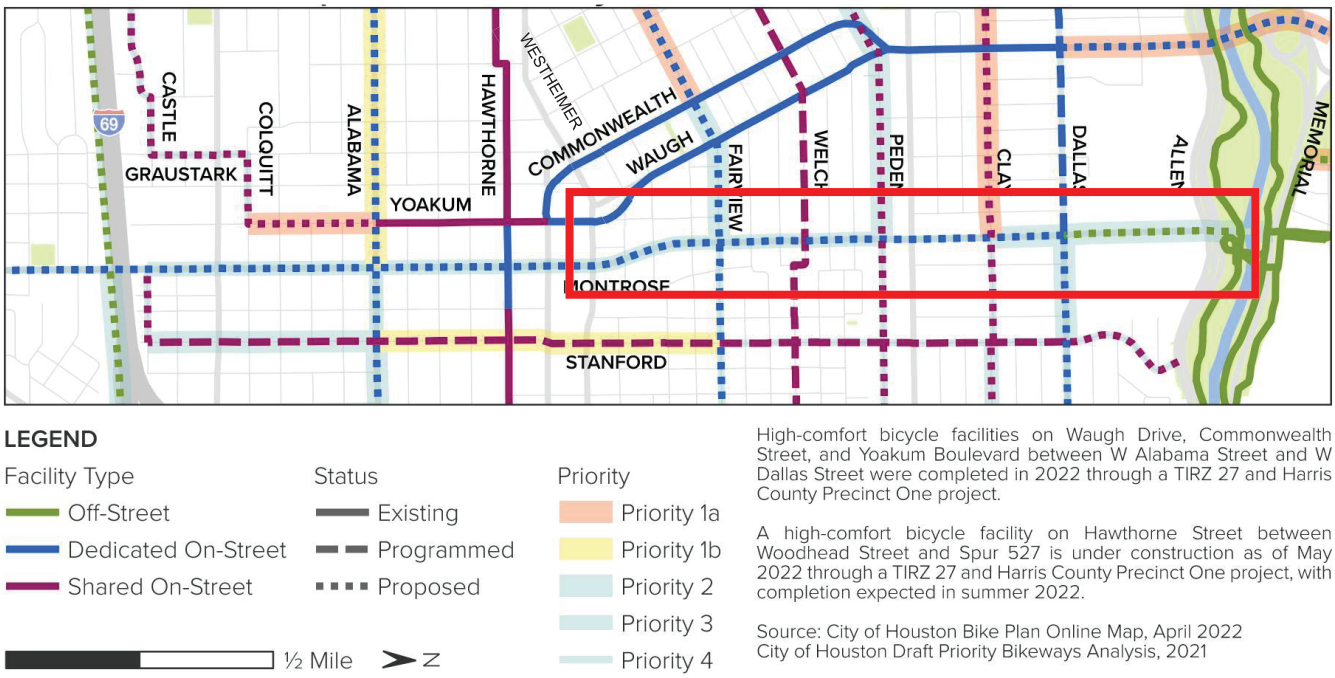


Figure 1 – Proposed Bikeways: Houston Bike Plan

1.3. W Dallas Street to Allen Parkway

The typical section between W Dallas Street and Allen Parkway was also modified due to a comment given by Houston Public Works Multimodal Safety & Design Branch to include a 6-foot-wide sidewalk on the west side along the cemetery from W Dallas to Allen Parkway.

2. Preferred Alternative – Updated Typical Sections

2.1. Westheimer Road to W Dallas Street

The original typical section for this segment included 10-foot typical sidewalks that narrow to 6-feet at obstructions, like trees and major utility poles. The updated typical section maintains this configuration on the west side of the roadway but changes the east side to include a continuous and uninterrupted 10-foot shared-use path as a bicycle facility. The shared-use path would require removal and replacement of all trees on the east side of this segment. (See below more information on the trees) The shared-use path would be designed to City of Houston (City) and AASHTO standards and all Ages and Abilities to accommodate a high comfort north/south bikeway from Buffalo Bayou Park to Westheimer Road. This recommendation balances all the goals of the project, which include:

- Maintaining two lanes in each direction for vehicular traffic,
- Narrowing the median from 30 feet to 20 feet, which preserves a number of median trees,
- Preserving many west-side trees by narrowing the sidewalk, thereby preserving shade for pedestrians,
- Constructing a 10-foot-wide shared-use path on the east side from Westheimer to W Dallas to accommodate the goals of the Houston Bike Plan, which also connects to the shared-use path north of W Dallas Street and links the community directly to Buffalo Bayou Park,
- Supporting the local residents' desire for a bicycle facility,
- Providing safe comfortable transportation options,
- Removing and replacing vulnerable east-side trees:

- Existing trees are growing in narrow strip of soil between sidewalk and curb, limiting the root system; these are likely to be impacted by reconstruction based on their challenging growing condition.
- Existing trees have been significantly pruned due to conflicts with overhead utility lines. See Figure 2 showing examples of trees on the east side.
- Trees would be replaced with new trees aligned with City tree guidelines within the 6-foot buffer giving them improved growing conditions which would allow them to thrive and provide shade to the shared use path.
- Wooden utility poles would be relocated closer to the ROW to reduce future impacts to the growth of the trees.

- And, where possible, maintaining healthy trees to provide shade within the existing street ROW.

Figure 2 – Vulnerable East-Side Trees

See Figure 3 below for the typical section.

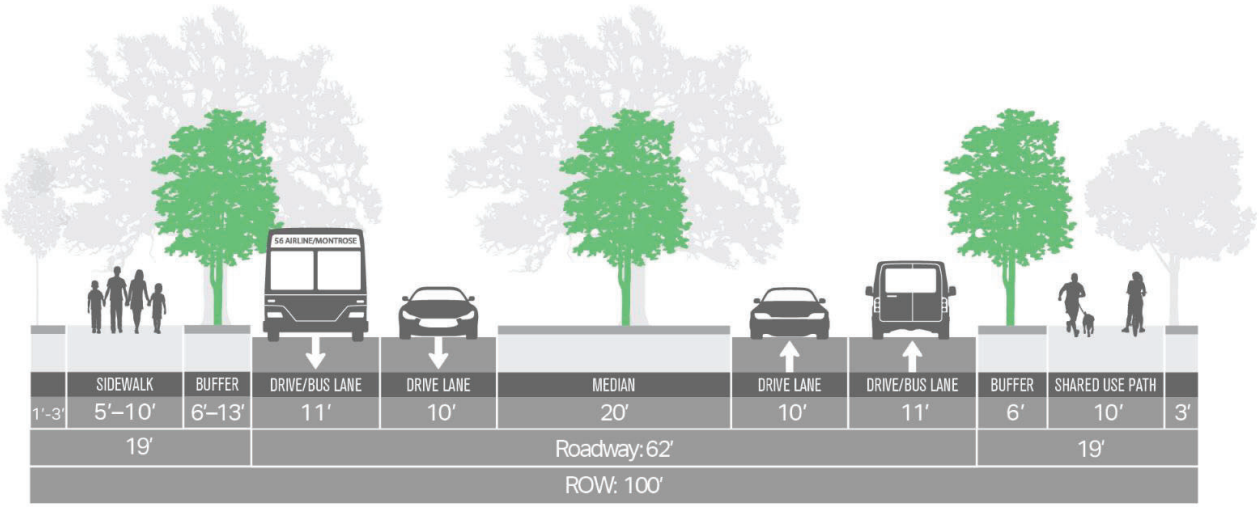


Figure 3 – Recommended Typical Section: Westheimer Road to W Dallas Street

2.2. W Dallas Street to Allen Parkway

The typical section from W Dallas Street to Allen Parkway changed based on a recommendation from Houston Public Works to include a 6-foot sidewalk on the west side and a 10-foot shared-use path on the east side. The narrow City of Houston 80-foot-wide ROW does not contain the entire typical section. The Ismaili Center is dedicating a strip of land as a Pedestrian Access Easement. The shared-use path will partially be in City ROW and the easement. See Figure 4 below for the typical section.

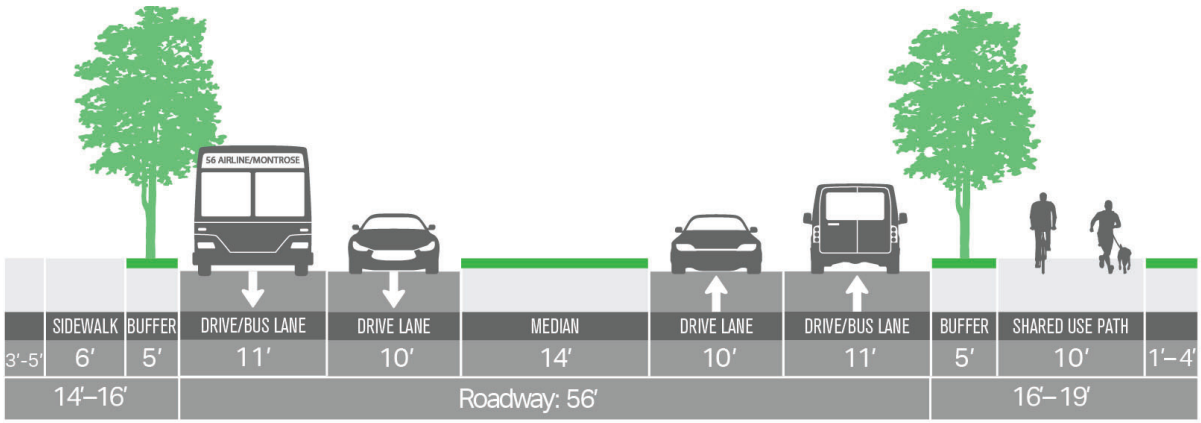


Figure 4 – Recommended Typical Section: W Dallas Street to Allen Parkway

3. Conclusion

These typical sections replace those shown in the Design Concept Report, dated August 18, 2022, for the described segments and are based on a multifaceted design approach that balances many goals of the City of Houston, TIRZ 27, METRO, and the local community. Gauge Engineering seeks approval from Houston Public Works of these typical sections to implement them in the first segment of the project, which is from W Clay Street to Allen Parkway. The segment south of Westheimer will be evaluated separately and a dedicated document summarize the results will be prepared and shared with Houston Public Works.

FY23 RAISE Application Submittal
Houston, TX | Montrose Boulevard Safety and Multimodal Access Project

Project Description

MONTROSE
TAX INCREMENT REINVESTMENT ZONE 27

Project Description

Project Summary

The Montrose Boulevard Safety and Multimodal Access Project (henceforth known as "the Project") reconstructs a signature north-south urban street, Montrose Boulevard, in the heart of Houston, Texas. The Project will reconstruct Montrose Boulevard from just south of West Clay Street at the northern end to US 59/I-69 at the southern end. The improvements include:

- Replace four wide travel lanes with narrower, safer lanes.
- Improve local bus transit quality with drastically improved and strategically placed stops.
- Create safer, accessible crossings for pedestrians and bicyclists.
- Replace broken, narrow sidewalks with 10-foot-wide accessible paths.

The Project addresses many local, regional, and national priorities for safety, multimodal connectivity, and quality of life so that people can affordably and, with dignity, reach opportunities regardless of travel mode.

Project Genesis

The Project is derived from a series of iterative, collaborative, and interagency planning exercises:

- **Walk + Bike Montrose Plan, Montrose Redevelopment Authority.**[1] This 2020 plan classifies the corridor as a walking priority street and a safe transit access project, specifically identifying widening sidewalks, rebuilding transit stops, improving crossings, and adding additional drainage capacity as priorities.
- **Montrose Livable Centers Plan, Montrose Redevelopment Authority.**[2] This 2021 plan, developed in partnership with the Houston-Galveston Area Council (H-GAC), identifies the need for a multimodal greenway link between Hermann Park, south of the Project, and Buffalo Bayou, north of the Project. Montrose Boulevard is the only contiguous connection between the two parks and is envisioned as this urban greenway facility.
- **METRONext, Houston METRO.**[3] Voters supported Houston METRO's broader METRONext plan in 2019, with 68% voting in favor. As a component of the improvements, 17 high-ridership, frequent bus routes were chosen to prioritize speed, accessibility, and reliability improvements – these are called BOOST corridors. A detailed plan for Route 56 Airline/Montrose Corridor was completed in 2021, as Route 56 is the pilot BOOST route. The Project implements the plan in the project limits.
- **Houston Bike Plan, City of Houston.**[4] This 2017 plan identifies Montrose Boulevard within the project limits as a candidate for a high-comfort bicycle facility. The ~10' sidewalks as part of the Project scope will provide sufficient width for bicyclists to travel the corridor safely.

In addition to the above plans, several other infrastructure and service enhancements are planned on adjacent and crossing corridors that will also add to an improved transportation network for people walking, rolling, biking, and riding transit. Transit users will have an improved experience with Houston METRO's Universal Accessibility initiative. The Montrose Redevelopment Authority has a number of pedestrian and bicycle projects identified and budgeted for in their Capital Improvement Plan (CIP) to improve safety for multimodal users on nearby neighborhood streets, including Welch Street, Stanford Street, Woodhead Street and Hawthorne Street. The City of Houston also has CIP projects to improve paving, drainage, water lines, and other reconstruction improvements.

[1] https://montrosehtx.org/wp-content/uploads/2020/07/Walk-Bike-Montrose-June2020.pdf
[2] https://www.h-gac.com/getmedia/6e67a8e3-e215-4aca-ac9b-2451a3ea70df/Montrose-LC-Final-Plan
[3] https://www.ridemetro.org/about/metronext/moving-forward-plan
[4] https://houstonbikeplan.org/

Project Location

The Project is located within the City of Houston, Texas, inside the Houston Urbanized Area and lies within the TX-07 U.S. Congressional District. The City of Houston is the fourth largest city in the United States with a 2021 population of approximately 2.2 million. As one of the most diverse cities in the country, Houston is experiencing rapid growth, including in the urban core where the Project is located. The Houston region overall is projected to have a population of 10.7 million by 2045.[5]

The Project is part of a broader effort to improve Montrose Boulevard in its entirety from Allen Parkway south to US 59/I-69. Phase I from Allen Parkway to West Clay Street is slated for construction. This RAISE application is for Phase II, which extends from just south of West Clay Street to US 59/I-69. Figure 1 depicts the Project's limits and broader context.

The Project limits bisect five Census Tracts, including a Historically Disadvantaged Community Tract 48201410702 (labeled as "4107" in the USDOT online map).[6] The Project will also improve affordable transportation for people walking, rolling, biking, and riding transit to and from the adjacent Tract 48201410100 ("4101" in the online map), a Historically Disadvantaged Community and an Area of Persistent Poverty tract. Improvements on the corridor will benefit residents of Houston's Fourth Ward neighborhood, which contains Freedmen's Town, a historically Black community.[7] See Figure 2.

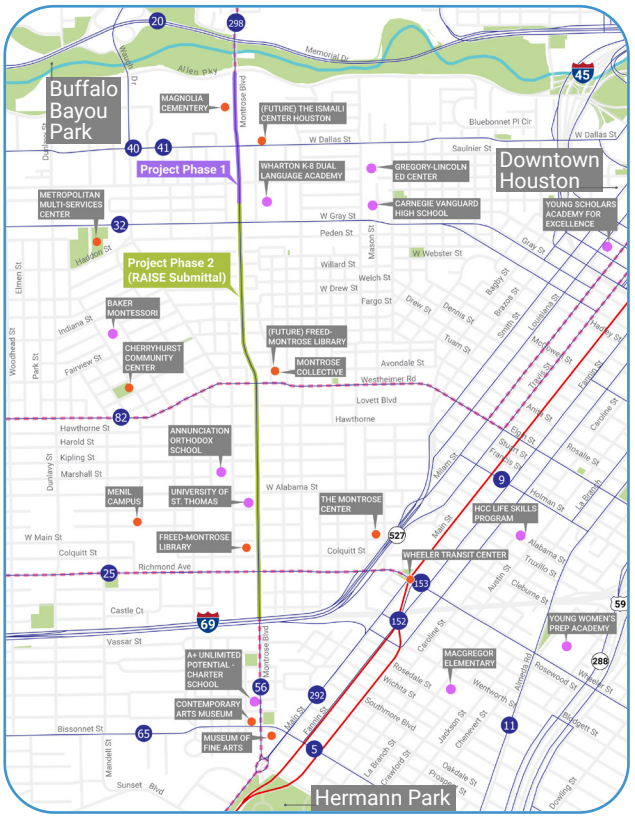


Figure 1. Project Limits

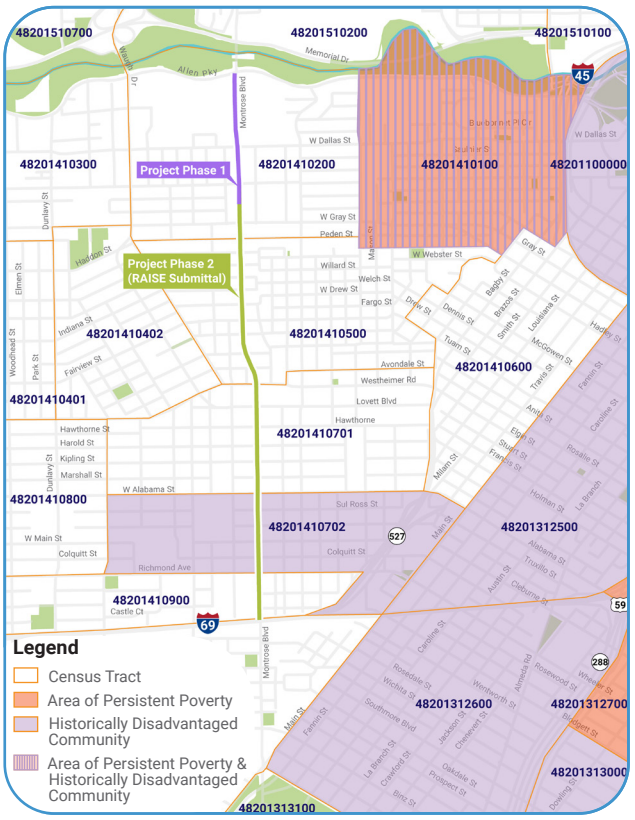


Figure 2. Project Census Tracts

Additional Project Context

Montrose Boulevard is an important north-south corridor and connects to several key east-west corridors. The Project is a principal connection to important transportation infrastructure facilities, including recently completed, in progress, and future projects. Specifically, the Project:

- Fills a gap to complete and enhance transit and pedestrian connections to Buffalo Bayou Park's shared use paths on the north end of the Project limits.
- Implements BOOST station placement and improvements on Route 56 along the

[5]2045 RTP Regional Transportation Plan, Summary. Houston-Galveston Area Council. http://2045rtp.com/documents/plan/2045-RTP-Executive-Summary.pdf
[6]https://maps.dot.gov/BTS/GrantProjectLocationVerification/
[7]https://houstonfreedmenstown.org/

Project corridor; connects with Houston METRO's highest ridership route, the east-west Westheimer Road Route 82, itself slated for Signature BOOST improvement; and connects to the east-west Richmond Avenue Route 25 corridor, itself slated for the University Line Bus Rapid Transit (BRT).

The Project corridor also provides access to several educational institutions, including: University of St. Thomas, Annunciation Orthodox School, Arabic Immersion Magnet School, and Wharton Dual Language Academy. Cultural institutions along or within the vicinity of the corridor include the Menil Collection, Rothko Chapel, current and future locations of the Freed-Montrose branch of the Houston Public Library System, and the Ismaili Center (under construction).

Detailed Scope and Design

The Project will create a signature urban street through a full reconstruction with enhancements for all modes. The reconstruction entails replacing pavement, driveways, medians, and drainage infrastructure. The Project will enhance safety for all street users through intersection improvements, new multimodal paths with ADA ramps and crossings, and upgraded traffic signals, as well as updated transit infrastructure, including new bus shelters with real-time information. The Project will also replace streetlights, add additional trees, and will make all attempts to preserve the historical large trees along the corridor.

Northern Section – North of Westheimer Road. The northern section, in Figure 3, has a wider right-of-way and an existing median. The new cross-section will consist of four narrower travel lanes and a 20' raised median with trees. There will also be left turn lanes similar to the existing conditions at most streets; and no left turn lanes at any unsignalized intersections.

Southern Section – South of Westheimer Road. In the southern section, in Figure 4, there will also be four narrower travel lanes and a 14' raised median with trees. At the intersections, there will be northbound and/or southbound left turn lanes. The speed limit will be reduced to 30 mph in this section to create a consistent speed limit across the entire corridor.

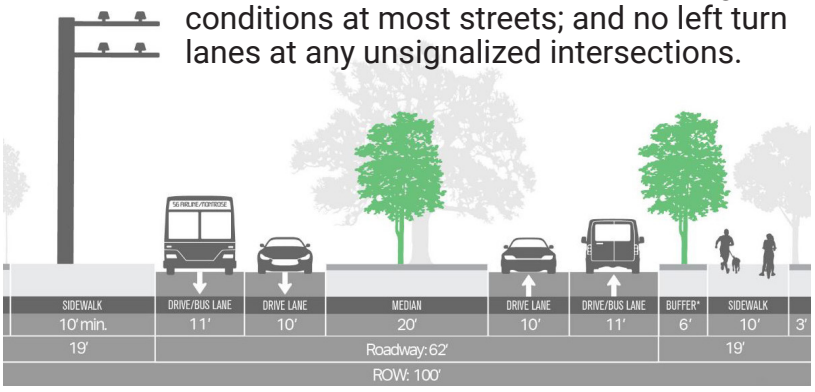


Figure 3. Proposed Improvements (Northern Section)

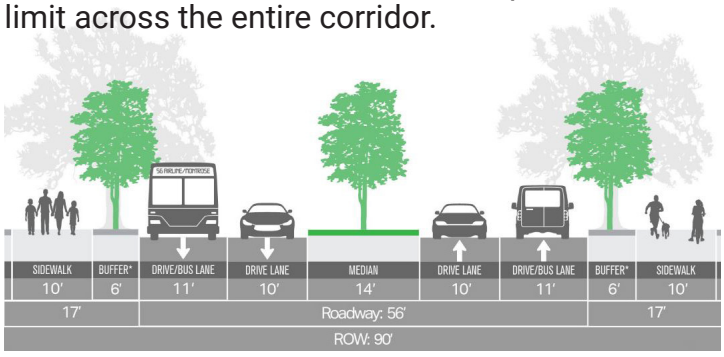


Figure 4. Proposed Improvements (Southern Section)

Other improvements applicable to the entire Project limits:

- Creating 10' paths on both sides of the street, where feasible, including ADA accessible ramps and features for people with disabilities.
- Uniformly enhancing bus stop platforms to accommodate full-size shelters and other amenities, consolidating stops for speedier service, and implementing Traffic Signal Priority (TSP) at signalized intersections.
- Replacing outdated public utilities, including replacing the aging sanitary sewer and water lines, as well as replacing storm sewers in accordance with City of Houston's ATLAS-14 requirements to reduce flooding and create climate resiliency through reduced overland sheet flows and reduced area flooding.

Both phases of the Montrose Boulevard Project underwent the City of Houston's Design Concept Report (DCR) process in 2022 and the final DCR documents will be submitted for final approval in March 2023, including the 30% planset drawings. Public meetings were held in the winter of 2022 and early 2023 to obtain further feedback from the public and stakeholders on the design and scope of the project. Phase I of the project, from Allen Parkway to West Clay Street, is locally funded and is currently in the detailed design process. Construction on Phase I is slated to begin in December 2023 and projected to be complete by Fall 2024. Phase II is the subject of this RAISE grant request.

Project Need: Transportation Challenges Addressed

The Project is a high priority for the community. Multiple community plans prioritize the project corridor and envision a signature north-south corridor for safe, dignified, accessible, and practical multimodal use.

The project corridor is unsafe. The City of Houston's Vision Zero Initiative has identified 60% of traffic deaths and serious injuries occurring on just 6% of Houston's streets. Montrose Boulevard between Bomar Street and Branard Street is on the City of Houston's High Injury Network. The entirety of the corridor is on Harris County's High Injury Network. Over the last 5 years, there have been nearly 500 crashes along the corridor, including 13 involving pedestrians and four involving bicycles. Based on the traffic volumes and crash data, the crash rate is 719 crashes per 100 million vehicle miles. The 2021 statewide traffic crash rate on divided four lane urban streets is 167.97.[8] The crash rates along the Project corridor are over four times higher than the Texas average.

CORRIDOR CRASH RATES
4x HIGHER THAN TEXAS AVERAGE

Figure 6. Existing Conditions

Montrose Boulevard is in disrepair. The poor condition of the facility results in an unsafe and often inaccessible travel environment for all users. The existing narrow sidewalks are in poor condition, lacking ADA ramps and marked crosswalks. There are sections of the corridor where tree roots have damaged the sidewalk, resulting in cracks and unlevel conditions. A 2021 sidewalk assessment found that nearly 82% of the sidewalks on Montrose Boulevard are in poor condition.[9] In 2023, the Houston Chronicle polled readers about the streets with the worst sidewalks in the Houston region — "any street in Montrose" was listed third in the top streets.[10]

The corridor is inaccessible and lacks safe crossings. Missing and damaged ADA ramps, unmarked crosswalks, and the presence of utilities behind the curb hinder the pedestrian and transit rider experience on Montrose Boulevard. Furthermore, there is a lack of safe crossings for bicyclists and pedestrians. The absence of median refuges on the corridor forces those

[8]Texas Department of Transportation. Statewide Traffic Crash Rates. https://ftp.txdot.gov/pub/txdot-info/trf/crash_statistics/2021/02.pdf.
[9]From DCR: https://drive.google.com/file/d/1rtLMQcZDh26NiZkn34c-q1utFR3ZFbJJ/view?usp=share_link
[10]Nickerson, R. (2023, February 3). Readers pick Houston's worst sidewalks, as residents with disabilities share dangers they face daily. Houston Chronicle. https://www.houstonchronicle.com

crossing Montrose Boulevard to take unnecessary risks to cross the street, either running across, waiting for traffic to clear on both sides, or walking over a third of a mile to reach a signalized crossing. There are no dedicated bikeways on Montrose Boulevard; currently, bicyclists are using the narrow, broken, and unlevel sidewalks.

Transit riders live with suboptimal service and poor stop conditions. The Project corridor is served by Houston METRO's local bus route 56 Airline/Montrose, which connects the Texas Medical Center and Greenspoint Transit Center, stopping at residential, employment, and commercial centers along the way. Route 56 is the ninth busiest route in the local bus network and second in the system for bicycle boardings. This underscores the need for improved multimodal access to the bus route. Most of the 32 transit stops along the corridor lack shelters and other amenities riders appreciate, especially in Houston's frequently hot and wet environment. The Project prioritizes equity by improving walking, rolling, biking, and riding transit. LINK Houston reports Route 56 riders to be: 80% people of color; 42% in households with no vehicle; 25% ride METRO 6-7 days a week; 18% have no other travel alternative.[11] The merit criteria and benefit-cost analysis go into further detail and focus specifically on bus riders using the bus stops improved by the Project.

The street has poor drainage and water routinely ponds. Houston receives increasingly frequent heavy rainfall. Improving stormwater drainage is an extremely high priority for the region. Routine rains create temporary flooding and longer-term standing water on the Project corridor – especially challenging for people with a disability who rely on corner curb cut ramps. Existing modeling shows significant ponding at the intersections of West Gray Street and West Alabama Street for 2- and 100-year flood events. The public utilities have exceeded their useful life and storm sewer is undersized.

The Project reconstructs Montrose Boulevard to address each of these five key issues. The result will enhance the community experience by creating a more livable corridor encouraging multimodal travel and economic activity and supporting the vibrant businesses and cultural institutions already nearby but largely functionally inaccessible. A RAISE grant award is essential to fill a funding gap on this high priority, multimodal urban street project.

This Project has broad, bipartisan support from a variety of elected officials, community and local organizations, area business owners and residents.

Figure 7. Existing Conditions

[11]LINK Houston, 2018 Equity in Transit Report, Supplement: Ridership by Mode and Route/Line. https://linkhouston.org/wp-content/uploads/2018/11/LINKHouston_EquityinTransit2018_Report.pdf

FY23 RAISE Application Submittal

Houston, TX | Montrose Boulevard Safety and Multimodal Access Project

Merit Criteria

MONTROSE
TAX INCREMENT REINVESTMENT ZONE 27

Merit Criteria

The Montrose Boulevard Safety and Multimodal Access Project (henceforth known as "the Project") reconstructs a signature urban street to:

- Replace four wide travel lanes with narrower, safer lanes.
- Improve local bus transit quality with drastically improved and strategically placed stops.
- Create safer, accessible crossings for pedestrians and bicyclists.
- Replace broken, narrow sidewalks with 10-foot-wide accessible paths.

Safety

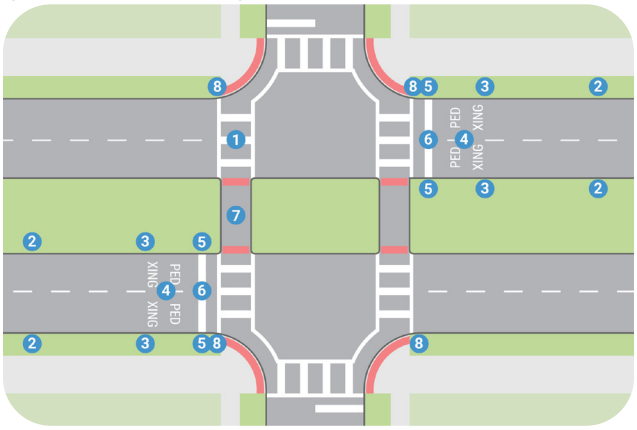
A safer street for all people, in or out of vehicles, is the most crucial benefit and aspect of the Project. The corridor is unsafe, with poor pavement, outdated traffic signals, broken sidewalks, missing ADA ramps, no bike facilities, and few safe crossings for people walking, rolling, or biking – including the nearly 1,000 daily transit boardings and alightings at the 32 bus stops the Project will improve.[1]

Protecting Non-Motorized Travelers and Communities from Safety Risk

The Project will create uniform, predictable, and safe ~10' paths for multimodal users. The sidewalks will include ADA compliant corner curb cut ramps. Crosswalks, presently non-existent or with faded markings, will include high visibility markings and lighting – ensuring people outside of vehicles are visible to drivers.

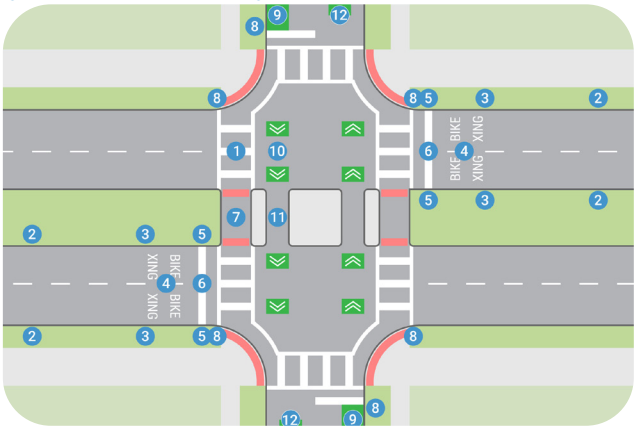
Safety for people outside vehicles will also be improved through enhanced pedestrian and bicyclist crossings that will be installed at presently uncontrolled crossing streets. The median crossings for vehicles will be closed and rectangular rapid-flashing beacons (RRFBs) and enhanced pedestrian or pedestrian and bicycle crossings will be created (see Figure 1). One intersection will also have a median refuge in conjunction with advance markings and signage.[2]

Typical Pedestrian Only Closed Median Treatment



1. White high-visibility crosswalk markings
2. W11-2 pedestrian warning sign with W16-9P AHEAD (plaque)
3. Rectangular rapid flashing beacon (RRFB) with W11-2 pedestrian warning sign with W16-7PL diagonal downward arrow (plaque)
4. "PED XING" advance pavement markings
5. R1-5b "STOP HERE FOR PED" sign
6. Stop bar
7. Pedestrian median refuge of the same width as the crosswalk, cutting through the median at street level if the median is less than 17 feet wide and ramping up otherwise
8. Push buttons to activate the RRFB

Typical Pedestrian & Bicycle Closed Median Treatment



1. White high-visibility crosswalk markings
2. W11-15 pedestrian/bicycle warning sign with W16-9P AHEAD (plaque)
3. Rectangular rapid flashing beacon (RRFB) with W11-15 pedestrian/bicycle warning sign with W16-7PL diagonal downward arrow (plaque)
4. "BIKE XING" advance pavement markings
5. R1-5b MOD "STOP HERE FOR PED BIKE" sign
6. Stop bar
7. Pedestrian median refuge of the same width as the crosswalk, cutting through the median at street level if the median is less than 17 feet wide and ramping up otherwise
8. Push buttons to activate the RRFB
9. Sharrows adjacent to the curb approaching crossing
10. Green-backed chevron guidance markings through the intersection
11. Bicycle median refuge aligned with guidance markings and cutting through the median at street level
12. Sharrows in the center of the lane heading away from crossing

Figure 1. Planned Pedestrian and Bike Treatments

[1]As of October 2022
[2]From DCR: https://drive.google.com/file/d/1rtLMQcZDh26NiZkn34c-q1utFR3ZFbJJ/view?usp=share_link

Slowing Speeds for a Safer Street

The Project will narrow travel lanes, which results in lower vehicle speeds and shorter crossing length/time for multimodal users. The 85th percentile speed of the corridor is 33 mph; thus the design speed should match the posted speed limit. Narrower lanes and lower speed limits will reduce severity of crashes and make the corridor safer for bicyclists and pedestrians as well. The posted speed limit will also be lowered from 35 mph to 30 mph on the northern section of the corridor, north of Westheimer Road. South of Westheimer Road, the speed limit is already 30 mph. The Project will also add a 14-foot median on the southern section, which will improve safety compared to the presently undivided roadway that offers multimodal users no respite while crossing.

Figure 2 shows the Project corridor is part of the City of Houston's High-Injury Network – meaning the corridor is within the 6% of streets seeing 60% of all serious and fatal crash impacts. The entirety of the Project is within Harris County's High Injury Network.

Safer System: Reducing Crash Frequency and Severity

The Project will modernize the street in many ways, but the design will most specifically seek to eliminate the root causes of the types of historical crashes in the corridor. Per the Texas Department of Transportation (TxDOT)'s Highway Safety Improvement (HSIP) strategies, the Project will reduce the number of crashes by improving the roadway and pedestrian facilities. Figure 3 lists the number of crashes that are able to be reduced by each countermeasure.

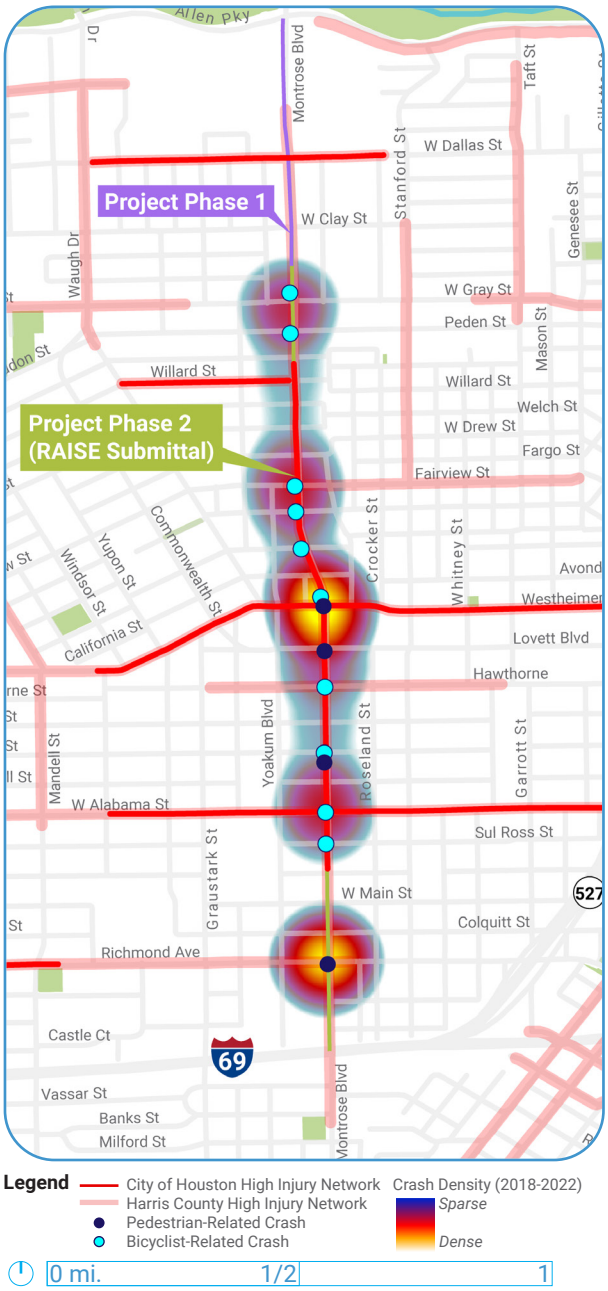


Figure 2. Crash Data and High Injury Networks

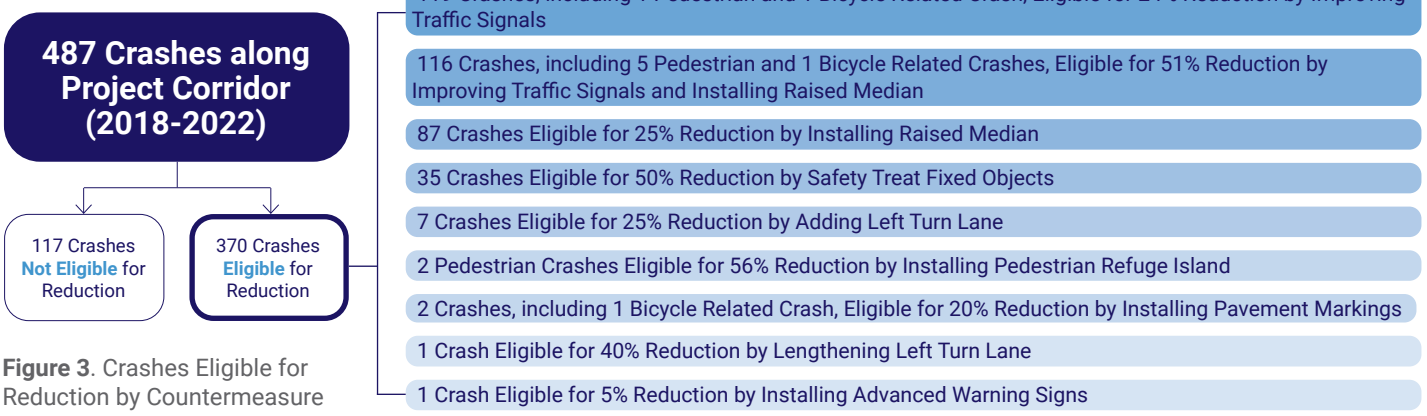


Figure 3. Crashes Eligible for Reduction by Countermeasure

Examples of countermeasures to be implemented on the Project:

- Adding pedestrian refuge islands, improving traffic signals and pavement markings, and installing a raised median – effectively reducing bicycle and pedestrian crashes by 21-56%.
- Adding a raised median, improving traffic signals, adding and lengthening left turn lanes at select intersections, installing pavement markings, installing advanced warning signs, and safety treating fixed objects – effectively reducing vehicle crashes by 5 - 51%.

Since 2018, approximately 500 crashes occurred within the Project limits; 13 crashes involved a total of 14 people walking or rolling and four crashes involved a bicyclist. Based on the TxDOT Crash Records Information System (CRIS), 55% of these 18 people walking, rolling, or biking were people of color. However, the population living within 500-feet of Montrose Boulevard is approximately 77% White.[3] People of color are disproportionately impacted in crashes in the Project corridor compared to the demographics of the adjacent community.

As the benefit cost analysis (BCA) demonstrates, the Project yields the greatest benefits in the area of safety by reducing the rate of crashes along the corridor – which in turn will have a positive, equitable outcome for people of color who are bearing the brunt of crash impacts while walking, biking and rolling.

Environmental Sustainability

Reduce VMT through Modal Shift

The Project significantly improves infrastructure for people not driving. The result? The Project will increase walking and biking, which in turn will also increase transit. The switch from automobile to the active travel modes and transit will result in over 7 million fewer vehicle miles traveled (VMT) over the planning horizon (see Table 1). The BCA contains more detailed information.

Table 1. VMT Reduction

Modal Shift	VMT reduced over planning horizon
Pedestrian	289,182
Bicycle	107,178
Transit	6,652,766
Total	**7,049,126**

The increased transit activity is primarily on the Airline/Montrose Route 56 local bus and METRO's Katy Freeway/Texas Medical Center Park and Ride Route 298, connecting suburban areas west of Houston to the Northwest Transit Center, the Project corridor (with a stop), and ultimately to the Texas Medical Center. Route 298 stops at Montrose Boulevard and West Alabama Road on its way into and out of the Texas Medical Center, enabling commuters to travel to and from the Montrose area with ease. A more conducive, comfortable, and attractive environment for transit use is crucial to facilitating the switch from driving to utilizing METRO bus services – ultimately taking automobiles off the street and reducing VMT.

Cleaner Air/Water and a Quieter Environment in Historically Underserved Communities

The Project corridor bisects five Census tracts; one of which is a Historically Disadvantaged Community (Census Tract 4107.02, noted as '4107' in the USDOT online map). The Project is also adjacent to Census Tract 4101, classified as both a Historically Disadvantaged Community and an Area of Persistent Poverty.[4] Reducing VMT will reduce exposure to air pollution, including greenhouse gas emissions, for the community. When combined, a lower speed limit, slower actual travel speeds, and reduced VMT result in less road noise. Table 2 documents the resulting pollution reduction in metric tons over the planning horizon.

[3]Per 2019 American Community Survey data obtained via ESRI's Business Analyst.
[4]https://maps.dot.gov/BTS/GrantProjectLocationVerification/

Avoid Adverse Environmental Impacts

A preliminary National Environmental Policy Act (NEPA) assessment was conducted for the Project in 2021. At that time, no impacts were identified as they relate to air, water, or other areas of concern. Due to the hazardous materials sites adjacent to the Project alignment, local standards are to apply a designation of a 'potentially petroleum contaminated corridor,' which requires a soil and groundwater management plan during construction to accommodate testing, identification, and disposal of hazardous materials if encountered. The project meets the criteria for a Categorical Exclusion (CE) finding.

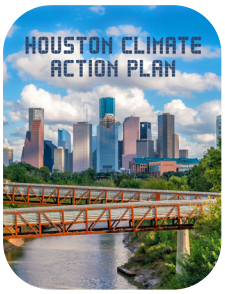
Table 2. Pollution Reduction

Pollutant	Reduction over planning horizon (metric tons)
Gaseous hydrocarbons	2.0
Carbon monoxide	73.5
Nitrogen oxides (NOx)	18.0
Non-methane hydrocarbons	1.0
Volatile Organic Compounds (VOCs)	1.3
Carbon dioxide (CO2)	15,091.0

Alignment with Climate Action Plan

The Project scope aligns with the goals and strategies of Houston's decarbonization plan – the 2017 Climate Action Plan (CAP). The CAP contains an emissions reduction strategy to meet the Paris Climate Agreement goal of carbon neutrality by 2050. Transportation is one of the four focus areas. Under transportation, there are three goals:

- **Goal 1:** Shift regional fleet to electric and low-emission vehicles
- **Goal 2:** Reduce VMT per capita, targeting a 20% reduction by 2050
- **Goal 3:** Provide equitable and safe mobility choices, targeting zero traffic-related deaths or serious injuries by 2030 and 500 miles of high-comfort bike lanes by 2025.



> *"Designing and retrofitting complete communities with emphasis on convenient public transportation, safe streets and walkable places is essential to our success in reducing GHG emissions and ensuring Houstonians can reduce private vehicle use."*
>
> Houston Climate Action Plan, 2017[5]

To reduce VMT, the strategies for meeting this goal include implementing integrated multimodal transportation systems and building and retrofitting complete, transit-oriented neighborhoods. The Project will help meet this goal by upgrading the multimodal environment and promoting the shift of automobile traffic to other non-motorized modes and transit that runs along and adjacent to the corridor. The CAP specifically calls out coordination with local Tax Increment Reinvestment Zones (TIRZ)s to align transportation improvements and investments that champion multimodal transportation.

Improve Resiliency

In addition to the CAP, in 2020, the City of Houston also authored Resilient Houston — a formal strategy to protect against future disasters and chronic issues, including aging infrastructure, flooding, poor air quality, and urban heat island effects. The Project ties in with goals and strategies included in Resilient Houston by improving safety and well-being, providing better pedestrian/bicycle accessibility to METRO stations, modernizing infrastructure, reducing the urban heat island effect, and promoting urban infill. The Project will also improve drainage and reduce flooding, key aspects of Resilient Houston.

[5]http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf

The drainage improvements in the Project scope will provide additional storage and detention for storm water. The Project will add 13.8 acre-feet of storage volume over existing conditions, reducing localized flooding in the community. In a 100-year flood event, there is a ponding benefit of up to 0.7 feet (8.4 inches) in the vicinity of Montrose Boulevard and Westheimer Road, meaning that there will be nearly a foot less water that remains on the road after a heavy rain event.

Quality of Life

The Project is located in Montrose, a neighborhood with a unique history and culture. Montrose is the creative epicenter of Houston and has been recognized for the arts and music scene, as well as its bohemian counterculture. The neighborhood started off as a streetcar suburb in the early 1900s and became the center of Houston's LGBTQ+ population in the 1970s and 1980s. The neighborhood and Project corridor are home to many small businesses, restaurants, and bars. There are a variety of residential buildings and structures in the area, ranging from bungalows to mid- and high-rise apartments. See Figure 4.

> *"One of the best things about Montrose is that it's truly a walking neighborhood — a pleasant rarity for a Texas city."*
>
> Condé Nast[6]

Expand Travel Choices and Integrate Land Uses and Affordability

Through public engagement, the 2021 Livable Centers Study for Montrose found that residents and business owners appreciate and want to build on the urban character of the neighborhood to realize its potential as one of Houston's truly walkable places. This Project embodies that ambition for the entire neighborhood by creating a signature urban street that will improve quality of life for residents, business owners, and visitors alike.

The Environmental Protection Agency (EPA) created a Walkability Index at the Census block group level that considers four factors: transit proximity, employment mix, employment-housing mix, and intersection density. The total score is out of 20 points. The block group at the intersection of Montrose Boulevard and Westheimer Road, the middle point of the Project and principal intersection, is ranked second in Harris County, with a score of 19.3 out of 20.[7] All other adjacent block groups to the project corridor also rank highly in the 'Most Walkable' category. However, the EPA's Index does not account for the presence of actual pedestrian infrastructure or the condition of existing facilities. Given the mixed land

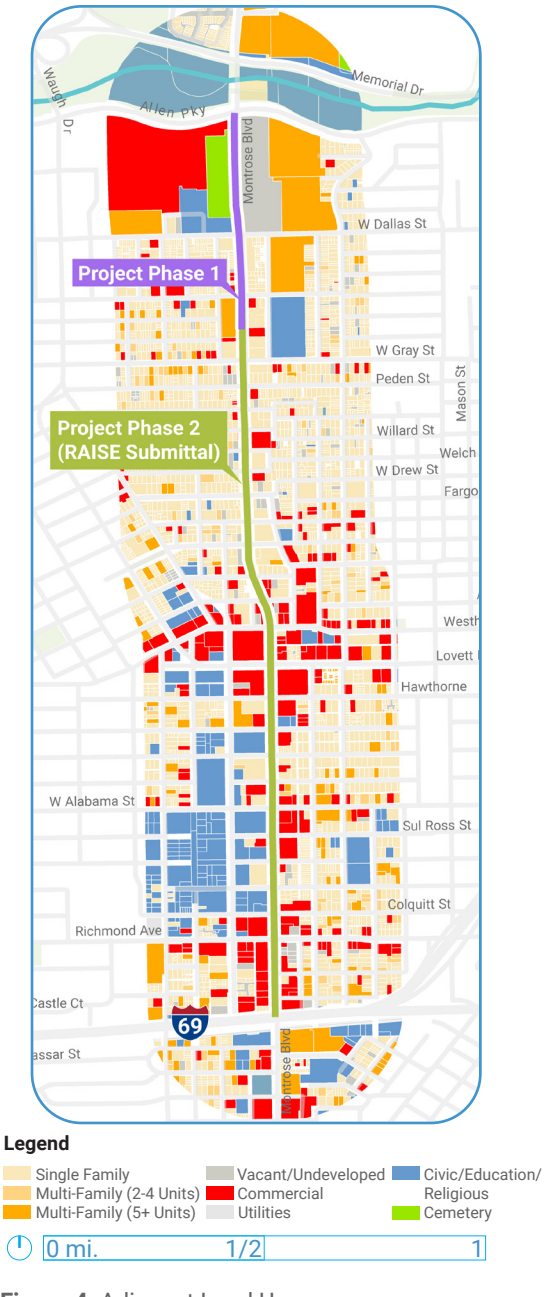


Figure 4. Adjacent Land Use

[6] Thompson, J. (2021, April 2). What to do in Montrose, Houston's Most Walkable Neighborhood. Conde Nast Traveler. https://www.cntraveler.com/story/neighborhood-guide-to-montrose-houston

[7] Where are Houston's most and least walkable areas? (2023, February 8) Houston Chronicle. https://www.houstonchronicle.com/projects/2023/walkable-neighborhoods-houston-map/

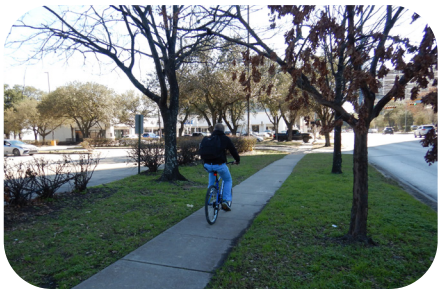


Figure 5. Existing multimodal users

use, intersection density, and proximity to transit, the Montrose Boulevard corridor needs improved sidewalks and multimodal facilities to help realize its potential as the most walkable area in Houston and in greater Harris County – making the EPA index result a reality.

The vision of the 2020 Walk + Bike Montrose Plan, sponsored by the Montrose Redevelopment Authority, is to make Montrose a 20-minute neighborhood. This means that it has a walkable and bikeable street grid to allow people to go about their daily lives without using a car. That plan found that although the neighborhood is already connected, affordable, and has enduring livability, it lacks safe infrastructure and connectivity for people outside vehicles. The Project will improve pedestrian conditions on a key north-south corridor that is the backbone of the neighborhood and is an important component of achieving the vision of a 20-minute neighborhood.

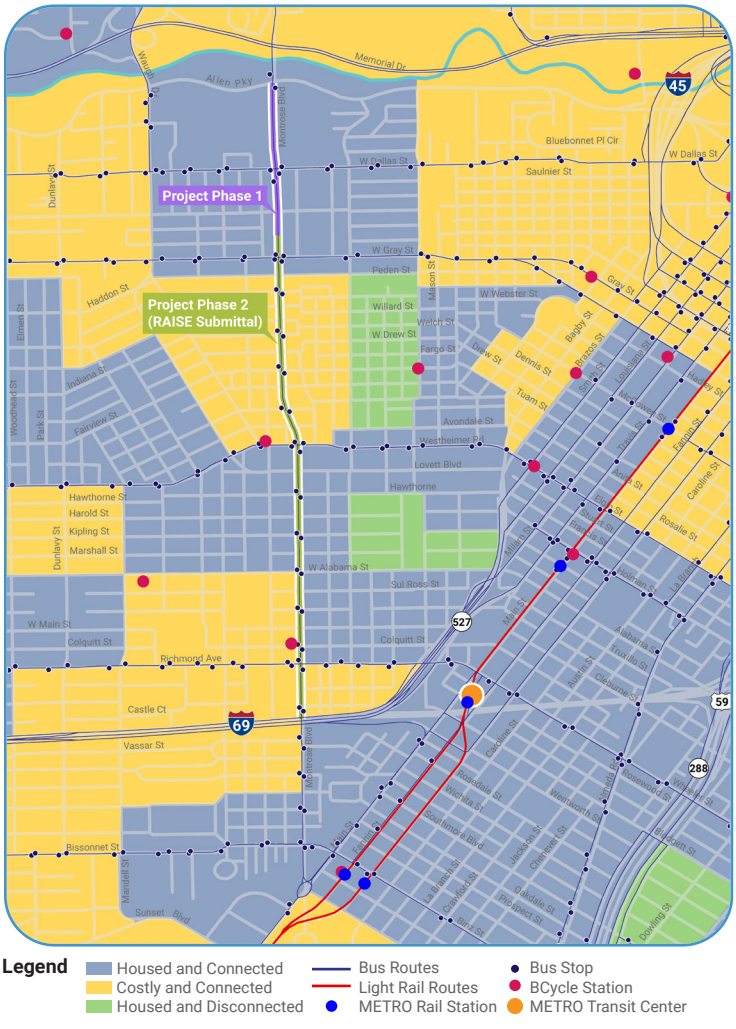
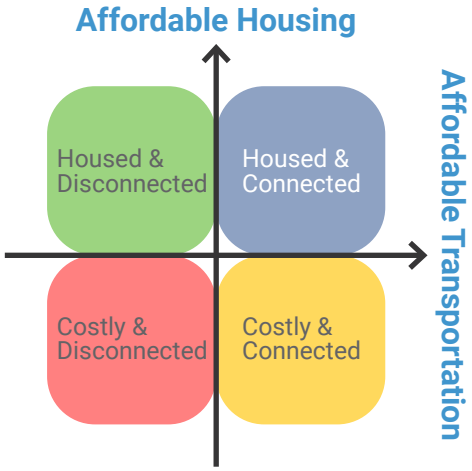


Figure 6. Quality Affordable Transportation Index (QATi)

A 2020 report published by the Kinder Institute and LINK Houston illustrated where affordable housing and affordable transportation co-exist in the greater Houston region.[8] The report found that much of the adjacent area to the Project is in an "Ideal Area for Families that Need Quality Affordability," underscoring the affordability of both transit and housing in the area. There are also adjacent areas nearby that need more affordable transportation, and this Project will improve walking, biking and transit for those areas. See Figure 6.



[8]https://kinder.rice.edu/research/where-affordable-housing-and-transportation-meet-houston

Improve Public Health

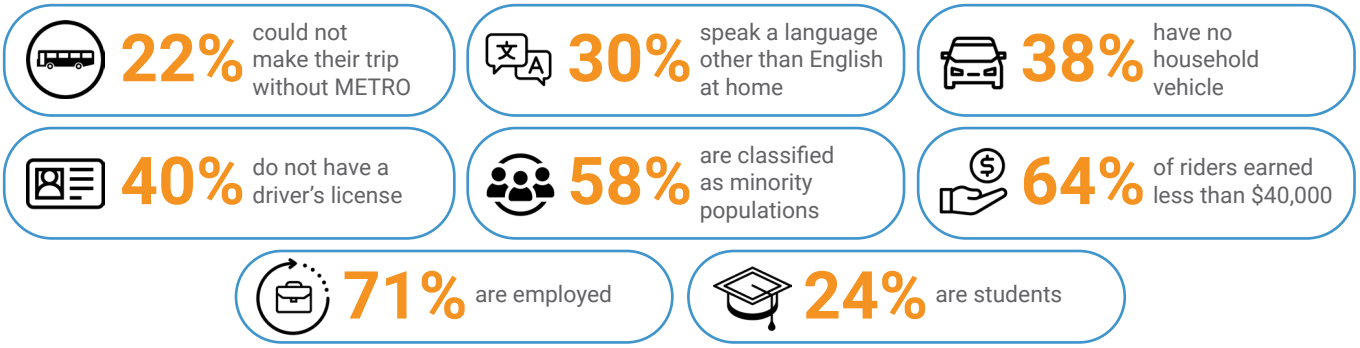
The Project will reinforce opportunities to be physically active while making practical trips to in-neighborhood destinations. The shift from automobiles to non-motorized modes will result in a health benefit through reduced air pollution and increased physical activity. Physical activity is a key aspect of personal health and wellbeing. As discussed previously, the Project will induce additional pedestrian and bicycle trips over the planning horizon. In the open year, there are expected to be about 291,700 induced pedestrian trips and 22,600 bicycle trips. The BCA quantifies mortality benefits to users switching to active transportation as well as the impacts of reduced air pollution and emissions.

Mitigate Urban Heat Islands

The 2021 Livable Centers study mapped heat islands in the Montrose neighborhood. On average, the neighborhood is about ten degrees warmer than the adjacent Buffalo Bayou Park, located at the northern edge of the Montrose Boulevard corridor. Eighty percent of the area is covered by impervious surfaces and 24 percent is covered by the existing canopy. The existing trees along Montrose Boulevard will be preserved wherever possible, and additional trees will be planted along the corridor for additional shade and coverage as part of the Project.

Increase Affordable Transportation Choices for Underserved Communities

The Project will improve the quality of life for historically marginalized and underserved populations, particularly by improving access to, and the quality of, transit. As discussed previously, the Project corridor is served by METRO Airline/Montrose Route 56 local bus and Katy Freeway/Texas Medical Center Park and Ride Route 298 that connects western suburbs to the Texas Medical Center. The BOOST improvements, such as upgraded shelters, amenities, coupled with improved sidewalk and multimodal access, will benefit existing and future riders. METRO's 2017 onboard survey of riders boarding or alighting at one of the 32 stops in the Project limits revealed the following:



Improve Access to Daily Destinations

The Project will improve access to daily destinations by improving transit and active transportation facilities. Along the corridor, there are nearly 3,300 jobs across 226 establishments.[9] The University of St. Thomas, Annunciation Orthodox School, Arabic Immersion Magnet School, and Wharton Dual Language Academy are all located close to the corridor. Cultural institutions along or within the vicinity of the corridor include the Menil Collection, Rothko Chapel, Freed-Montrose branch of the Houston Public Library System (both current and future locations), and the Ismaili Center (currently under construction). The Project also provides connectivity to Buffalo Bayou Park to the north, a large recreational area and home of some of the region's principal bike "highways" (i.e., shared use paths).

In addition to improved access to nearby destinations, the transit BOOST improvements will help expand access to essential services. The METRO Airline/Montrose Route 56 connects

[9]DatabaseUSA Business Database: https://databaseusa.com/

Montrose to the Texas Medical Center – the world's largest medical complex with over 9,000 hospital beds and 106,000 employees.[10] The bus route also stops at the Museum District, allowing for access to the myriad cultural institutions and Hermann Park, which contains 445 acres of recreation, including the Houston Zoo and Miller Outdoor Theatre. Montrose Boulevard intersects with several other transit lines, including Route 82 along Westheimer Road, Routes 40 and 41 along West Dallas Street, Route 32 along West Gray Street, and Route 25 along Richmond Avenue. Together, these routes provide increased access to Downtown Houston, community centers, schools, libraries, several grocery stores, and other important daily destinations. See Figure 8.

Create More Livable Communities and Implement Transit-Oriented Development

The Project will support and provide access to a mixed use, livable neighborhood. There are several recent and planned future projects along the corridor. At the corner of Montrose Boulevard and Kipling Street, there is a 36-story apartment building under construction, which will have ground-floor retail.[11] At the corner of Westheimer and Montrose Boulevard, a large mixed-use project with retail, office and residential is planned.[12] The nearly 200,000-square foot Montrose Collective recently opened at the same intersection and offers office space, retail, and restaurants.[13] The Houston Public Library will be relocating the Freed-Montrose branch to The Montrose Collective as well.

Figure 7. Montrose Collective

Adjacent to Phase I of the project, the Ismaili Center is under construction. This 11-acre tract will contain educational spaces, a prayer hall, and multipurpose meeting, conference, and social facilities.[14]

With the University Line Bus Rapid Transit (BRT) line planned for Richmond Avenue, the stop at the corner of Richmond Avenue and Montrose Boulevard on the Project corridor will result in the City of Houston Transit-Oriented Ordinance (TOD) Ordinance to take effect. The TOD standards will require a 20-foot pedestrian realm for redevelopment projects between US 59/I-69 and Branard Street and provide an incentive for developers between Branard and Harold Street.

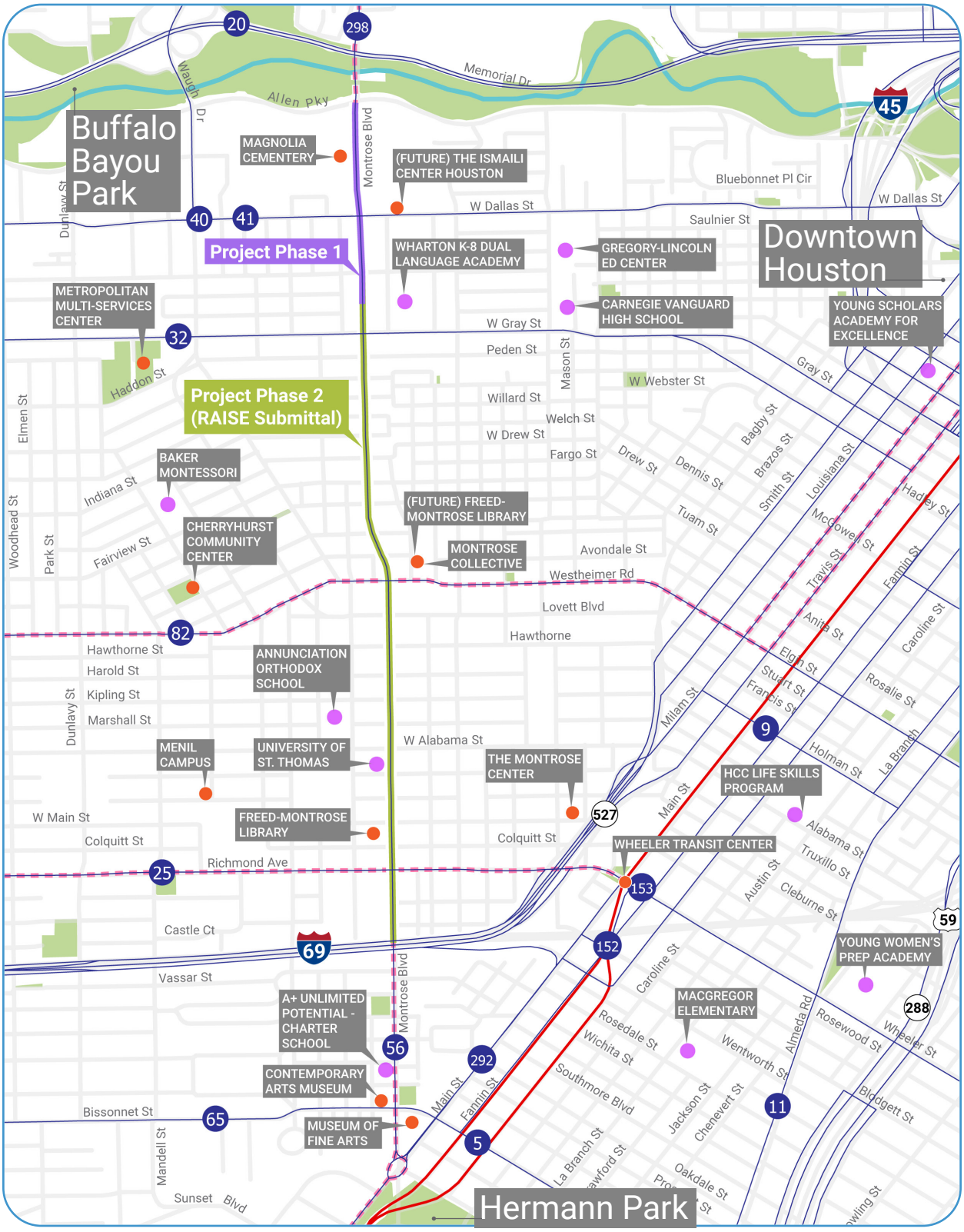
Improves Mobility + Community Connectivity

Improve System-wide Connectivity

The Project will improve safety and mobility. In conjunction with Phase I, the Project will connect to Buffalo Bayou Park and the Buffalo Bayou Trail. The trail ties into the regional trail network, allowing for bicycle and pedestrian access to White Oak Bayou Greenway Trail and MKT Trail. The Project will increase the number of bicycle and pedestrian users along the corridor. The BCA estimates about 800 daily induced pedestrian trips and over 60 bicycle trips in 2029, the project open year.

The transit improvements will facilitate access to several bus routes, as detailed in the Quality of Life section. Access will be facilitated via transit to Downtown, The Medical Center, the Museum District, and other community destinations. As part of METRONext's Moving Forward Plan, Houston METRO will invest $7.5 billion dollars to improve transit service and accessibility

[10]https://www.tmc.edu/
[11]Arrajj, S. (2022, August 23). Crews clear way for proposed 36-story apartment at Montrose Boulevard, Kipling Street intersection. Community Impact Newspaper. https://communityimpact.com/houston/heights-river-oaks-montrose/development/2022/08/23/crews-clear-way-for-proposed-36-story-apartment-at-montrose-boulevard-kipling-street-intersection/
[12]Dulin, M. (2021, February 9). As new buildings rise in Montrose, a neighborhood raises its voice. Community Impact Newspaper. https://communityimpact.com/houston/heights-river-oaks-montrose/development/2021/02/09/as-new-buildings-rise-in-montrose-a-neighborhood-raises-its-voice/
[13]https://www.radomcapital.com/montrose-collective
[14]https://the.ismaili/global/news/institutional-news/ismaili-center-houston-designed-embody-spirit-openness-and-dialogue



Legend

Project Limits
- *Phase 1*
- *Phase 2 (RAISE Submittal)*

- Bus Routes
- Light Rail Routes
- Future METRO BOOST Routes/BRT Lines

- Educational Institutions
- Cultural Institutions and Other Points of Interest

Figure 8. Project Mobility Connections

0 mi. 1/2 1

with over 500 miles of travel improvements. METRO bus Route 56 Airline/Montrose was selected as one of the region's first BOOST networks, which will include reliability and access improvements at 17 of the highest-ridership, frequent bus routes. Given the BOOST improvements along the corridor, it is estimated that ridership will increase by 13%, based on ridership data from Houston METRO before and after the BOOST improvements were installed on Studewood Street, located north of the project corridor along the same 56 Airline/Montrose route. The improvements are anticipated to induce nearly 54,000 new riders in 2029 and nearly 1.2 million riders over the planning horizon.

As part of the corridor improvements, transit signal priority (TSP) will be implemented to reduce delays for buses at intersections, and bus stops will be relocated to the far-side to improve travel times. Stops will be relocated to a quarter-mile spacing to further improve speed along the corridor.

Figure 9. Existing Corridor Bus Service and Stop

Increase ADA Accessibility and Advance Universal Design

The project design will facilitate bus stops that meet BOOST standards, with a 5-foot-deep shelter, 7-foot (minimum) unobstructed sidewalk, and 4-foot safety buffer. The stops will have custom shelters, lighting, real time signage, and bike parking. The near-level boarding platforms with platforms at both doors of the bus will improve boarding and alighting for people with mobility impairments. The stop design goes beyond ADA requirements and considered aspects of the U.S. Access Board's (proposed) Public Rights-of-Way Accessibility Guidelines.[15]

Figure 10. Proposed BOOST Stop

Economic Competitiveness and Opportunity

> *"Montrose is a pocket of eccentricity: a flamboyantly jagged jigsaw piece that lends the greater Houston picture a vivid splash of multi-chromatic verve... Since 1910, Montrose has been described as 'the heart of Houston' and 'the strangest neighborhood east of the Pecos,' but the neighborhood's true beauty lies in the fact that it contains something for everyone."*
>
> Condé Nast[6]

Facilitate Tourism Opportunities

The Project will reconstruct a main north-south corridor through Montrose. The Montrose neighborhood attracts tourists due to its cultural attractions, world renowned restaurants, vibrant nightlife, and unique shopping opportunities. The Menil Collection contains nearly 17,000 pieces of artwork and is free to the public. Adjacent to the main museum building are the Menil Drawing Institute, the Cy Twombly Gallery, and the Dan Flavin Installation at Richmond Hall. In 2019, the Menil Collection had approximately 260,000 visitors. The Rothko Chapel, a non-denominational chapel, is also located nearby. The Montrose neighborhood also contains myriad art galleries, showcasing local to international artists. The Project will enhance access to these cultural destinations. Several statewide and national publications, including Condé Nast Traveler, the New York Times travel section, and Texas Monthly, have highlighted Montrose as a tourist destination with guides to attractions, restaurants, and shopping. Furthermore, the northern portion of the corridor (Phase I of the project) will

[15]U.S. Access Board. https://www.access-board.gov/prowag/

connect to Buffalo Bayou Park, home to 160 acres of bike paths, trails, parks, and public art. Today, a visitor would be hard pressed to move about the area without driving, at least safely and comfortably, but the Project will create new opportunities for visitors and residents to move about in more environmentally friendly and physically active ways.

Rothko Chapel | Menil Park Campus | The Menil Collection | Dan Flavin Installation at Richmond Hall

Figure 11. Nearby Cultural Attractions and Tourism Opportunities[16,17]

Inclusive Economic Development

The Montrose neighborhood has a history of being a center for counterculture, often referred to as the 'gayborhood' and the 'hipstrict.' Along the Montrose project corridor, there are about 225 businesses, of which 68% are classified as small businesses.[18] Although data is not available on the number of LGBTQ+ business owners, as this area has historically been the 'gayborhood' of Houston and is a nexus for the LGBTQ+ community it is likely that there is a higher proportion of LGBTQ+ owned businesses in this neighborhood more than anywhere else in Houston.

For nearly 40 years, from 1976 to 2016, Houston's Pride Festival took place in Montrose. There are several institutions that provide services for the LGBTQ+ population. The Montrose Center, opened in 1978, sees more than 100,000 visitors per year and serves as a community hub providing mental health services, housing assistance, and senior/youth programs. The Legacy Community Health center located adjacent to the corridor historically provided services for STD testing and HIV/AIDS support. Today, it is a Federally Qualified Health Center to provide services to an uninsured and underinsured population. There are also several eating and drinking establishments geared towards the LGBTQ+ population.

Figure 12. Houston Pride Parade and Festival in Montrose[19]

Figure 13. Recent high-rise development along Project corridor

Long-term Economic Growth: Investments in Land Use Productivity and Density

There are nearly 1,000 businesses within a quarter mile of the Project corridor employing about 9,600 people.[20] The Project corridor is already seeing increased density. As detailed in the Quality of Life section, the planned developments include high-rises and mixed-use developments. A Smart Growth America report found that Complete Streets projects can increase private investment, employment, and net new businesses.[21] Given the location of Montrose Boulevard in a walkable dense area of Houston, existing land uses, and the future projected development, the Project will only enhance the economic potential of the corridor and further the mixed-use and dense nature of development. The corridor is currently hindered by poor pavement, unsafe conditions, and subpar or missing multimodal facilities.

[16]https://www.rothkochapel.org/
[17]https://www.menil.org/
[18]DatabaseUSA Business Database: https://databaseusa.com/
[19]https://www.houstonchronicle.com/projects/2022/visuals/houston-pride-parade-history/
[20]Per 2022 ESRI Business Analyst data,
[21]Smart Growth America. March 2015. Safer Streets, Stronger Economies. https://smartgrowthamerica.org/wp-content/uploads/2016/08/safer-streets-stronger-economies.pdf

State of Good Repair

The Project is a total reconstruction of Montrose Boulevard from US 59/I-69 to near West Clay Street. The Project will replace and upgrade roadway, multimodal, and public utility infrastructure within the existing public right-of-way. The public underground utilities have exceeded their useful life. The roadway is able to be upgraded within the existing footprint. The City of Houston's latest Pavement Condition Index (PCI) from 2019 classifies a portion of the corridor in poor condition.

Today, the pavement along the Project corridor is in poor condition overall. There is significant longitudinal and transverse cracking and a notable presence of potholes along the southern portion of the corridor. On the northern portion of the corridor, there is transverse cracking of the concrete. Failed patching is evident throughout. Striping is poor throughout the length of the Project. There are several intersections without ADA ramps; existing ramps are often broken or overrun with vegetation or sediment. Sections of the sidewalk are in such poor condition, that someone relying on a wheelchair or other mobility assistive device would confront impassable conditions. The BCA quantifies the benefit of total reconstruction as compared to continual rehabilitation and maintenance throughout the planning horizon.

Figure 14. Existing Conditions

Partnership and Collaboration

Coordination with Other Entities and Projects

The Montrose Redevelopment Authority will work closely with the City of Houston, Houston METRO, Houston-Galveston Area Council (H-GAC), and other community groups to design and deliver the Project. Coordination with METRO is essential, as this corridor is designated as a BOOST corridor. METRO will be approving the stop locations and will install the BOOST amenities and transit signal priority along the corridor.

The current design allows for partnerships with private developers and entities along the corridor. Phase I of the project (not included in this funding request) will require right-of-way from the future Ismaili Center. They are donating an easement to the City of Houston for a shared use path and in exchange, the City will build a retaining wall. There are several parcels along the Project corridor slated for redevelopment and ongoing coordination will occur.

Meaningful, Continuing Community Engagement

The 2021 Montrose Livable Centers Study involved extensive, iterative public outreach. The Study convened a steering committee with business owners, residents, City staff, institutional representatives, and other community leaders. The engagement occurred in 2020 and the general public was involved via social media, surveys, and two virtual public workshops, given the COVID-19 pandemic. From this study, Montrose Boulevard was identified as a key corridor for multimodal connectivity. This recommendation was voted to be in the top three, with 95% people agreeing that creating an urban greenway on Montrose Boulevard with connectivity to Buffalo Bayou and Hermann Park will address a pressing need in Montrose.

The Montrose Redevelopment Authority held two recent public meetings regarding the full Montrose Boulevard reconstruction project, as part of the City of Houston's Design Concept report process. The meeting in December 2022 was held virtually and the meeting in January 2023 was an in-person open house format. Both meetings were to receive feedback about the project and answer questions. Nearly 100 people attended the meeting in January. Overall, the public supports the Project and is interested in seeing the multimodal improvements realized for the entire corridor.

The outreach efforts specifically included consideration for equitable, inclusive participation. For example, during the process to create the Concept Plan for the Livable Centers study, there was a panel discussion with experts in LGBTQ+ communities and inclusive planning. The panel discussed how to balance growth and development in gayborhoods to retain their inclusive identity. Examples were given from other communities around the country to help guide Montrose and the recommendations in the Livable Centers Study.

Figure 15. The Montrose Livable Centers Study (2021) Engagement

The public meetings for the project in December 2022 and January 2023 were held in the evening to accommodate schedules. The first meeting was held virtually over Zoom and the second was held in person, allowing residents and stakeholders to attend whichever format was more convenient. The in-person meeting was held in an annex of a church in a transit-accessible location in the neighborhood. The location was near Route 56 Airline/Montrose, Route 82 Westheimer, and Route 25 Richmond bus routes. Furthermore, the Montrose Redevelopment Authority took questions and comments both in person and online and published answers/responses on the website.

Project partners will continue their practice to seek and welcome community input, both during detailed design and during future construction. This Project is supported by a variety of community and local organizations, area business owners, advocacy groups, and elected officials from both parties. Letters of support are attached to the application.

Figure 16. Public meeting, January 2023

Innovation

Innovative Technologies

The METRO BOOST improvements will incorporate Traffic/Transit Signal Priority (TSP) at intersections along the project corridor. TSP is a technology that will help make transit service faster and more reliable along the corridor, improving the experience for transit users. The technology is not new to Houston but its use is limited. The Project corridor is a segment of the pilot BOOST implementation – so in that sense the TSP implementation will prove out the technology's implementation in a new type of service in Houston.

The project will consider the use of Silva Cell technology to provide underground bioretention and support large tree growth along the project corridor. The technology is essentially a series of underground planting boxes designed to allow for root growth and stormwater storage without compromising the structural integrity of adjacent surface-level improvements. This technology is currently being piloted on a BUILD-funded project within the City of Houston (The Shepherd and Durham Major Investment Project). This Project will allow an opportunity to further introduce this concept.

Innovative Financing

This Project is sponsored by, and will be let by, the Montrose Redevelopment Authority which is funded via a Tax Increment Financing (TIF) vehicle. Thus, the Project will utilize value capture, both along the corridor and throughout the Authority boundaries to fulfill long-term project funding obligations and the repayment of associated debt.

FY23 RAISE Application Submittal
Houston, TX | Montrose Boulevard Safety and Multimodal Access Project

Project Readiness

MONTROSE
TAX INCREMENT REINVESTMENT ZONE 27

Project Readiness

The Montrose Boulevard Safety and Multimodal Access Project ("Project") is the second phase of a two-part project, to reconstruct the entirety of Montrose Boulevard from Buffalo Bayou to US 59/I-69. These two boundaries provide a natural barrier for corridor improvements. Phase I of corridor, which is the northern section from Allen Parkway (at Buffalo Bayou) is currently funded and projected to begin construction later in 2023. Phase I improvements are fully funded by the Montrose Redevelopment Authority and are anticipated to be complete in 2024.

Both phases of corridor improvements will create a safer, multimodal corridor for all users. The Project will add 10' paths that are primarily for pedestrians but can also be used by bicyclists as well, add safer crossings for multimodal users, and reconstruct the entirety of the corridor with intersection and safety improvements and new utilities, including traffic signals and sanitary and water lines. As part of the Project, Houston METRO will add new shelters and transit amenities in support of the BOOST corridor improvements.

Due to the drainage improvements that are a component of the corridor improvements, Phase I needs to be completed first, as it is closer to Buffalo Bayou, which is the where the water from the corridor drains. By reconstructing Montrose Boulevard, the storm sewer system can be constructed much deeper from the outfall working upstream. Thus, both phases of this project need to be completed prior to other improvements in the area to maximize the drainage benefits for the entire community.

Detailed Project Schedule

The Project schedule is shown in Table 1 below. Funds will be obligated via an executed grant agreement in the third quarter of 2025, following completion of NEPA, completion of 100% PS&E, and related FHWA approvals, in advance of the administrative deadline of June 30, 2027. Construction is anticipated to begin in late 2025 and will take approximately 3 years. All funds will be able to be expended well in advance of September 2032. Right-of-way acquisition is not anticipated to be required.

Table 1. Project Schedule

Project Phase	2024 I	2024 II	2024 III	2024 IV	2025 I	2025 II	2025 III	2025 IV
RAISE Decision								
TIP/STIP Amendments								
60% Design								
90% Design								
95%/100% Design								
NEPA								
RAISE Grant Agreements								
Utility Coordination								
ROW Acquisition - N/A								
Letting/FHWA Approvals								
Construction Begin								

Environmental Risk Assessment

A preliminary National Environmental Policy Act (NEPA) assessment was completed for the entirety of the project (Phase I and II) in 2021. The report followed the standard federal and state NEPA review process in order to identify potential adverse impacts generated by the project early in its development. The only areas where potential impacts were identified were historic resources and hazardous materials.

Properties adjacent to the proposed project are listed on the National Register, identified in neighborhood surveys, and have historical markers. While not reviewed in the preliminary risk assessment in detail, it is likely that multiple National Register eligible sites (structures age 50+ years) are adjacent to the Project. The proposed Project will not extend outside of the existing right-of-way, indicating that historic resources would not be adversely impacted. Concurrence from the State Historic Preservation Office (SHPO) will likely be required by the reviewing agency. Local experience indicates that this approval can be achieved in 30 to 60 days. It is not perceived to be a threat to the project schedule or budget.

Due to the developed nature of land uses around the Project, the volume of sites that store, treat, or have released hazardous substances was too great to perform detailed analysis in the vein of a Phase I Environmental Site Assessment (ESA) for the preliminary report. A high-level review of hazardous waste sites was conducted using Texas Commission on Environmental Quality (TCEQ) GIS data.

The Project has multiple hazardous materials sites adjacent to the alignment, including Municipal Settings Designations sites, Voluntary Cleanup Program sites, and Dry Cleaners Remediation Program sites. The listing of a site does not necessarily indicate that it is in active remediation; sites remain listed even after they have been closed by TCEQ. In situations like this, local standards will apply a designation of "a potentially petroleum contaminated corridor." This requires the application of a soil and groundwater management plan during construction to accommodate testing, identification, and disposal of hazardous materials if encountered. This is understood as a component of the project development process and accommodated in the project schedule and budget.

It is anticipated that the project will qualify as a Categorical Exclusion under (c)(12):

> *Projects, as defined in 23 U.S.C. 101, that would take place entirely within the existing operational right-of-way. Existing operational right-of-way means all real property interests acquired for the construction, operation, or mitigation of a project. This area includes the features associated with the physical footprint of the project including but not limited to the roadway, bridges, interchanges, culverts, drainage, clear zone, traffic control signage, landscaping, and any rest areas with direct access to a controlled access highway. This also includes fixed guideways, mitigation areas, areas maintained or used for safety and security of a transportation facility, parking facilities with direct access to an existing transportation facility, transportation power substations, transportation venting structures, and transportation maintenance facilities.*

The project could otherwise qualify under (d)(6) for facility modernization or the more general open ended (d) category.

Local reviews, approval, and permits will likely be required by the following local entities:

- **Houston Public Works:** Permits for construction, coordination and approval of design.
- **Harris County Flood Control District:** Coordination and approval of design and connection to existing outfall structures.
- **Houston METRO:** Coordination regarding the BOOST improvements.
    - Houston METRO will be installing the shelters, amenities, and Transit Signal Priority (TSP) improvements on Montrose Boulevard. Due to the interdependency of the two sets of improvements, it is imperative that these occur at the same time and the Project adhere to the schedule.

As part of the City of Houston Design Concept Review (DCR) process, two public meetings were held in December 2022 and January 2023. At these meetings, the public was given the opportunity to comment on the proposed design. Public comments were also submitted online. The comments are being incorporated into the final DCR and 30% design. Overall, there is significant and broad public support for the proposed project, particularly the multimodal aspects of the project.[1]

Project Risks and Mitigation Strategies

This project does not have any risks that would prevent implementation and construction or fulfillment of a grant agreement. The construction cost estimate contains a 20% contingency, which accounts for any potential cost overruns or issues that might arise during detailed design or construction. The contingency is planned to accommodate for inflation and potential rising construction costs.

Considerations for project cost increases or delays include the following:

- **Utility coordination:** There are several utilities, both above and underground, along the project corridor. Coordination with utility carriers will need to be completed at each design phase to ensure that the conflicts are identified and addressed.
- **Changing land use and design:** The corridor has undeveloped and vacant lots that will likely be redeveloped. The detailed design process will have to monitor access management and multimodal access and connectivity at these areas to ensure coordination.

[1]Arrajj, S. (2023, January 24) Houstonians weigh in on proposed $55M Montrose Boulevard project. Community Impact Newspaper. https://communityimpact.com/houston/heights-river-oaks-montrose/transportation/2023/01/24/houstonians-weigh-in-on-proposed-55m-montrose-boulevard-project/

Technical Capacity Assessment

This Project is at approximately 30% design. If funded through the RAISE program, The Montrose Redevelopment Authority ("the Authority") will let and manage the project, with the City of Houston participating as a partner.

The Project has undergone the City of Houston's Design Concept Report (DCR) process. The City's process has three components: Data Collection, Alternatives Evaluation, and Concept Plan Development. A drainage analysis and traffic analysis have already been completed for the entirety of the corridor. An alternatives analysis was completed and determined the cross-section as presented in this RAISE grant is the preferred alternative. The project is nearly complete with finalizing the concept plan. At this time, there is a cross-section, schematic and the project is at 30% design. The design is compatible with local Houston design requirements and will likely be compliant with TxDOT or FHWA requirements and standards. The final DCR and 30% planset documents are anticipated to be complete in March 2023.

In FY23, the Authority is delivering approximately $10M in major capital projects. These include work on neighborhood roadway and sidewalk improvements, the construction of bicycle facilities, and the implementation of a safe sidewalk program. The Authority is projected to deliver an additional $17M in capital projects in FY24, focusing generally on the first phase of the Montrose Boulevard project ($8.3M), and the construction of additional bikeway and sidewalk projects. The Authority staff and Project Management team have extensive experience in the management, delivery, and administration of complex construction projects.

The Authority's Project Management team is composed of a wide variety of contractors and consultants who have experience delivering a variety of multimodal capital projects and significant experience in the delivery of federal projects. The Authority has received two recent federal grants from the Federal Transit Administration (FTA) under the Section 5310 program. The grants will allow for construction of sidewalks and ADA accommodations adjacent to the project corridor on West Gray Street to improve access to Houston METRO stops.

As a condition of being a subrecipient of FTA funding, the Authority created a federally compliant Title VI plan, which outlines their Limited English Proficiency plan and Four Factor Analysis. The Board of Directors approved and adopted the Title VI plan in 2022. The Authority is audited yearly for federal compliance by the designated recipient of the Section 5310 program, Metropolitan Transit Authority of Harris County (METRO). If the Project were to receive RAISE grant funding, the Authority would have the capability to comply with all applicable federal requirements.

Financial Capacity Assessment

The Authority has a projected income stream of approximately $6M for FY23. This revenue, generated via tax increment financing, is anticipated to grow significantly in the future due to major development projects currently underway, as well as rising property values within Houston, Texas. In addition to organic revenue generation, the Authority has $50M in approved bonding capacity and authority afforded to it, which it plans to use as the source of local share for this and other similar projects. The Authority is subject to an annual audit process and employs a bookkeeper, auditor, and financial advisor. All parties have independently verified that the Authority has the financial capacity to deliver projects such as this.

Legal Capacity Assessment

The Authority is a local government corporation and has the legal capacity to enter into grant agreements directly with the United States Department of Transportation and to deliver projects funded by the Office of the Secretary of Transportation. The Authority has worked closely with its sister Authorities within the City, such as the Memorial Heights Redevelopment Authority (awarded a 2019 BUILD grant), as well as the City of Houston (awarded TIGER/RAISE grants) on processes, procedures, and recommendations for delivering a BUILD/RAISE grant. The Authority plans to use this institutional knowledge and assistance to streamline processes and deliver a project on time and budget.

FY23 RAISE Application Submittal
Houston, TX | Montrose Boulevard Safety and Multimodal Access Project

Letters of Support

MONTROSE
TAX INCREMENT REINVESTMENT ZONE 27

Table of Contents

JOHN CORNYN
TEXAS

United States Senate

WASHINGTON, DC 20510–4305

February 13, 2023

The Honorable Pete Buttigieg
Secretary
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

I am writing to express my support for Montrose Redevelopment Authority's application to the Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equality (RAISE) discretionary grant. As you and your staff review the proposals, I trust you will give full consideration to the many strengths of their application.

The Montrose Redevelopment Authority is seeking funding for the Montrose Boulevard reconstruction project, which aims to rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Montrose Boulevard is a main thoroughfare that provides north-south connectivity and the reconstruction of the roadway will result in a signature corridor for all users. By implementing shared use paths and intersection improvements, the project aims to reduce the high incidences of crashes along the corridor, which is mostly on the City of Houston's High Injury Network. Additionally, the project will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users through the implementation of multimodal infrastructure.

I would appreciate your efforts to ensure that I am kept informed of the progress of this application. Please contact Bryson Albert (Bryson_Albert@cornyn.senate.gov), my Grants Coordinator, with any developments regarding this application soon as they are available.

Thank you for your consideration.

Sincerely,

John Cornyn

JOHN CORNYN
United States Senator

Congress of the United States
Washington, DC 20515

February 1, 2023

Secretary Pete Buttigieg
U.S. Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

I write regarding the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant application submitted to the Department of Transportation by the Montrose Redevelopment Authority for the Montrose Boulevard Safety and Multimodal Access Project. This project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety along a major thoroughfare in the City of Houston.

Montrose Boulevard is an iconic approximately three-mile thoroughfare that connects surface streets to several major roadways in Houston, from US-59 in the South to Allen Parkway and US-90 in the North. It provides connectivity to many surrounding communities, including Fourth Ward/Freedmen's Town, a community created by recently freed slaves after the Civil War, which is currently classified as a persistent poverty census tract, and the Museum District and Hermann Park, one of Houston's oldest public parks. It also runs through a Historically Disadvantaged Community census tract.

This project includes a full reconstruction of four travel lanes, improved pedestrian crossings and hike-and-bike paths, and upgraded drainage and public utilities. Most of Montrose Boulevard is on the City of Houston's High Injury Network and shared use paths and intersection improvements will help reduce the high incidence of crashes along the corridor. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users.

I am a strong advocate for efforts to improve and enhance multimodal transportation facilities. The reconstruction of Montrose Boulevard is a critical component of the transportation infrastructure for the City of Houston and within the Houston-Galveston region. Its broader connectivity and its access to major national highways also makes this project regionally significant.

The Montrose Boulevard Safety and Multimodal Access Project provides local and regional benefits by strengthening economic competitiveness, aiding regional stormwater mitigation efforts, improving access to fixed route public transportation, and helping the City of Houston achieve its Vision Zero targets. I hope this request is given all due consideration and a timely response.

Sincerely,

Lizzie Fletcher
Member of Congress

MORGAN LUTTRELL
8TH DISTRICT, TEXAS

COMMITTEE ON ARMED SERVICES
COMMITTEE ON HOMELAND SECURITY
COMMITTEE ON VETERANS' AFFAIRS

www.LUTTRELL.HOUSE.GOV

Congress of the United States
House of Representatives
Washington, DC 20515–4308

1320 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–4308
(202) 225–4901

18230 FM 1488, SUITE 308
MAGNOLIA, TX 77354
(281) 305–7890

February 24, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

I would like to take this opportunity to express support for the Montrose Redevelopment Authority's pursuit of funding through the United States Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2023 to reconstruct Montrose Boulevard.

Although the project is not located in my Congressional district, it is in the adjacent district. As is common in a large city such as Houston, the citizens regularly travel through multiple districts as they go about their work and school routines, and as they shop and recreate. The project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. The shared use paths and intersection improvements will help reduce the high incidence of crashes along the corridor, most of which is on the City of Houston's High Injury Network. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users.

The reconstruction of Montrose Boulevard is a critical component of the transportation infrastructure for the City of Houston and within the Houston-Galveston region. Though the project is not within Congressional District 8, it will benefit my constituents by strengthening economic competitiveness, aiding regional stormwater mitigation efforts, and improving access to fixed route public transportation. For these reasons, I strongly support this project

I am always happy to answer any questions you may have or to more fully discuss the benefits of this project.

Sincerely,

Morgan Luttrell
Member of Congress

AL GREEN
9 TH DISTRICT, TEXAS

WASHINGTON OFFICE:
2347 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-7508
FAX: (202) 225-2947

HOUSTON DISTRICT OFFICE:
3003 S. LOOP WEST, SUITE 460
HOUSTON, TX 77054
(713) 383-9234
FAX: (713) 383-9202

algreen.house.gov

Congress of the United States
House of Representatives
Washington, DC 20515-4309

COMMITTEE ON FINANCIAL SERVICES

RANKING MEMBER
SUBCOMMITTEE ON OVERSIGHT & INVESTIGATIONS

MEMBER
SUBCOMMITTEE ON FINANCIAL INSTITUTIONS & MONETARY POLICY

MEMBER
SUBCOMMITTEE ON DIGITAL ASSETS, FINANCIAL TECHNOLOGY, AND INCLUSION

February 27, 2023

The Honorable Pete Buttigieg
Secretary
U.S. Department of Transportation
1200 New Jersey Ave. SE
Washington, D.C. 20590

RE: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

I write to request that the U.S. Department of Transportation give full and fair consideration to the Montrose Redevelopment Authority's pursuit of funding for the reconstruction of Montrose Boulevard through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2023.

Montrose Boulevard is a major thoroughfare that provides north-south connectivity for the Houston-Galveston area, and reconstruction of the roadway will result in an improved signature corridor for all users. According to information provided to my office, the project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. The shared-use paths and intersection improvements will help reduce the high incidence of collisions along the corridor, most of which is located on the City of Houston's High Injury Network. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users.

The reconstruction of Montrose Boulevard is a critical component of the transportation infrastructure for the City of Houston and within the Houston-Galveston region. Though the project is not within my congressional district, it provides regional benefits by strengthening economic competitiveness, aiding regional stormwater mitigation efforts, and improving access to fixed-route public transportation. Given the broader connectivity associated with this particular corridor, the project is regionally significant.

As such, I ask that you give full and fair consideration as well as notification to my office upon approval or disapproval of the Montrose Redevelopment Authority's application for this RAISE grant. Should you require additional information, please contact my Chief of Staff, Scott Bell, by email at Scott.Bell@mail.house.gov or phone at 202-893-0438.

Sincerely,

AL GREEN
Member of Congress

SHEILA JACKSON LEE
18TH DISTRICT, TEXAS
COMMITTEES:

JUDICIARY
SUBCOMMITTEES:
Chair
Crime, Terrorism, Homeland Security and Investigations
Immigration and Citizenship
Constitution, Civil Rights, and Civil Liberties

HOMELAND SECURITY
SUBCOMMITTEES:
Cybersecurity, Infrastructure Protection, and Security Technologies

Counterterrorism and Intelligence

Emergency Preparedness, Response, & Recovery

BUDGET COMMITTEE

Congress of the United States
House of Representatives
Washington, DC 20515

STEERING AND POLICY COMMITTEE

VICE CHAIR
CONGRESSIONAL PROGRESSIVE CAUCUS

CHIEF DEPUTY WHIP
DEMOCRATIC CAUCUS

FOUNDER AND CO-CHAIR
CONGRESSIONAL CHILDREN'S CAUCUS

February 24, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

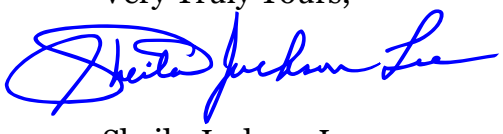
I write to you on behalf of the constituents of the 18th Congressional District of Texas, which I represent in the U.S. House of Representatives, to express support for the Montrose Redevelopment Authority, in coordination with the City of Houston's, pursuit of funding through the United States Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2023 to reconstruct Montrose Boulevard.

The project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. The shared use paths and intersection improvements will help reduce the high incidence of crashes along the corridor, most of which is on the City of Houston's High Injury Network. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users. A portion of the corridor is in a Historically Disadvantaged Community census tract and the corridor is in close proximity to the Fourth Ward/Freedmen's Town, an area classified as a persistent poverty census tract. Montrose Boulevard is a major thoroughfare that provides north-south connectivity and the reconstruction of the roadway will result in a signature corridor for all users.

I am a strong supporter of efforts to improve and enhance roads for the benefit of Houstonians; the reconstruction of Montrose Boulevard is a critical component of the transportation infrastructure for the City of Houston and within the Houston-Galveston region. Though the project is not within all of our congressional districts, it provides regional benefits by strengthening economic competitiveness, aiding regional stormwater mitigation efforts, and improving access to fixed route public transportation. Given the broader connectivity associated with this particular corridor, the project is regionally significant.

I am requesting due and fair consideration of this application for the USDOT RAISE Grant. Thank you for any assistance that you and the USDOT might provide.

Very Truly Yours,



Sheila Jackson Lee
Member of Congress

WESLEY HUNT
38TH DISTRICT, TEXAS

1520 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–4338
(202) 225–5646

Congress of the United States
House of Representatives
Washington, DC 20515–4338

February 24, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

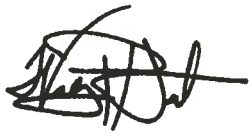
I write to express support for the Montrose Redevelopment Authority's pursuit of funding through the United States Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2023 to reconstruct Montrose Boulevard.

The project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety in a Congressional District that is directly adjacent to mine. In large cities such as Houston, it is customary for residents to travel between numerous Congressional districts during their routine schedule for work or leisure.

The shared use paths and intersection improvements will help reduce the high incidence of crashes along the corridor, most of which is on the City of Houston's High Injury Network. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users. Given the broader connectivity associated with this particular corridor, the project is regionally significant.

We appreciate your thoughtful consideration of this application. Thank you for any assistance that you and the USDOT might provide.

Sincerely,



Wesley P. Hunt

STATE OF TEXAS
HOUSE OF REPRESENTATIVES

JOLANDA "JO" JONES
STATE REPRESENTATIVE
DISTRICT 147

February 22, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the State Representative for House District 147, I am pleased to offer my support for the Montrose Redevelopment Authority in the City of Houston in their pursuit of funding through the United States Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2023 to reconstruct Montrose Boulevard.

The project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. The shared use paths and intersection improvements will help reduce the high incidences of crashes along the corridor, most of which is on the City of Houston's High Injury Network. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users. A portion of the corridor is in a Historically Disadvantaged Community census tract and the corridor is in close proximity to the Fourth Ward/Freedmen's Town, an area classified as a persistent poverty census tract. Montrose Boulevard is a main thoroughfare that provides north-south connectivity and the reconstruction of the roadway will result in a signature corridor for all users.

I am a strong advocate of efforts to improve and enhance transportation facilities within House District 147. The reconstruction of Montrose Boulevard is a critical component of the transportation infrastructure for the City of Houston and within the Houston-Galveston region.

Thank you for your consideration of this important project.

In Service,

Jolanda "Jo" Jones

State Rep. Jolanda "Jo" Jones

TEXAS HOUSE OF REPRESENTATIVES
ANN JOHNSON
DISTRICT 134

February 17, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the State Representative for House District 134, I am pleased to offer my support for the Montrose Redevelopment Authority in the City of Houston in their pursuit of funding through the United States Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2023 to reconstruct Montrose Boulevard.

The project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. The shared use paths and intersection improvements will help reduce the high incidences of crashes along the corridor, most of which is on the City of Houston's High Injury Network. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users. A portion of the corridor is in a Historically Disadvantaged Community census tract and the corridor is in close proximity to the Fourth Ward/Freedmen's Town, an area classified as a persistent poverty census tract. Montrose Boulevard is a main thoroughfare that provides north-south connectivity and the reconstruction of the roadway will result in a signature corridor for all users.

I am a strong advocate of efforts to improve and enhance transportation facilities within House District 134. The reconstruction of Montrose Boulevard is a critical component of the transportation infrastructure for the City of Houston and within the Houston-Galveston region.

Thank you for your consideration of this important project.

Sincerely,

Ann Johnson
State Representative, House District 134

P.O. BOX 2910 · AUSTIN, TEXAS 78768-2910 · PHONE (512) 463-0389
ann.johnson@house.texas.gov

Abbie Kamin

Houston City Council Member, District C

February 23, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the Houston Council Member for District C, and the City's Chair of Public Safety & Homeland Security, I would, respectfully, appreciate your consideration and support for the Montrose Redevelopment Authority in the City of Houston in their pursuit of funding through the United States Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program for 2023 to reconstruct Montrose Boulevard.

I am honored to also have other Council colleagues with knowledge and involvement in the area co-sign this letter of support.

The project will rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. The shared use paths and intersection improvements will help reduce the high incidences of crashes along the corridor, most of which is on the City of Houston's High Injury Network. The multimodal infrastructure will create a safer and more accessible corridor for pedestrians, bicyclists, and transit users. A portion of the corridor is in a Historically Disadvantaged Community census tract and the corridor is in close proximity to the Fourth Ward/Freedmen's Town—an area recognized by UNESCO and is included as a nationally registered historical site as the area where former enslaved people from surrounding areas settled after emancipation—that is classified as a persistent poverty census tract.

Montrose Boulevard also rests in the historically LGBQTIA+ neighborhood of Houston that is filled with a vibrant and beautiful culture and history that continues to exist today. The Boulevard is a major thoroughfare that provides north-south connectivity for the heart of our city, and this proposed reconstruction will result in a signature corridor for all users.

We are strong advocates of efforts to improve and enhance transportation facilities within the District that will benefit all. The reconstruction of Montrose Boulevard is a critical component of the transportation infrastructure for the City of Houston and within the Houston-Galveston region.

City Hall Annex
900 Bagby St., 1st Floor, Houston, TX 77002

Phone: 832.393.3004
Email: districtc@houstontx.gov

Abbie Kamin

Houston City Council Member, District C

Thank you for your time and thoughtful consideration of this important project.

Most appreciatively,

Abbie Kamin
Houston City Council Member, District C
Chair, Public Safety & Homeland Security

David Robinson
Houston City Council Member, At-Large 2
Chair, Transportation, Technology & Infrastructure

Sallie Alcorn
Houston City Council Member, At-Large 5
Chair, Regulatory and Neighborhood Affairs

City Hall Annex
900 Bagby St., 1st Floor, Houston, TX 77002

Phone: 832.393.3004
Email: districtc@houstontx.gov

CITY OF HOUSTON

Sylvester Turner
Mayor

P.O. Box 1562
Houston, Texas 77251-1562

Telephone – Dial 311
www.houstontx.gov

February 1, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:
The City of Houston, Texas enthusiastically supports a submission for the 2023 United States Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program. The Montrose Boulevard Safety and Multimodal Access Project, submitted via the Montrose Redevelopment Authority, a political subdivision of the City, will reconstruct this roadway to achieve municipal priorities for safety, state of good repair, economic development, and overall quality of life.

This project is a priority for the City of Houston for several reasons:

- Montrose Boulevard is located on the City of Houston's High Injury Network. The corridor has had over 500 crashes in the last 5 years and the crash rate on the corridor is well over the statewide average. This project will help to advance the City's Vision Zero commitment to end traffic deaths and serious injuries by 2030. The reconstruction of Montrose Boulevard with will result in key safety improvements for all users.
- The roadway connects to key destinations in the City of Houston, including the location of a new Montrose Neighborhood Library and Buffalo Bayou Park. Montrose Boulevard provides access and connections to key cultural institutions, including the Ismaili Center. There are schools, other parks, and cultural institutions such as the Rothko Chapel and Menil Collection within close proximity of the corridor.
- This corridor is identified as a BOOST corridor by Houston METRO. The bus route on Montrose Boulevard is prioritized for speed, reliability, and access improvements. The project will also interface with the planned University Line BRT. The reconstruction of this roadway is synergistic and essential to public transportation improvements.
- The project's drainage components will help to further the City's flood mitigation objectives and will help to protect homes, businesses, and other regional assets in the wake of Hurricane Harvey.

It is for these reasons and more that we hope the USDOT agrees that this project is essential to the City of Houston and to our great region. Thank you for the consideration of this important funding request.

Sincerely,

DocuSigned by:
David Fields
7470E6886974417...

David Fields, AICP
Chief Transportation Planner

DocuSigned by:
Veronica O. Davis
0011AEA4D66B454...

Veronica O. Davis, PE
Director, Transportation and Drainage Operations

HOUSTON-GALVESTON AREA COUNCIL
SERVING TODAY ▪ PLANNING FOR TOMORROW

February 21, 2023

The Honorable Pete Buttigieg
Secretary of Transportation
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

On behalf of the Metropolitan Planning Organization for the Houston-Galveston region, I am pleased to submit this letter of support for the Montrose Redevelopment Authority's application to the U.S. Department of Transportation for the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program.

The Montrose Boulevard Safety and Multimodal Access Project would improve transportation safety and mobility for all users along an important corridor in our region. This project proposes a reconstruction of the historic Montrose Boulevard that would also help maintain a state of good repair, move people and good efficiently, strengthen economic competitiveness, and protect our natural and cultural resources.

Thank you for your consideration of the Montrose RDA's application. The project is consistent with safety and mobility goals included in the 2045 Regional Transportation Plan and the Regional Safety Plan. If this project is selected for a RAISE grant award, H-GAC will collaborate with our stakeholders to complete the process for including this project in our Transportation Improvement Program and move this project forward as rapidly as possible.

Sincerely,

Craig Raborn, AICP
Metropolitan Planning Organization Director
Houston-Galveston Area Council

Street: 3555 Timmons Lane, Suite 120, Houston, TX 77027 ▪ Mail: P.O. Box 22777, Houston, Texas 77227-2777
Phone: (713) 627-3200 ▪ Fax: (713) 993-2414 ▪ Web: h-gac.com ▪ Social: @HouGalvAreaCog

BIKEHOUSTON®

Joe Cutrufo
BikeHouston
4201 Main Street, Suite 200-102
Houston, TX 77002

February 21, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the executive director of BikeHouston, a non-profit organization working to transform Houston into a city where anyone can safely and easily get around by bike, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

Today, Montrose Boulevard is a thoroughfare designed to move as many cars as possible through Montrose, a relatively dense, urban neighborhood where many people rely on transit, bikes, and their own two feet to get around. The project would rehabilitate the existing roadway, improve drainage, and critically, prioritize multimodal connectivity and safety, in a neighborhood where more people than ever are seeking alternatives to driving.

While there are parallel routes that better accommodate people on bikes, this new design will make it easier for people to cross Montrose Boulevard regardless of what mode they use, and it will transform this corridor into an asset for Houstonians who walk, bike and use transit in this increasingly multimodal neighborhood.

Thank you for your consideration.

Joe Cutrufo
Executive Director, BikeHouston

BUFFALO BAYOU
PARTNERSHIP

February 9, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the President of the Buffalo Bayou Partnership, I am happy to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. The project will improve connectivity to Buffalo Bayou Park, Elanor Tinsley Park, and numerous other improvements that the Buffalo Bayou Partnership has introduced along the Bayou and Allen Parkway. Broader connectivity and connections help to make our region's trails and greenspaces more accessible for all users.

Connections to regionally significant activity centers like Buffalo Bayou is one reason why this project is important for the City of Houston and the entire region. Thank you for your consideration.

Sincerely,

Anne Olson
President

1019 Commerce Street, Suite 200
Houston, Texas 77002
713.752.0314
fax 713.223.3500
buffalobayou.org
info@buffalobayou.org

HERMANN PARK CONSERVANCY

February 15, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the president of Hermann Park Conservancy, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Hermann Park has over 6 million annual visitors, and during our master planning process over 50% of the mobility, requests involved improved bike and pedestrian access. This project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at 713-360-1492 or doreen@hermannpark.org.

Sincerely,

Doreen Stoller
President
Hermann Park Conservancy

Hermann Park Conservancy
1700 Hermann Drive
Houston, Texas 77004

Phone: 713.524.5876
Fax: 713.524.5887

hermannpark.org

Scenic Houston

February 16, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As Executive Director of Scenic Houston, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Additionally, this project will preserve as many existing trees as possible, add new trees and improve the lighting in and around the pedestrian realm. Scenic Houston strongly supports the preservation of our most scenic spaces and the enhancement of those streets and spaces that connect our ever expanding and diverse city and region.

Scenic Houston believes that every Houstonian deserves the right to live and travel in thoughtfully planned, safe and visually appealing communities and neighborhoods. This project embodies this belief and is an important component to the overall connectivity of our city and region.

Thank you for your consideration of this request. If you have any questions or concerns, please feel free to contact me at andrea@scenichouston.org or 713.629.0481

Sincerely,

Andrea French
Executive Director
Scenic Houston

LINK HOUSTON

February 21, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

LINK Houston is a 501c(3) nonprofit organization focused on advancing equity in and through transportation so all people in Houston can safely, practically, and with dignity reach opportunity. We are happy to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project will improve the existing roadway and stormwater drainage. LINK Houston supports the project because it will also drastically improve sidewalks and local transit. Several blocks have completely inaccessible sidewalks and many of the intersections lack corner curb cuts. Crosswalks are haphazard if they exist at all – the same is true for pedestrian buttons and signals. Some of the bus stops in the corridor include a shelter, trash can, and real-time signs, but most do not and are in varying states of disrepair. LINK Houston supports this project because it will systemically address each of those issues.

This is a priority for the several 1,000+ people already using the project corridor as bus riders and subsequently people walking, rolling, and biking. The project also implements BOOST local bus service and stop/station improvements in a key corridor connecting equity demand areas further north on Route 56 to opportunities in the central business district. LINK Houston annually updates our Transportation Equity Demand Index to identify areas with statistically high demand for better, more equitable affordable

LINK HOUSTON

transportation for people walking, rolling, biking, and riding transit. The Montrose Boulevard project is in one of the three highest demand areas.

Houston METRO's latest survey data about riders using the 32 stops in the corridor also reveals why we support this project as an equity priority:

- 24% are students
- 30% speak a language other than English at home
- 38% of riders have no vehicle
- 40% possess no driver license
- 58% are people of color
- 71% are employed full or part-time

The project is worthy of a RAISE grant as it will improve the economic opportunities for people traveling by all modes, but especially transit. Thank you for your consideration.

Sincerely,

Gabe Cazares
Executive Director
LINK Houston

Houston Region
taghouston.org

February 23, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the Executive Director of TAG Houston, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety.

This project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at 832-724-3817 or Christina.Cabral@taghouston.org

Sincerely,

Christina Cabral

Christina Cabral

Executive Director

Transportation Advocacy Group (TAG)

HOUSTON
PARKS BOARD

PARKS BY YOU

February 23, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

Houston Parks Board's mission is to create, improve, protect, and advocate for parks for everyone. We are dedicated to improving our city's greenspaces and being passionate stewards of Houston's Bayou Greenways, keeping them beautiful, accessible, safe, and sustainable.

As President and CEO of Houston Parks Board, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Ensuring pedestrian and bike safety across our region is a priority of Houston Parks Board and this project will support that goal.

We believe in the power of parks, trails and multimodal connections to transform communities and are confident the Montrose Redevelopment Authority can successfully deliver this project.

Sincerely,

Beth White
President & CEO
Houston Parks Board

Houston Parks Board
300 North Post Oak Lane
Houston, Texas 77024
713.942.8500
Fax 713.942.7664
www.houstonparksboard.org

February 6, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the President of the Hyde Park Civic Association, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The Hyde Park Civic Association is located in the heart of the Montrose community and is bordered to the East by Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Hyde Park residents will directly benefit from the project through increased safety conditions for pedestrians, bicyclists, and drivers. Additionally, the neighborhood has experienced tremendous growth in population and density. The project will replace aging public utilities and lessen the strain on our quality of utility services.

This project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at 713-705-8008.

Sincerely,

Chris Delphin
President
Hyde Park Civic Association

Imara Houston Inc.

1700 First Colony Blvd, Suite C; Sugar Land, Texas, USA
Phone: +1 281-980-4747 Fax: +1 281-980-4737

February 4, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the President of Imara Houston Inc, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Imara Houston Inc has been contracted by Aga Khan Foundation USA to build the Ismaili Center in Houston. The Center's design is contemporary, yet reflects a historically rooted, rich architectural heritage. The Center's landscaped gardens will provide a sense of serenity and peace, offering a respite from its urban surroundings. The rehabilitation and beautification of surrounding area, including Montrose Boulevard, is necessary to commensurate the stature of this upcoming Center in Houston.

The Montrose project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me.

Sincerely,

Barkat Fazal

Dr. Barkat Fazal
President
Imara Houston Inc
Email: Barkat.Fazal@ImaraHouston.com
Mobile: (713) 203-7545

LEGACY COMMUNITY HEALTH

1415 California St.
Houston, TX 77006

T (832) 548 5100
F (832) 548 5092

LegacyCommunityHealth.org

February 1, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the Chief Executive Officer of Legacy Community Health, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Legacy Community Health's headquarters has been in the heart of the Montrose neighborhood for over 40 years. We have seen the roads deteriorate over time, flooding in the streets that impacts our patients reaching our facility, and an urgent need for planning and safety of roadways to address the increased population in the area. This project is sorely needed to address the infrastructure in this area; it is important for the City of Houston and the entire region. Thank you for your consideration.

Thank you for your consideration of our comments on behalf of Legacy Community Health. If I can be of further assistance to you, please do not hesitate to contact Lindsay Lanagan at LLanagan@LegacyCommunityHealth.org.

Sincerely,

Robert Hilliard, Jr., M.D.
Chief Executive Officer

February 14, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590
Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg,

As the director of a world-renowned public art museum in central Houston, The Menil Collection, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Established in the early 20th-century, Montrose Boulevard was once a great neighborhood boulevard with a landscaped median and street car. Over the last century, the private vehicle has been privileged to the detriment of the pedestrian realm. The Montrose neighborhood is historically known for its vibrant LGBTQ+ and artist communities and is bookended by two beloved green spaces, Buffalo Bayou and Hermann Park. This project will reclaim and renew Montrose Boulevard as a great 21st-century American cultural corridor, increasing wellness, connectivity, and a sense of belonging.

Significantly, the reconstruction of Montrose Boulevard will enhance access for affordable and historic inner-city neighborhoods to universities, the Medical Center, and the Museum District. Prioritizing multimodal connectivity will also improve pedestrian and bike safety and provide critical interconnections for central Houston.

In short, this project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at (713) 525-9430 or at rrabinow@menil.org.

Sincerely,

Rebecca Rabinow

Rebecca Rabinow
Director, The Menil Collection

Neartown Association

February 7, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the President of the Neartown Association, neighborhood council for City of Houston Super Neighborhood #24, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Montrose Blvd. is the primary north-south street through the heart of the Neartown/Montrose Super Neighborhood, which is home to historic residential districts, numerous small businesses, a university, major arts/cultural institutions, and a landmark shopping center. The neighborhood – and Montrose Blvd. in particular – is experiencing tremendous redevelopment and densification, putting increasing strain on aging and flood-prone infrastructure. This project promises to address much-needed improvements that will enable the infrastructure to better accommodate the growth, as well as greatly enhance the safety and comfort of all users – residents and visitors alike.

This project is important for the City of Houston and the entire region. Thank you for your consideration. If you have any questions or concerns, please feel free to contact me at president@neartown.org or Neartown's address below.

Sincerely,

Greg S. LeGrande
Neartown President

PO BOX 667061 / HOUSTON, TX 77266
WWW.NEARTOWN.ORG

February 1, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As a Principal at Radom Capital, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. As a member of Bike Houston, these improvements to support multi-modal transportation are critical to Houston moving forward. This project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at evan@radomcapital.com

Sincerely,

Evan Peterson
Principal
Radom Capital

February 9, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As President of the Richwood Place Civic Association, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. Montrose is nationally known as one of Houston's eclectic and historic neighborhoods and Montrose Boulevard is its backbone. We have the chance to revitalize an aging street and turn it into the signature gateway that Montrose and its residents would love to see.

This project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at jgeissjr@comcast.net, 713-828-5240.

Sincerely,

John Geiss
President
Richwood Place Civic Association

SCD MONTROSE HOUSTON LLC

800 Capitol Street, Suite 1210
Houston, Texas 77002

February 21, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project, 2023 RAISE Program

Dear Secretary Buttigieg,

As Manager of SCD Montrose Houston LLC, I am pleased to support the Montrose Redevelopment Authority and the City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

SCD Montrose is the property owner of 2.9 acres at the corner of Montrose Boulevard and Westheimer Road and we are planning a mixed-use high-rise development. Montrose Boulevard is a major destination and a vital component of the city's cultural heritage. The boulevard is home to several important destinations, including world class museums, parks, restaurants, and historic residential buildings. However, Montrose Boulevard is also notorious for flooding during heavy rainfall, causing traffic disruption, property damage, and safety hazards.

Improved drainage would help alleviate these issues, making the boulevard safer and more reliable for commuters and residents. In addition, improving multimodal connectivity along Montrose Boulevard would encourage alternative modes of transportation, such as walking, cycling, and public transit, reducing congestion and air pollution while promoting physical activity and community engagement.

Please consider providing funding to the Montrose Boulevard Safety and Multimodal Access Project. It is important for the City of Houston and the entire region. If you have any questions or concerns, please feel free to contact me at (254) 220-3051 or matthew.damborsky@skanska.com.

Thank you,

Matthew Damborsky
Manager
SCD Montrose Houston LLC

February 8, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As the Lead Director of Vermont commons Civic Association, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety.

Montrose Blvd runs primarily through the oldest parts of Houston. As Houston continues to grow and develop in the inner city, redeveloping Montrose would not only benefit the residents of this old community, but residents who come to Houston for work, recreation and medical needs at the Houston Medical Center.
This project is important for the City of Houston and the entire region. Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at Jeanette Hix hix@rmi.net

Sincerely,

Jeanette Hix
Lead Director
Vermont Commons Civic Association.

February 6, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As President of the Westmoreland Civic Association, I am pleased to support the Montrose Redevelopment Authority and City of Houston in their pursuit of discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety.

Montrose Boulevard from Allen Parkway to US-59/I-69 is an integral part of the area, serving not only our neighborhood, but various significant areas of commerce, the Houston Medical Center and the Houston Museum district. The inclusion of multimodal improvements is a welcome addition for those committed to driving less in this area as the city continues to become more densely populated.

Thank you for your consideration.

If you have any questions or concerns, please feel free to contact me at: Brad Nyberg, 407 Marshall Street, Houston TX 77006 or by phone 713-818-2794

Sincerely,

Brad Nyberg
President
Westmoreland Civic Association

February 1, 2023

Secretary Pete Buttigieg
United States Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Re: Montrose Boulevard Safety and Multimodal Access Project – 2023 RAISE

Dear Secretary Buttigieg:

As Chair of the Wharton DLA Safer Walks Committee, I am pleased to support the Montrose Redevelopment Authority and City of Houston in pursuing discretionary funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program for 2023 to reconstruct Montrose Boulevard.

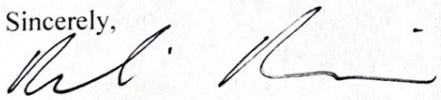
The project would rehabilitate the existing roadway, improve drainage, and prioritize multimodal connectivity and safety. These improvements will translate into meaningful transportation changes in Houston that will result in more efficient vehicular travel, and more importantly, facilitate increased walking and biking.

With five public schools located within seven blocks of this significant corridor, these improvements will go a long way to enabling our kids to walk to school instead of using vehicular transportation. The impacts on the health and well-being of our kids will be incredible.

This project is important for the City of Houston and the entire region. I appreciate your consideration.

If you have any questions or concerns, please feel free to contact me at mehdirais@gmail.com or (972)897-6398.

Sincerely,



Mehdi Rais
Chair of the Wharton DLA Safer Walks Committee

FY23 RAISE Application Submittal

Houston, TX | Montrose Boulevard Safety and Multimodal Access Project

Benefit Cost Analysis Narrative

MONTROSE
TAX INCREMENT REINVESTMENT ZONE 27

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Executive Summary

The 2023 USDOT Benefit-Cost Analysis (BCA) Guidance for Discretionary Grant Programs provides the foundation for the methodologies used to estimate the quantified and subsequent monetized benefits in this BCA.[1] The evaluation process examines the fundamental question of whether the expected societal benefits of the project justify the cost with the understanding that some benefits and costs are difficult to quantify. This analysis examines how the No-Build and Build Scenarios improve the societal benefits throughout the planning horizon.

The BCA quantifies the net difference between the No-Build and Build Scenarios for the project corridor. The Montrose Boulevard Safety and Multimodal Access Project ("Project") limits are described in Table 1.

Table 1. Project Limits

Street	Terminus A	Terminus B
Montrose Boulevard	U.S. Route 59 (US-59)	Halfway Between W Gray Street and W Clay Street

The **No-Build Scenario** assumes that the roadway will continue to deteriorate and be minimally maintained throughout the planning horizon. The planning horizon includes 25 years, from 2024 to 2049.

The **Build Scenario** assumes a replacement of infrastructure within public right-of-way (ROW) along the project limits, which will include the following major components:

- Reconstruct the roadway with new concrete panels and reduce travel lane widths.
- Expand existing sidewalks along both sides of the project corridor to 10 feet wherever possible and install ADA compliant ramps.
- Reduce speed limit in the north of Westheimer Road from 35 mile per hour (MPH) to 30 MPH and increase trees along the corridor which can also encourage slower vehicle speeds to increase safety.
- Extend turn lanes along Montrose Boulevard to 150' at select signalized intersections.

1 United States Department of Transportation (2022). Benefit-Cost Analysis Guidance for Discretionary Grant Programs. Retrieved August 2022 from https://www.transportation.gov/office-policy/transportation-policy/benefit-cost-analysis-guidance-discretionary-grant-programs-0

- Add a median south of Westheimer Road to create a divided roadway for the entirety of the project extents. The median enables enhanced crossing treatments including Rectangular Rapid-Flashing Beacons (RRFB) and pedestrian refuges at unsignalized intersections. Left turn lanes will be added at certain intersections in conjunction with the new median.
- Install pavement markings and advance signage at unsignalized intersections.
- Upgrade traffic signals.
- Enhance bus stop platforms designed to BOOST standards that accommodate full-size shelters, unobstructed sidewalks, and bus stop amenities; improve bus travel time through signal priority and streamlined stops.
- Reconstruct the storm sewer system much deeper from the outfall working upstream and replace aging utilities along the Project corridor that have exceeded their useful life.
- Remove on-street parking on Montrose Boulevard to reduce points of conflicts on the corridor and accommodate a median and pedestrian realm.

Summarized Planning, Design, Environmental, and Capital Costs

The costs (excluding on-going maintenance) for the Project in year of expenditure, or nominal dollars, is $63,032,000. The annual inflation factor of 2.44% applied to the projected costs (nominal $), was discounted from the year of expenditure to reflect the real $ in year 2021. The 2.24% inflation factor is derived from the inflation adjustment values found in Table A-7 in the 2023 USDOT BCA Guide.[1] The total project cost in 2021 real dollars is $54,878,000. These costs are discounted 7% from the expenditure year to year 2021. The total year 2021 real discounted costs are $37,424,000. Project costs are described in Table 2.

Table 2. Project Costs

Cost	Nominal $ Year of Expenditure No Discount	Real $ $2021 No Discount	7% Discount $2021
Planning	$30,000	$30,000	$30,000
Design/Environmental	$4,908,000	$4,607,000	$3,878,000
Construction	$58,094,000	$50,241,000	$33,515,000
Project Costs	**$63,032,000**	**$54,878,000**	**$37,445,000**

Summarized Benefits

The proposed Project will provide a variety of societal benefits to the national, state, and local transportation system.

The No-Build Scenario will result in the following[2]:

- The pavement condition along the project corridor will likely remain **poor**. The 2019 City of Houston's Pavement Condition Rating (PCR) for Montrose Boulevard shows that the pavement conditions vary from Fair to Satisfactory with PCR values ranging from 61 to 87. There are certain sections that were observed to be in poor condition. During the field visit conducted by the project team, it was observed that the pavement has deteriorated since then. Notable damage exists in the vicinity of Richmond Avenue, from Alabama Street to Hawthorne Street, and around Westheimer Road. From Richmond Avenue to Hawthorne Street there exists significant longitudinal and transverse cracking and a notable presence of potholes, in both the northbound and southbound directions. Failed patching is evident throughout, increasing in severity nearer the edges of the roadway. From Westheimer Road to the northern Project limits there is notable transverse cracking of the concrete throughout. This section also has prevalent pothole patching failure. Striping is poor throughout the length of the corridor. Curbs are in generally acceptable condition where present, although when broken or missing are overrun with vegetation or runoff sediment.
- The existing sidewalk will continue to be in **disrepair**. The existing narrow sidewalks on both sides of Montrose Boulevard, ranging from 4 to 6 feet, are mostly in poor condition. These sections have unpaved areas to accommodate trees and their root systems. There are a few areas where tree roots have damaged the sidewalk, causing cracks and vertical changes in level making a hazardous condition for pedestrians. Several intersections along the corridor lack ADA compliant ramps, and existing ramps are often overgrown with vegetation or in poor condition.
- The access management of the project corridor will continue to be **inadequate**. An access management assessment of the corridor intersections has determined that there are one or more non-compliant access management measures as described in the City of Houston Infrastructure Design Manual (COH IDM). Most of the intersections do not meet the minimum ROW corner cutbacks, driveway spacing, or median lengths required by the COH IDM.
- The existing storm sewer system along the corridor will remain **undersized**. Sections from Richmond Ave to Marshall Street and Lovett Boulevard to Hyde Park Boulevard lack a truckline. The pipes in service have unknown dates of installation and will likely be reaching the end of their useful service life.

[2] Gauge Engineering. (August 2022). Design Concept Report Montrose Boulevard Improvements Allen Parkway to US-59.

- The transit service provided along the corridor will remain the same with **inadequate** transit stops. Many of the existing bus stops lack accessible boarding zones, shelters, and other transit stop elements and amenities, detracting from existing riders' transit experience and discouraging transit use. The current spacing and placing of bus stops, typically located on the near side of intersections every eighth mile, contributes to bus delays and slow travel speeds on the 56 Airline/Montrose route.
- The Corridor will likely remain **unsafe** with poor sight-distances, aging sidewalks, limited pedestrian crossings and no bicycle facilities. The existing infrastructure limits opportunities for pedestrians and bicyclists to safely cross Montrose Boulevard at locations other than signalized intersections, reducing walking access to destinations and detracting from the safety of vulnerable road users. The lack of accessible median refuges force pedestrians to cross the four lanes of fast, heavy traffic on Montrose Boulevard in unsafe conditions, and the lack of marked crosswalks, advance signage, and visibility enhancements leads to low yielding rates by vehicles. Pedestrians must either wait for a sufficient gap in traffic at unsignalized intersections, deviate up to a third of a mile to cross via a signalized intersection, or cross in a risky fashion that jeopardizes their safety.

Moving forward with the **Build Scenario** will result in the following monetized societal benefits; however, there are some disbenefits also associated with the Project, as explained below:

Benefits Monetized – Transportation

- **Benefit 1: Remaining Useful Life of Asset**
  - The asset will be built with a useful life of 50 years, therefore there will be 60% remaining useful life at the end of the planning horizon.
- **Benefit 2: Maintenance (Disbenefit)**
  - The Project will build new or replace existing facilities that will lead to a change in on-going maintenance costs.
- **Benefit 3: State of Good Repair**
  - The Project will replace the pavement, which will significantly reduce vehicle wear and tear and ongoing maintenance costs.
- **Benefit 4: Motorist Safety Improvements**
  - The Project will provide significant safety improvements and as a result, a likely reduction of motor vehicle crashes (separate from pedestrian and bicycle related crashes).

- **Benefit 5: Pedestrian Safety Improvements**
    - The Project will experience significant pedestrian safety improvements and as a result, a likely reduction of pedestrian related injuries.
- **Benefit 6: Bicycle Safety Improvements**
    - The Project will experience significant bicycle safety improvements and as a result, a likely reduction of bicycle related injuries.
- **Benefit 7: Facility Improvements – Walking**
    - The Project will improve sidewalks and therefore improve the quality or comfort of journeys made by pedestrians.
- **Benefit 8: Facility Improvements – Cycling**
    - The Project will improve bicycle facilities and therefore improve the quality or comfort of journeys made by cyclists.
- **Benefit 9: Facility improvements – Transit**
    - The Project will improve transit service and amenities, therefore improve the quality or comfort of journeys made by transit users.
- **Benefit 10: Value of Travel Time**
    - The Project will improve the roadway infrastructure, therefore reduce travel delays.
- **Benefit 11: Operating Cost Savings – Walking**
    - The Project will include upgraded sidewalks and therefore encourage active transportation ultimately reducing automobile usage.
- **Benefit 12: Operating Cost Savings – Cycling**
    - The Project will include new bike facilities and therefore encourage active transportation ultimately reducing automobile usage.
- **Benefit 13: Operating Cost Savings – Transit**
    - The Project will include new transit amenities for users and therefore encourage transit usage, ultimately reducing automobile usage.
- **Benefit 14: Mortality Reduction Benefits — Walking**
    - The Project will encourage more walking which can lead to a reduction in mortality risks for pedestrians.
- **Benefit 15: Mortality Reduction Benefits — Cycling**
    - The Project will encourage more cycling which can lead to a reduction in mortality risks for bicyclists.
- **Benefit 16: Congestion Externalities Reduction**
    - The Project will include new active transportation facilities and therefore encourage active transportation, which reduces automobile usage and results in reduced congestion externalities.
- **Benefit 17: Emissions Reduction – Walking**

    - The Project will include upgraded sidewalks and therefore encourage active transportation, which reduces automobile usage and therefore a reduction of emissions from automobile usage.
- **Benefit 18: Emissions Reduction – Cycling**
    - The Project will include new bicycle facilities and therefore encourage active transportation, which reduces automobile usage and therefore a reduction of emissions from automobile usage.
- **Benefit 19: Emissions Reduction – Transit**
    - The Project will improve transit amenities and therefore encourage transit usage, which reduces automobile usage and therefore a reduction of emissions from automobile usage.
- **Benefit 20: Auto Idling Fuel Saving Benefits (Disbenefit)**
    - The Project will modernize existing traffic signals, however automobile idling time will be increased and does not lower fuel consumption.
- **Benefit 21: Auto Idling Environmental Benefits (Disbenefit)**
    - The Project will modernize existing traffic signals, however, automobile idling time will be increased.

The baseline (No-Build) and Build methodology and calculations for each benefit are contained within this technical memorandum, supported by the BCA Excel Workbook. The benefits are quantified and monetized for the BCA.

Benefits and costs in real dollars and discounted real dollars are showing in the following table. Real dollars, also known as inflation-free dollars or constant dollars, stands for dollars that are netted out the effect of inflation by using a common base year. Discounting is made to account for the time value of money. It means benefits and costs that occur sooner rather than later are valued more, and there is thus a cost associated with diverting the resources needed for an investment from other productive uses in the future.[3] Future streams of benefits and costs will be expressed in the same present value terms after discounting.

The benefit-cost ratio is 2.61 in 2021 real dollars and when discounted at a 7% discount rate, the benefit-cost ratio is 1.08. The 2021 real dollar NPV is $88,398,000 and when discounted at 7%, $3,102,000.

3 Federal Highway Administration. Benefit-Cost Analysis Guidance for Discretionary Grant Programs https://www.transportation.gov/sites/dot.gov/files/2022-03/Benefit%20Cost%20Analysis%20Guidance%202022%20%28Revised%29.pdf

Table 3. BCA Summary

Scenario	$2021 Real Dollars	$2021 Real Dollars 7% Discount
Benefits	$143,278,000	$40,526,000
Costs	$54,878,000	$37,424,000
BCA	2.61	1.08
NPV	$88,398,000	$3,102,000

Table 4 summarizes the Project benefits.

Table 4. Project Benefits Summary

Benefit	Current Status/Baseline and Problem to be Addressed	Change to Baseline or Alternatives	Types of Impacts	$2021 Monetized Value	$2021 Real Dollars 7% Discount Rate
Benefit 1: Remaining Useful Life of Asset	The current asset has 0% remaining useful life	Replace infrastructure within public right-of-way	Extend useful life	$34,858,000	$5,243,000
Benefit 2: Maintenance	Ongoing maintenance for existing bus shelters	Ongoing maintenance for new BOOST bus shelters	Maintenance cost change	-$352,000	-$107,000
Benefit 3: State of Good Repair	Ongoing expensive maintenance of roadway pavement	Low maintenance required of new facility through the planning horizon	Maintenance cost savings	$10,259,000	$312,800,000
Benefits 4, 5 and 6: Safety Benefits	Outdated design, disproportionally higher crash rates	Safety improvement resulting in reduction in traffic crashes	Reduced crashes resulting in reduced fatalities and injuries	$46,286,000	$15,670,000
Benefits 7, 8, and 9: Facility Improvements	The current facilities are not conductive for active transportation or using transit	Improvements to the current facilities will improve the quality or comfort of journeys	Improved comfort for active transportation and public transportation users	$13,754,000	$4,314,000
Benefit 10: Value of Travel Time	The current facilities lead to significant delay of users.	Improvements to the current facilities will reduce delay	Travel time savings	$8,808,000	$2,795,000

Benefit	Current Status/Baseline and Problem to be Addressed	Change to Baseline or Alternatives	Types of Impacts	$2021 Monetized Value	$2021 Real Dollars 7% Discount Rate
Benefits 11, 12 and 13: Operating Cost Savings	The current facilities result in limited demand of walking, biking, and transit usage	New and improved walking, biking, and transit facilities will induce demand	Reduced operating costs derived from modal shift from driving personal vehicles to walking, biking, and taking transit	$390,000	$124,000
Benefit 14 and 15: Mortality Reduction Benefits	Roadway is not conducive for active transportation.	New and improved active transportation facilities will encourage more walking and cycling	Reduced mortality risks associated with increased walking and cycling	$26,930,000	$8,306,000
Benefits 16: Congestion Externalities Reduction	Roadway is not conducive for active transportation.	New and improved facilities will encourage more walking and cycling	Reduced congestion externalities	$1,049,000	$333,000
Benefits 17, 18, and 19: Emissions Reduction	The current facilities are not conductive for active transportation or using transit	Improvements to the existing facilities will induce demand for walking, cycling, and taking transit	Reduced emission derived from modal shift from driving personal vehicles to walking, biking, and taking transit	$1,470,000	$795,000
Benefit 20 and 21: Automobile Idling Emissions and Fuel Consumption	Vehicle idling results in exhaust and the consumption of fuel	Improvements slightly increase automobile emissions and fuel consumption	Increased exhaust and fuel consumption	-$179,000	-$80,000
			Totals	**$143,280,000**	**$40,525,000**

Foundations to Benefit / Cost Analysis

The following methodologies and/or general assumptions are used to quantify the benefits for the Project.

Real Dollars & Discount Rate

All monetized values in both benefit and cost equations within the analysis have been converted to a base year (real dollars) of 2021. Cost elements that were expended or derived from cost estimates in prior years were inflated using the inflation adjustment values found in Table A-7 in the 2023 USDOT BCA Guidance for Discretionary Grant Programs.[1] The inflation factors were removed for non-capital and operational cost elements (e.g., safety monetization factor) that occurred in 2021.

The OMB Circular A-94 provides guidance on discount rates. As a default position, OMB Circular A-94 states that a discount rate of 7% should be used as a base-case for regulatory analysis. The 7% rate is an estimate of the average before-tax rate of return to private capital in the U.S. economy. It is a broad measure that reflects the returns to real estate and small business capital as well as corporate capital. A 7% discount rate was applied to all 2021 real dollar monetized costs and benefits.

Planning, design, environmental and capital costs

The costs for the Project in year of expenditure, or nominal dollars, is $63,032,000. The annual inflation factor of 2.24% applied to the projected costs (nominal $), was discounted from the year of expenditure to reflect the real $ in year 2021. The 2.24% inflation factor is derived from the 2003 to 2021 inflation adjustment values found in Table A-7 in the 2023 USDOT BCA Guide. The total project cost in 2021 real dollars is $54,878,000. These costs are discounted 7% from the expenditure year to year 2021. The total year 2021 real discounted costs are $37,424,000.

Planning Horizon

The 25-year planning horizon is from 2024 to 2049 and discounted at 7% to 2021 dollars. The Project is assumed to open in 2029; thus, most benefits are generally quantified for a 20-year period, from 2029-2049 once the facility is open for users.

No-Build Scenario

The No-Build Scenario assumes that roadway improvements will only consist of minimal planned improvements to the project corridor within the No-Build Scenario.

Benefit 1: Remaining Useful Life of Asset

No-Build Scenario

The roadway in the Project corridor will need to be repaired throughout the planning horizon.

Build Scenario

The Project will be designed and constructed for a useful life of 50 years.[4]

Methodology/Summary

The residual life benefit assumes there will be 60% of the Project life remaining at the end of the planning horizon. The residual life benefit only captures 60% of the construction cost of the Project. Using Equation 1, the remaining useful life for the Project is calculated.

Equation 1. Useful Life Methodology

Useful Life = Construction Costs * 60%

Accumulated benefits for the 25-year horizon are quantified and discounted at a 7% rate, shown in Table 5.

Table 5. Useful Life Benefit

Scenario	Monetized Values
No-Build Benefit	$0
Build Benefit	$34,858,000
Net Benefit	**$34,858,000**
Net Benefit Discounted @ 7% to $2021	**$5,243,000**

Benefit 2: Maintenance

No-Build Scenario

The Metropolitan Transit Authority of Harris County (Houston METRO) or the Montrose Redevelopment Authority will continue to maintain the existing bus shelters on the project corridor throughout the planning horizon.

4 City of Houston (2022). Public Works Infrastructure Design Manual. Retrieved August 2022 from https://www.houstonpermittingcenter.org/news-events/2021-infrastructure-design-manual-announcement

Build Scenario

The Project will remove and replace existing bus shelters on the project corridor with standard BOOST bus shelters and add new shelters at stops that did not previously exist All new shelters will require maintenance.

Methodology/Summary

The maintenance benefit is equal to the difference between the on-going maintenance cost for the existing bus shelters and the new maintenance cost for the BOOST bus shelters.

Equation 2. Maintenance Cost Methodology

Maintenance Cost = Existing Maintenance Cost – New Maintenance Cost

Accumulated benefits for the 25-year horizon are quantified and discounted at a 7% rate, shown in Table 5.

Table 6. Maintenance Benefit

Scenario	Monetized Values
No-Build Benefit	$150,000
Build Benefit	$480,000
Net Benefit	**-$352,000**
Net Benefit Discounted @ 7% to $2021	**-$107,000**

Benefit 3: State of Good Repair

Maintenance and user costs associated with the condition of a roadway's surface are significant factors in the decision to continue with the current pavement or to replace it. The capital expenditure required for a reconstruction project may make economic sense if it saves money over the planning horizon. Demonstrating a roadway's current surface condition, or state of good repair (SOGR), and projecting the costs and benefits for alternative maintenance strategies will provide the information needed to make this decision.

No-Build Scenario

Continue maintenance strategy through remaining life of facility. The roadway is currently composed of a concrete base and asphalt overlay from US-59 to Westheimer Road, and concrete pavement from Westheimer Road to the northern Project limits.

Build Scenario

The existing pavement along the project corridor will be replaced with new concrete pavement.

Methodology

This section summarizes the methodology and results of this analysis.

Life Cycle Cost Analysis Methodology

The evaluation for SOGR uses a Life Cycle Cost Analysis (LCCA) model adapted to the scope of this project to determine the more cost-effective of the No-Build and Build Scenarios.[5] The primary purpose of this method is to compare the costs of reconstruction to those of continued maintenance of the existing roadway surface. The focus of the analysis is pavement condition and does not include costs associated with drainage, traffic management, or other non-vehicular support facilities. The analyzed costs include agency costs due to reconstruction or repair, user costs due to construction zone time delays, and operation and upkeep of vehicles used on the roadway throughout its life cycle. The life cycles for asphalt and concrete pavement are assumed to be 25 years and 50 years. The phasing of the 25-year life cycle is shown in Figure 1.[6,7]

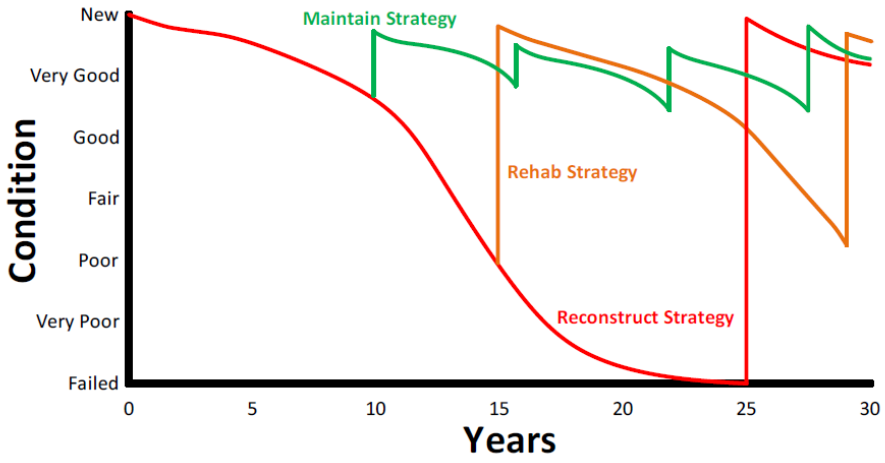

Figure 1. Pavement Life Cycle Curve

5 Federal Highway Administration. Life-Cycle Cost Analysis. Retrieved August 2022 at https://www.fhwa.dot.gov/infrastructure/asstmgmt/lcca.cfm.

6 Texas Department of Transportation. Transportation Asset Management Plan, p. 53. Retrieved August 2022 from https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Data/Performance/TxDOT-Initial-Transportation-Asset-Management-Plan.pdf

7 City of Houston (2018). Public Works Infrastructure Design Manual, p. 10-6. Retrieved June 2019 from https://edocs.publicworks.houstontx.gov/documents/design_manuals/idm.pdf

The key assumption is that if the proposed Project is not implemented (the No-Build Scenario), the City of Houston will follow a maintenance strategy that includes annual routine maintenance and periodic rehabilitation for the project corridor. Conversely, the Build Scenario, in which the roadway is rebuilt and thus brand new, would result in no maintenance or rehabilitation requirements within the planning horizon. The key roadway characteristics related to the analysis are summarized in Table **7**.

Table 7. Montrose Boulevard Characteristics

Segment	Class	Pavement	Length (ft)	Lanes	Lane-miles	Average Daily Traffic (2021)	Truck %
US-59 to Westheimer Road	Minor Arterial	Asphalt Overlay	4,570	4	3.46	24,740	3.20%
Westheimer Road to Northern Limit	Minor Arterial	Concrete	3,524	4	2.67	23,087	3.20%

Maintenance - Concrete Pavement

An assessment of the pavement's current SOGR determines where the roadway is on its life cycle curve. The life cycle curve is composed of phases established by the Texas Department of Transportation (TxDOT) Transportation Asset Management Plan (TAMP) and assumes a 50-year life for concrete pavement. By modeling the deterioration of pavement over time due to environmental and traffic factors, the phases establish timings for maintenance requirements and effects on user vehicle operating costs for the No-Build Scenario.

The pavement's condition declines gradually in its first 10 years, but then quickly deteriorates to an unacceptable state. Any rehabilitation or maintenance strategy can reset the pavement's life cycle to a certain extent. Based on information from the City of Houston Public Works, and verified by site visits, the corridor is mostly in the final phase of its service life. Most of Montrose Boulevard between Westheimer Road and the Project's Northern Limit is in poor condition.

Table 8. Condition Assessment - Montrose Boulevard between Westheimer Road and Northern Limit

Street Name	Overall Condition (Weighted Average)
Montrose Boulevard between Westheimer Road and Northern Limit	Poor

A critical planning factor for maintenance operations is that the cost of repairs increases as the reliability of pavement decreases over the service life.[8] Essentially, newer pavement requires less maintenance than older, more deteriorated pavement to maintain acceptable levels of service. To approximate the increasing probabilities of portions of each roadway requiring repairs and the effects on maintenance costs, this analysis used approximate failure rate factors as a multiplier of the annual maintenance costs incurred by the City of Houston. The City of Houston FY2021 expenditures on street and bridge maintenance is over $100 million, which covers about 16,600 lane-miles of roadways, according to the Department of Public Works.[9] This analysis used the average expenditure from these totals ($6,135 per lane-mile), the lane-miles of each roadway, and the failure rate factor to develop estimates of annual maintenance costs by life cycle phase based on condition, shown in **Table 9**.

Table 9. Annual Pavement Maintenance Costs by Life Cycle Phase - Montrose Boulevard between Westheimer Road and Northern Limit

Phase	Percent of Life	Failure Rate Factor	Cost
New	24%	0.00	$0
Very Good	40%	0.00	$0
Good	52%	0.25	$4,094
Fair	64%	1.00	$16,377
Poor	80%	1.50	$24,566
Very Poor	100%	3.00	$49,132

Rehabilitation, which for this analysis consists of full-depth panel replacement for concrete conducted at select intervals in addition to routine annual repairs to maintain the structural integrity of the roadways. The expected result of this strategy is the extension of the service lives of the roadways by approximately 25 years for concrete.[10] Based on the concrete's life cycle, iterations of systematic repairs will be required over the next 20 years. Table 10 shows the schedule for rehabilitation under the No-Build Scenario.

Table 10. Rehabilitation Cycle - Montrose Boulevard between Westheimer Road and Northern Limit

Street Name	Pavement	2024	2045
Montrose Boulevard	Concrete	Panel Replacement	Panel Replacement

8 Federal Highway Administration (2013). Reformulated Pavement Remaining Service Life Framework, p. 43-49. Retrieved August 2022 from https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/13038/13038.pdf

9 City of Houston Fiscal Year Operating Budgets, Retrieved in August 2022 from https://www.houstontx.gov/budget/

10 City of Houston Report to TTI Committee. Retrieved August 2022 from https://www.houstontx.gov/council/committees/tti/20140513/Maintaining_Houston_Streets.pdf

For simplicity, this analysis assumes the rehabilitation of the entire length of the Project within the stated limits would be accomplished within time periods noted above. Similarly, it is assumed all failures of pavement within a certain life cycle phase occur all at once and the replacement costs may be captured as discrete projects. This analysis also assumes that unforeseen pavement failures that affect daily traffic are addressed as needed through annual maintenance and there would be residual life of the last major rehabilitation within the planning horizon.

This analysis assumes the rehabilitation of the Project takes the form of concrete panel replacement. According to City of Houston 2022 Capital Improvement Projects Panel Replacement Package, the cost for full-depth repair of joint concrete pavement is $171 per square yard (SY) in 2021. If the TxDOT standard panel dimensions of 12 feet (lane size) by 50 linear feet are used, the per panel replacement cost can be calculated using **Equation 3**.

Equation 3. Cost of Concrete Panel Replacement

Panel Replacement Cost = $171 · A · P
A = 67 SY (panel surface area) P = number of panels required

The number of panels required to be replaced is based on the condition assessment presented above. The proportion of panels in the various phases of the life cycle for the length of the project under analysis and the associated life expectancies and replacement costs are summarized in Table 11.

Table 11. Concrete Pavement Costs - Montrose Boulevard between Westheimer Road and Northern Limit

Phase	Percent of Total	Number of Panels	Year(s) of Replacement	Replacement Cost	Remaining Life
Very Poor	0%	0	N/A	$0	$0
Poor	100%	281	2024, 2045	$5,723,000	$4,579,000
Fair	0%	0	N/A	$0	$0
Good	0%	0	N/A	$0	$0
Very Good	0%	0	N/A	$0	$0

The preferred alternative minimizes total maintenance costs over the planning horizon. As presented above, annual maintenance and scheduled rehabilitation for the existing pavements create a cost, or disbenefit, to the City of Houston for the No-Build Scenario. The Build Scenario presents an opportunity to avoid most of that financial burden. The

proposed construction calls for concrete roadway and the new pavement would not require maintenance or rehabilitation for the remainder of the planning horizon; thus, the only rehabilitation costs are those incurred prior to project implementation. Table 12 summarizes the maintenance and rehabilitation costs for each scenario.

Table 12. Summary of Maintenance & Rehabilitation Costs - Montrose Boulevard between Westheimer Road and Northern Limit

Roadway	No-Build Scenario			Build Scenario		
	Annual Maintenance	Scheduled Rehab	Roadway Subtotal	Annual Maintenance	Scheduled Rehab	Roadway Subtotal
Montrose Boulevard	$259,000	$9,170,000	$9,429,000	$143,000	$0	$143,000

Maintenance – Asphalt Pavement

An assessment of the pavement's current SOGR determines where the roadway is on its life cycle curve. The life cycle curve is composed of phases established by the TxDOT TAMP and assumes a 25-year life for asphalt pavement. By modeling the deterioration of pavement over time due to environmental and traffic factors, the phases establish timings for maintenance requirements and effects on user vehicle operating costs for the No-Build Scenario.

The pavement's condition declines gradually in its first 4 years, but then quickly deteriorates to an unacceptable state. Any rehabilitation or maintenance strategy can reset the pavement's life cycle to a certain extent. Based on information from the City of Houston Public Works, and verified by site visits, the corridor is mostly in the final phase of its service life. Most of Montrose Boulevard between US-59 and Westheimer Road is in very poor condition.

Table 13. Condition Assessment - Montrose Boulevard between US-59 and Westheimer Road

Street Name	Overall Condition (Weighted Average)
Montrose Boulevard	Very Poor

A critical planning factor for maintenance operations is that the cost of repairs increases as the reliability of pavement decreases over the service life.[11] Essentially, newer pavement requires less maintenance than older, more deteriorated pavement to

11 Federal Highway Administration (2013). Reformulated Pavement Remaining Service Life Framework, p. 43-49. Retrieved August 2022 from https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/13038/13038.pdf

maintain acceptable levels of service. To approximate the increasing probabilities of portions of each roadway requiring repairs and the effects on maintenance costs, this analysis used approximate failure rate factors as a multiplier of the annual maintenance costs incurred by the City of Houston. The City of Houston FY2021 expenditures on street and bridge maintenance is over $100 million, which covers about 16,600 lane-miles of roadways, according to the Department of Public Works.[12] This analysis used the average expenditure from these totals ($6,135 per lane-mile), the lane-miles of each roadway, and the failure rate factor to develop estimates of annual maintenance costs by life cycle phase based on condition, shown in Table 14.

Table 14. Annual Pavement Maintenance Costs by Life Cycle Phase - Montrose Boulevard between US-59 and Westheimer Road

Phase	Percent of Life	Failure Rate Factor	Cost
New	24%	0.00	$0
Very Good	40%	0.00	$0
Good	52%	0.25	$5,310
Fair	64%	1.00	$21,239
Poor	80%	1.50	$31,858
Very Poor	100%	3.00	$63,716

Rehabilitation, for this analysis, consists of asphalt mill and overlay conducted at select intervals in addition to routine annual repairs to maintain the structural integrity of the roadway. The expected result of this strategy is the extension of the service life of the roadway by approximately 10 years for asphalt.[13] Based on each pavement's life cycle, iterations of systematic repairs will be required over the next 20 years.

Table **15** shows the schedule for rehabilitation under the No-Build Scenario.

Table 15. Rehabilitation Cycle - Montrose Boulevard between US-59 and Westheimer Road

Roadway	Pavement	2024	2032	2040	2048
Montrose Boulevard	Mill & Overlay	Mill & Overlay	Mill & Overlay	Mill & Overlay	Mill & Overlay

12 City of Houston Fiscal Year Operating Budgets, Retrieved in August 2022 from https://www.houstontx.gov/budget/
13 City of Houston Report to TTI Committee. Retrieved August 2022 from https://www.houstontx.gov/council/committees/tti/20140513/Maintaining_Houston_Streets.pdf

For simplicity, this analysis assumes the rehabilitation of the entire length of the Project within the stated limits would be accomplished within time periods noted above. Similarly, it is assumed all failures of pavement within a certain life cycle phase occur all at once and the replacement costs may be captured as discrete projects. This analysis also assumes that unforeseen pavement failures that affect daily traffic are addressed as needed through annual maintenance and there would be residual life of the last major rehabilitation within the planning horizon.

The rehabilitation projects for the asphalt surfaces of the Project are projected in this analysis to occur in 10-year increments. According to TxDOT's Average Low Bid Unit Prices, the cost for mill and overlay is $11,400 per lane-mile in 2021. The total cost of mill and overlay can be calculated using Equation 4.

Equation 4. Cost of Asphalt Pavement with Mill & Overlay

Mill & Overlay Cost = $11,400 * L * M
L = number of lanes M = roadway (project limits) length in miles

Given the roadway characteristics and rehabilitation schedule, the total rehabilitation costs of the asphalt pavement under the No-Build Scenario are listed in in Table 16.

Table 16. Asphalt Pavement Mill and Overlay Costs - Montrose Boulevard between US-59 and Westheimer Road

Roadway	Lane-miles	1st Mill & Overlay	2nd Mill & Overlay	3rd Mill & Overlay	4th Mill & Overlay	Residual Life Remaining	Total Cost
Montrose Boulevard	3.46	$43,000	$52,000	$63,000	$76,000	$58,000	$174,000

The preferred alternative minimizes total maintenance costs over the planning horizon. As presented above, annual maintenance and scheduled rehabilitation for the existing pavements create a cost, or disbenefit, to the City of Houston for the No-Build Scenario. The Build Scenario presents an opportunity to avoid most of that financial burden. The proposed construction calls for new pavement would not require maintenance or rehabilitation for the remainder of the planning horizon; thus, the only rehabilitation costs are those incurred prior to project implementation.

Table **17** summarizes the maintenance and rehabilitation costs for each scenario.

Table 17. Summary of Maintenance & Rehabilitation Costs - Montrose Boulevard between US-59 and Westheimer Road

Roadway	No-Build Scenario			Build Scenario		
	Annual Maintenance	Scheduled Rehab	Roadway Subtotal	Annual Maintenance	Scheduled Rehab	Roadway Subtotal
Montrose Boulevard	$413,000	$233,000	$646,000	$230,000	$0	$230,000

User Costs

As pavement conditions worsen over the life of the roadway, the cost to the community to maintain vehicles operated on the roads also increases.[14] For planning purposes, this analysis assumes that qualitative assessments of pavement condition are correlated with established roughness indices and thus may be used to estimate its impact on vehicle operating costs. The study referenced by this analysis established baseline costs in terms of cents per mile for passenger and commercial vehicles on new pavement, as well as cost factors for each of five roughness index values, listed in Table 18.

Table 18. Vehicle Operating Costs in ¢/mile (inflated to $2021)

Vehicle Class	Road Class	Pavement Roughness Index / TxDOT Phase					
		Baseline	Adjustment Factors (multiplied by baseline for cost per mile)				
		Cents Per Mile ($2021)	2 Very Good	3 Good	4 Fair	5 Poor	6 Very Poor
Very Poor Poor Fair	Collector	19.8	1.02	1.03	1.07	1.15	1.25
	Arterial	24.7	1.02	1.03	1.07	1.15	1.24
	Highway	32.4	1.01	1.02	1.06	1.14	1.22
Good Very Good	Collector	52.1	1.02	1.03	1.07	1.13	1.21
	Arterial	80.3	1.01	1.02	1.05	1.11	1.18
	Highway	114.0	1.01	1.02	1.04	1.09	1.15

When correlated with the five TxDOT pavement condition phases, these factors can be applied to forecast vehicle operating costs that the public bears to the planning horizon. Several variables are required to complete this analysis, including current condition

14 National Academy of Sciences, Engineering, and Medicine (2012). Estimating the Effects of Pavement Condition on Vehicle Operating Costs, p. 40-50. Retrieved August 2022 from https://www.nap.edu/catalog/22808/estimating-the-effects-of-pavement-condition-on-vehicle-operating-costs.

assessments of the roadways, H-GAC traffic model data for volume on each road type over time, and TxDOT traffic count data for commercial vehicle (truck) percentage; all of which were provided earlier in this section.

The difference between the costs due to the condition of the pavement during any year within the planning horizon and the baseline costs for new pavement is the disbenefit to the community from the state of good (or bad) repair. This analysis accumulated the year-over-year car and truck cost differentials to compare the total disbenefit due to vehicle operating costs for No-Build and Build Scenarios.

Table 19 shows the total operating costs for each scenario.

Table 19. Summary of Vehicle Operating Costs (inflated to $2021)

Roadway	No-Build Scenario			Build Scenario		
	Car	Truck	Total Vehicle	Car	Truck	Total Vehicle
Montrose Boulevard between US-59 and Westheimer Road	$2,343,000	$178,000	$2,521,000	$1,692,000	$124,000	$1,815,000
Montrose Boulevard between Westheimer Road and Northern Limit	$1,302,000	$99,000	$1,401,000	$1,056,000	$77,000	$1,133,000

During reconstruction (Build Scenario) or maintenance treatment cycles (No-Build Scenario), users incur costs due to delays. They may need to reduce speed or wait in a queue. For the purposes of this analysis, overall speed through work zones is assumed to drop by 35%. Repairs are assumed to take approximately 240 days per mile for reconstruction and 120 days per mile for the maintenance treatment cycles. Per USDOT guidance, the value of travel time is $19.24 per hour per person and vehicle occupancy is 1.65 persons per vehicle. Since repair projects occur in multiple years, this analysis adjusted traffic volume used to calculate cost based on growth rate to the year of repair. Equation 5 shows the total user cost due to delays during the construction period is equivalent to time lost to slower overall speeds through the work zones.

Equation 5. User (Delay) Cost

User (Delay) Cost = AADT · 1.65 * $19.24 * D * 0.65(T)
AADT = Average Annual Daily Traffic (number vehicles per day) D = construction work zone duration (workdays) T = Normal travel time (hours) through zone = Lane-miles / Speed Limit (mph)

The analysis tabulated AADT for each year in the planning horizon by factoring the growth rate inferred from results of forecast year traffic volumes from the TxDOT. Assuming linear growth, annual traffic volume can be calculated using Equation 6.

Equation 6. Traffic Volume

Traffic Volume = AADTc * (1+ X) * N
$AADT_c$ = Current year's volume X = Annual growth rate N = Number of years to which volume is being forecasted

The results of the user delay costs are shown in Table **20**.

Table 20. Summary Value of Travel Time Costs

Scenario	Costs
No-Build Cost	$9,274,000
Build Cost	$5,177,000

SOGR Benefit Summary

The preferred scenario from the perspective of SOGR minimizes costs due to maintenance and user costs. Overall, the Build Scenario is preferable to No-Build on the merits of savings in each of the three categories covered in this section: life cycle costs, maintenance, and user costs. Accumulated benefits for the analysis period are quantified and discounted at a 7% rate, shown in Table 21.

Table 21. State of Good Repair Benefit

Scenario	Monetized Value
No-Build Cost	$18,633,000
Build Cost	$8,374,000
Net Benefit	$10,259,000
Net Benefit Discounted @ 7% to $2021	**$3,128,000**

Benefit 4, 5 and 6: Safety Benefits

The Project will improve safety along the Project corridor by reducing the number of crashes. Benefits can be derived from the projected reduction in the number of crashes and property damage incurred.

No-Build Scenario

The corridor would incur no safety improvements and would continue to be an unsafe urban corridor in Houston, Texas.

Build Scenario

The Project would experience significant safety improvements, resulting in fewer traffic accidents.

Methodology/Summary

The analysis uses the average number of crashes by type over the last 5 years (2018-2022) from TxDOT Crash Record Information System (CRIS) database. The appropriate reduction factor was given by TxDOT based on the 2022 TxDOT Highway Safety Improvement Program (HSIP) work codes, and the damages avoided are quantified.[15] Accumulated benefits are totaled and discounted at a 7% rate.

To evaluate the existing conditions on the Project corridor, crash records were obtained from TxDOT CRIS database for years 2018-2022. TxDOT uses the KABCO Scale in the CRIS database, which uses law enforcement data and rates traffic crash injuries. The monetary value of potential safety improvements used in the BCA that are provided by the 2023 USDOT BCA Guide are listed in Table **22**. The methodology uses the reduction in crashes associated with each roadway improvement, as identified in HSIP.

For all Project types, when the number of crashes decrease with safety improvements, benefits also accrue from reduced property damages. This methodology is documented in the 2023 USDOT BCA Guide. The guide values each crash with only property damage at $8,600 in damages ($2021).

Table 22. Monetary Value of Fatalities and Injuries from Traffic Accidents

KABCO Level	Monetized Value ($2021)
O – No Injury	$4,000
C – Possible Injury	$78,500
B – Non-incapacitating	$153,700
A – Incapacitating	$564,300
K – Killed	$11,800,000
U – Injured (Severity Unknown)	$213,900
# Accidents Reported (Unknown if Injured)	$162,600

15 Texas Department of Transportation (2022). Highway Safety Improvement Manual. Retrieved August 2022 from https://www.txdot.gov/inside-txdot/forms-publications/publications/highway-safety.html

HSIP Work Codes correspond to different enhancements (e.g., improve traffic signals, install raised medians, install pavement markings). TxDOT has a work code table that provides associated definitions, reduction factors, and preventable crash codes. Preventable crashes are those with defined characteristics that may be affected by the proposed improvement as described by the work code. The codes correspond to numeric codes assigned in CRIS to the indicated variable. Information is collected from law enforcement crash reports and converted into a coded format that corresponds to the work code table.

A crash can only be assigned to one work code. If multiple work codes are applicable to one crash, the work code with the highest crash reduction rate will be assigned to that crash. For the Project, the previous 5-year crashes were assigned to codes listed in Figure **2**.

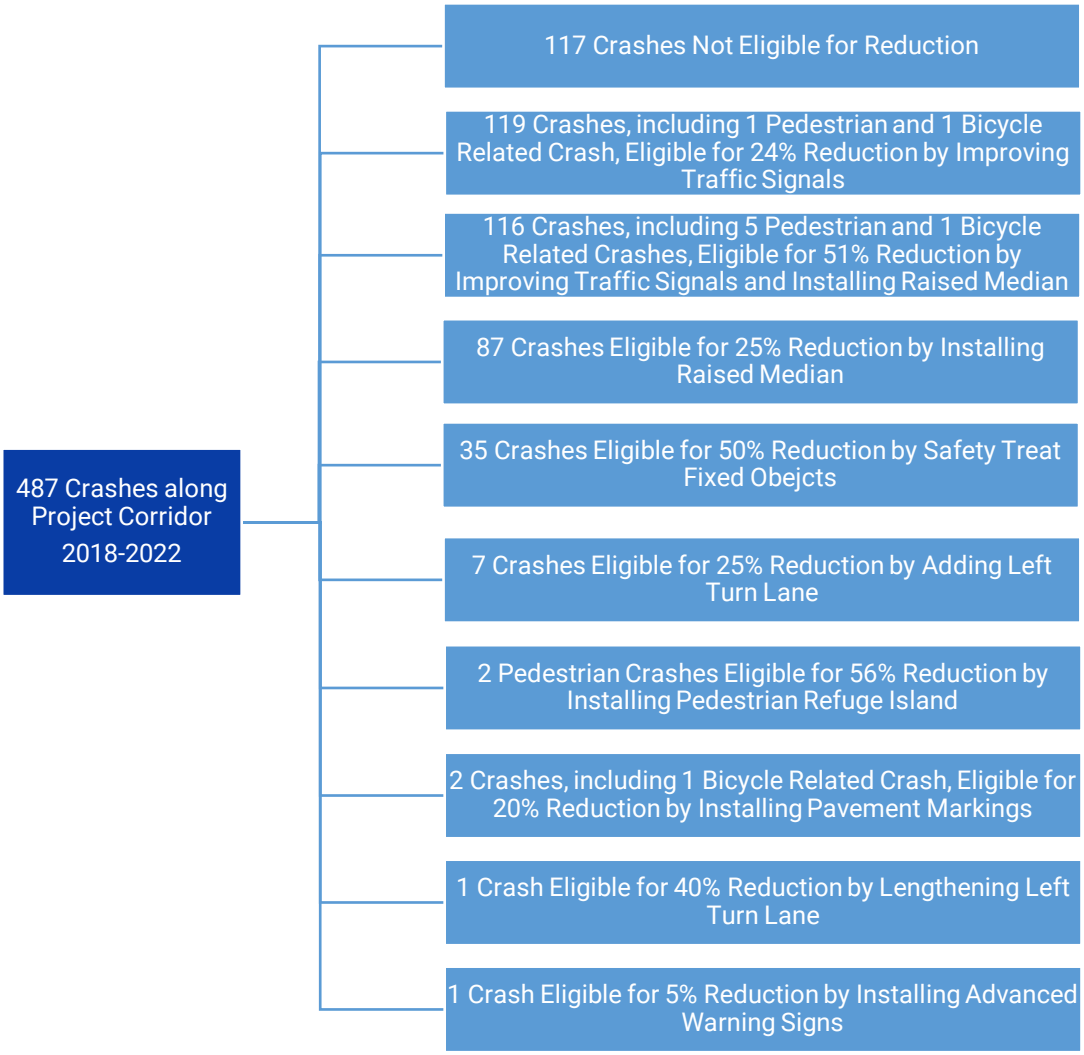

Figure 2. Traffic Crashes and HSIP Work Codes

Work codes based on crashes that can be avoided are described in the following tables.

Table 23. Crash Reduction Factor – Improve Traffic Signals

Work Code 108: Improve Traffic Signals	
Definition	Improve existing intersection signals to current design standards.
Reduction Factor	24%
Service Life (Years)	10
Maintenance Cost	N/A
Preventable Crashes	(Intersection Related = 1 or 2) AND [(Vehicle Movements/Manner of Collision =10-39) OR (First Harmful Event = 1 or 5)]

Table 24. Crash Reduction Factor – Improve Traffic Signals and Install Raised Median

Work Code 108 and 203: Improve Traffic Signals and Install Raised Median	
Definition	Improve existing intersection signals to current design standards; Install a roadway divider using barrier curb.
Reduction Factor	51%
Service Life (Years)	20
Preventable Crashes	(Intersection Related = 1 or 2) AND [(Vehicle Movements/Manner of Collision =10-39) OR (First Harmful Event = 1 or 5)] OR [(Part of Roadway No. 1 Involved = 1) AND (Vehicle Movements/Manner of Collision = 10, 14, 20-22, 24, 26, 28-30, 34, 36, or 38)]

Table 25. Crash Reduction Factor – Install Raised Median

Work Code 203: Install Raised Median	
Definition	Install a roadway divider using barrier curb.
Reduction Factor	25%
Service Life (Years)	20
Maintenance Cost	N/A
Preventable Crashes	(Part of Roadway No. 1 Involved = 1) AND (Vehicle Movements/Manner of Collision = 10, 14, 20-22, 24, 26, 28-30, 34, 36, or 38)

Table 26. Crash Reduction Factor – Safety Treat Fixed Objects

Work Code 209: Safety Treat Fixed Objects	
Definition	Remove, relocate, or safety treat all fixed objects including the installation of guardrail for safety treatment of a fixed object or drainage structures within the project limits, to include both point and continuous objects.
Reduction Factor	50%

Service Life (Years)	20
Maintenance Cost	N/A
Preventable Crashes	(Roadway Related = 2, 3 or 4) OR (Object Struck = 20-26, 29-36, 40-42, 56-58, 60, 62, or 63)

Table 27. Crash Reduction Factor – Add Left Turn Lane

Work Code 519: Add Left Turn Lane	
Definition	Provide an exclusive left turn lane where none existed previously. The affected intersection approaches must be specified.
Reduction Factor	25%
Service Life (Years)	10
Maintenance Cost	N/A
Preventable Crashes	Vehicle Movements/Manner of Collision = 20-22, 24, 26, 28-30, 34 or 38 AND Intersection Related != 4

Table 28. Crash Reduction Factor – Pedestrian Refuge Island

Pedestrian Refuge Island[16]	
Definition	A pedestrian refuge island is a median with a refuge area that is intended to help protect pedestrians who are crossing a road.
Reduction Factor	56%
Service Life (Years)	20
Maintenance Cost	N/A
Preventable Crashes	First Harmful Event = 1

Table 29. Crash Reduction Factor – Install Pavement Markings

Work Code 401: Install Pavement Markings	
Definition	Place complete pavement markings, excluding crosswalks, in accordance with the TMUTCD where either no markings or nonstandard markings exist. This work code includes items such as turn arrows, stop bars, lane markings, etc.
Reduction Factor	20%
Service Life (Years)	4 (Product used must meet 4-year service life.)
Maintenance Cost	N/A
Preventable Crashes	(Roadway Related = 1) OR (Vehicle Movements/Manner of Collision = 21 or 30)

[16] U.S. Department of Transportation Federal Highway Administration. (n.a.). Medians and Pedestrian Refuge Islands in Urban and Suburban Areas. Retrieved February 2023 from https://highways.dot.gov/safety/proven-safety-countermeasures/medians-and-pedestrian-refuge-islands-urban-and-suburban-areas

Table 30. Crash Reduction Factor – Lengthen Left Turn Lane

Work Code 520: Lengthen Left Turn Lane	
Definition	Provide additional length to an existing exclusive left turn lane. Affected intersection approaches must be specified.
Reduction Factor	40%
Service Life (Years)	10
Maintenance Cost	N/A
Preventable Crashes	Vehicle Movements/Manner of Collision = 20-22 AND Intersection Related != 4

Table 31. Crash Reduction Factor – Install Advanced Warning Signs (Intersection)

Work Code 128: Install Advanced Warning Signs (Intersection)	
Definition	Provide signs in advance of an intersection where none previously existed.
Reduction Factor	5%
Service Life (Years)	6
Maintenance Cost	N/A
Preventable Crashes	Intersection Related = 1 or 2

Using the average crash data from 2018-2022 available in the CRIS dataset, eligible crashes are reduced by the reduction factor above and monetized based on the USDOT recommended values in Table **22**. Accumulated benefits for the specified service life are quantified up and discounted at a 7% rate, shown in the following tables.

Table 32. Motorist Safety Benefits

Scenario	Monetized Value
No-Build Cost	$116,143,000
Build Cost	$76,318,000
Net Benefit	**$39,825,000**
Net Benefit Discounted @ 7% to $2021	**$13,557,000**

Table 33. Pedestrian Safety Benefits

Scenario	Monetized Value
No-Build Cost	$11,455,000
Build Cost	$5,566,000
Net Benefit	**$5,889,000**
Net Benefit Discounted @ 7% to $2021	**$1,905,000**

Table 34. Bicycle Safety Benefits

Scenario	Monetized Value
No-Build Cost	$1,241,000
Build Cost	$669,000
Net Benefit	**$572,000**
Net Benefit Discounted @ 7% to $2021	**$208,000**

Benefits 7, 8, and 9: Facility Improvement Benefits

Improvements to pedestrian, cycling, transit facilities, and transit vehicles often provide amenities that can improve the quality or comfort of journeys made by active transportation (e.g., cyclists and pedestrians) and public transportation users. The improvements will not only benefit the existing users, but also encourage more people walking, biking, and using the public transit. Method for estimating new active or public transportation demand is explained in the Modal Diversion and Reduced VMT section at the end of this document. The 2023 USDOT BCA Guidance provides recommended monetized values for facility improvement benefits based on the research of revealed preferences of system users. For additional users attracted to the improved facilities, the value of the benefits they receive is at one-half the product of the value and the difference in volumes between the build and no-build cases.

No-Build Scenario

The current condition of the existing facilities is not conductive for walking, cycling, or using transit.

Build Scenario

The Project will improve the active transportation and transit facilities.

Methodology/Summary

This section summarizes the methodology and results of the analysis for facility improvement benefits.

Pedestrian Facility Improvements

The 2023 USDOT BCA Guidance points out that traffic speeds and volumes along key pedestrian corridors, as well as elevation gains and width of sidewalks, can directly affects the comfort, convenience, and safety of the facility for pedestrian use.

Using revealed preference studies, the recommended value per person-mile walked on an expanded sidewalk is $0.11 for each foot of added width, and it is $0.09 per MPH of

traffic speed reduction for the roadway segment at where the current speed limit is equal to or lower than 45 MPH. For the mile-based benefits, the estimated value per pedestrian is capped at 0.86 miles, which is the average length of a walking trip in the 2017 National Household Travel Survey. And the monetized benefits for expansions are appliable for sidewalks up to approximately 31 feet. For additional users attracted to the improved facilities, the value of the benefits they receive is at one-half the product of the value and the difference in volumes between the build and no-build cases. The benefits of improved pedestrian facility are calculated using Equation 7 and Equation 8.

Equation 7. Pedestrian Facility Improvement Benefits – Sidewalk Expansion

Sidewalk Expansion Benefit = $0.11 * Added Width (foot) * (Number of Existing Walking Trips + ½ New Walking Trips) * Trip Length
Trip Length = Proposed Length of Expanded Sidewalk or 0.86 Miles (whichever is smaller)

Equation 8. Pedestrian Facility Improvement Benefits – Traffic Speed Reduction

Traffic Speed Reduction Benefit = $0.09 * Reduced MPH of Traffic Speed * (Number of Existing Walking Trips + ½ New Walking Trips) * Trip Length
Trip Length = Proposed Length of Roadway Segment for Traffic Speed Reduction or 0.86 Miles (whichever is smaller)

Accumulated benefits for the 25-year horizon are quantified and discounted at a 7% rate, presented in Table 35.

Table 35. Pedestrian Facility Improvement Benefit

Scenario	Monetized Value
No-Build Cost	$0
Build Cost	$5,717,000
Net Benefit	**$5,717,000**
Net Benefit Discounted @ 7% to $2021	**$1,763,000**

Bicycle Facility Improvements

The 2023 USDOT BCA Guidance suggests that cycling facilities can improve journey quality and comfort for cyclists, in addition to any travel time savings they provide. The recommended monetized value per cycling mile for various cycling facility improvements are listed in Table 36. The Project expands existing sidewalk to 10-ft that

could be used by cyclists as well. The value of Cycling Path with At-Grade Crossings is used for calculating the improvement benefit.

Table 36. Cycling Facility Improvement Revealed Preference Values

Facility Type	Recommended Value per Cycling Mile (2021 $)
Cycling Path with At-Grade Crossings	**$1.42**
Cycling path with no At-Grade Crossings	$1.78
Dedicated Cycling Lane	$1.69
Cycling Boulevard/"Sharrow"	$0.26
Separated Cycle Track	$1.69

The benefit of cycling facility improvement is calculated using the Equation 9. The average length of a cycling trip in the 2017 National Household Travel Survey is 2.38 miles. According to 2023 USDOT BCA Guidance, if the cycling facility length is less than 2.38 mile, then the trip length per cyclist would be the facility length; however, if the cycling facility is longer than 2.38 miles, the assumption of all cyclists travel the full distance of a proposed facility cannot be made. For additional users attracted to the improved facilities, the value of the benefits they receive is at one-half the product of the value and the difference in volumes between the build and no-build cases. The benefit of improved cycling facility is calculated using Equation 9.

Equation 9. Cycling Facility Improvement Benefit

Cycling Facility Improvement Benefit = Value per Cycling Mile * (Number of Existing Cycling Trips + ½ New Cycling Trips) * Trip Length
Trip Length = Proposed Cycling Facility Length or 2.38 Miles (whichever is smaller)

Accumulated benefits for the 25-year horizon are quantified and discounted at a 7% rate, presented in the following table.

Table 37. Cycling Facility Improvement Benefit

Scenario	Monetized Value
No-Build Benefit	$0
Build Benefit	$705,000
Net Benefit	**$705,000**
Net Benefit Discounted @ 7% to $2021	**$217,000**

Transit Facility Improvements

The 2023 USDOT BCA Guidance suggests that transit facility and vehicle improvements can improve the accessibility, quality, convenience, and comfort of users of transit systems. The recommended transit facility amenity revealed and states preference value per user trip for bus stops are listed in Table **38**. The project team documented the existing amenities at the current bus stations to determine which facilities riders already have at each stop. For the new BOOST bus stations of the Project, the proposed amenities would include electronic real-time information displays, platform/stop seating availability, platform/stop weather protection, step-free access to station/stop, and step-free access to vehicle in Table **38**.

Table 38. Transit Facility Amenity Revealed and Stated Preference Values

Attribute Type	Recommended Value per User Trip (2021 $, Bus Stop)
Clocks	$0.03
Electronic Real-Time Information Displays	**$0.31**
Information/Emergency Button	$0.24
PA System	$0.31
Platform/Stop Seating Availability	**$0.19**
Platform/Stop Weather Protection	**$0.25**
Restroom Availability	$0.14
Retail/Food Outlet Availability	$0.11
Staff Availability	$0.08
Step-Free Access to Station/Stop	**$0.32**
Step-Free Access to Vehicle	**$0.42**
Surveillance Cameras	$0.31
Temperature Controlled Environment	$0.62
Ticket Machines	$0.10
Timetables	$0.23
Clocks	$0.03
Electronic Real-Time Information Displays	**$0.31**
Information/Emergency Button	$0.24
PA System	$0.31

The benefit of transit improvement is calculated using Equation **10**. Benefits to existing users for any given year in the analysis period is calculated based on the number of users projected in that year under the No-Build baseline. For additional users attracted to the improved facilities, the value of the benefits they receive is at one-half the product of the value and the difference in volumes between the build and no-build cases.

Equation 10. Transit Facility Improvement Benefit per Bus Stop

Transit Facility Improvement Benefit per Bus Stop= Total of Transit Facility Amenity Revealed and Stated Preference Values per User Trip * (Number of Existing Transit Riders + ½ New Transit Riders)

Accumulated benefits for the 25-year horizon are quantified and discounted at a 7% rate, presented in Table 39.

Table 39. Transit Facility Improvement Benefit

Scenario	Monetized Value
No-Build Benefit	$0
Build Benefit	$7,332,000
Net Benefit	**$7,332,000**
Net Benefit Discounted @ 7% to $2021	**$2,334,000**

Benefit 10: Value of Travel Time

No-Build Scenario

The roadway would increase in traffic volumes and congestion delays throughout the planning horizon. Active transportation users would face delays in crossing the corridor, and transit users would be encumbered by waiting at traffic lights.

Build Scenario

The Project will improve traffic flow and reduce travel times for all roadway users of this corridor, including active and public transportation users.

Methodology/Summary

The impact of a project on congestion can be measured through the value of travel time (VoTT) on the network. Travel time has a direct relationship with overall network congestion. The more congested a roadway or network is, the longer the travel time is, thereby increasing person hours traveled. The methodology for determining congestion benefits uses Synchro software to analyze delay reduction at intersections with a micro-level model during the AM and PM peak hour for driving and walking separately. This method requires collecting the current traffic counts, including pedestrian counts, along the affected roadways and project the future volume under the Build and No-build scenarios. The Synchro analysis shows the operational impacts of the proposed Project, which includes intersection delay. The modeling results suggest that the Project will decrease average vehicle delays at the signalized intersections but increase

average pedestrian delays at non-signalized crossings. Therefore, the Project will benefit travel time savings of motor vehicles but will increase the average non-signalized intersection crossing time of pedestrians.

While the traffic model is not able to include Traffic Signal Priority/Preemption (TSP), the Project includes applying TSP to all signals on Montrose Boulevard to support faster and more reliable service on METRO's 56 Airline/Montrose route. Transit signal priority extends the green signal phase on the transit corridor or calls the cross street's green phase early to minimize bus delay. Transit preemption overrides the normal operation of a traffic signal to provide buses with a green signal to proceed directly through the intersection. Research suggests a 10% to 15% decrease in bus running times in a bus priority area was identified as a desirable objective for bus priority treatments[17]. The calculation of VoTT assumes a 15% reduction in bus travel time after the project is completed. Thus, the Project will decrease travel time of transit users.

The Synchro traffic impact analysis provides the average delay caused by the Project, while the 2023 USDOT BCA Guidance provides recommended hourly values ($2021) of travel time savings for occupants of passenger vehicles ($18.80/person-hour and 1.67 persons per vehicle) and for commercial vehicle operators ($32.40/person-hour). A separate value is provided for reductions in other components or aspects of travel time, including walking, cycling, waiting time, transfer time, and time spent standing in a crowded transit vehicle ($34.00/person-hour). Using Equation **11**, the users' value of time, including driving, walking, and taking public transit,for the Project is calculated.

Equation 11. Value of Travel Time

Travel Time Savings = Annual Person-Hour Saved * VoTT
Annual Person-Hour Saved for Year N = VHT for Project build year*$(1.7\%+x\%)^n$ x% is assumed to be the annual growth rate

Accumulated benefits for the 25-year horizon are quantified and discounted at a 7% rate, presented in Table 40.

[17] Danaher, A. R. (2010). *Bus and rail transit preferential treatments in mixed traffic* (Vol. 83). Transportation Research Board.

Table 40. Summary Value of Travel Time Costs

Scenario	Monetized Value
No-Build Cost	$214,247,000
Build Cost	$205,439,000
Net Benefit	**$8,808,000**
Net Benefit Discounted @ 7% to $2021	**$2,795,000**

Benefits 11, 12, and 13: Operating Cost Savings

Operating a vehicle is one of the most expensive budget items in American households. The reduction in VMT from automobile trips converted to walking, cycling, and transit trips results in a benefit for automobile owners. The methodology for modal diversion and VMT reduced is explained in the last section of this document (Modal Diversion and Reduced VMT).

No-Build Scenario

The current condition of the active transportation and transit facilities are not conducive for pedestrians, cyclists, or transit users.

Build Scenario

The Project will improve pedestrian, bicycle, and transit facilities along the project corridor. These amenities will induce new pedestrian, cyclists, and transit users.

Methodology

The 2023 USDOT BCA Guide estimates the cost of light duty vehicle operation as $0.46 ($2021) per mile. The value per mile includes operating costs such as gasoline, maintenance, tires, and depreciation. The benefit omits fixed costs of owning a vehicle such as insurance and registration. Equation 12 is used to estimate the total automobile operating costs saved by reducing VMT.

Equation 12. Automobile Operating Cost Saving

Automobile Operating Savings = VMT * MC * 260
VMT = Annual Reduced Vehicle Miles Traveled Due to Modal Diversion MC = Automobile Operating Costs per mile 260 = Average Number of Working Days in a Year

For operating cost savings resulted from modal diversion from driving to using public transit, the savings calculated in Equation 12 also account for the average cost of bus tickets as Equation 13 shows.

Equation 13. Bus Ticket Cost

Bus Ticket Cost = Average Transit Ticket Price * Number of Annual Transit Trips

The accumulated benefits of increased walking, biking, and transit trips on automobile maintenance savings for the analysis period are quantified and discounted at a 7% rate, presented in the tables below.

Table 41. Operating Cost Savings - Walking

Scenario	Monetized Value
No-Build Cost	$3,000
Build Cost	$70,000
Net Benefit	**$67,000**
Net Benefit Discounted @ 7% to $2021	**$21,000**

Table 42. Operating Cost Savings - Cycling

Scenario	Monetized Value
No-Build Cost	$2,000
Build Cost	$27,000
Net Benefit	**$25,000**
Net Benefit Discounted @ 7% to $2021	**$8,000**

Table 43. Operating Cost Savings - Transit

Scenario	Monetized Value
No-Build Cost	$5,832,000
Build Cost	$6,130,000
Net Benefit	**$298,000**
Net Benefit Discounted @ 7% to $2021	**$95,000**

Benefits 14 and 15: Mortality Reduction Benefits

Active transportation modes such as walking and cycling can help improve cardiovascular health and lead to other positive outcomes for users. Adding or upgrading cycling or pedestrian facilities can convert users from inactive transportation

modes to active transportation modes. A key health outcome from increased physical activity is a reduction in mortality risks for those users that are converted to active transportation modes from inactive modes. The methodology for modal diversion is explained in the last section of this document (Modal Diversion and Reduced VMT).

No-Build Scenario

The existing sidewalks are in disrepair and there is a lack of bicycle facilities.

Build Scenario

The Project will install new 10 feet sidewalks. The paths will be wide enough to accommodate bicyclists.

Methodology

Mortality Reduction - Walking

The 2023 USDOT BCA Guide recommends $7.20 ($2021) per induced walking trip for monetizing reduced mortality risks associated with increased walking. It is based on an assumed average walking speed of 3.2 miles per hour, an assumed average age of the relevant age range (20-74 years) of 45, a corresponding baseline mortality risk of 267.1 per 100,000, an annual risk reduction of 8.6 percent per daily mile walked, and an average walking trip distance of 0.86 miles. This monetization value can only be applied to trips induced from non-active transportation modes within the relevant age ranges. A general assumption of 68% of overall induced trips falling into the walking age range (20-74 years), assuming a distribution matching the national average, is applied in the absence of more localized data on the proportion of the expected users falling into the age range. Equation 14 is used to estimate the mortality reduction benefits of induced walking trips.

Equation 14. Mortality Reduction Benefits - Walking

Mortality Reduction Benefits = Number of New Walking Trips Induced from Non-Active Transportation Modes * 68% * $7.20

The accumulated benefits of mortality reduction benefits for the analysis period are quantified and discounted at a 7% rate, presented in Table 44.

Table 44. Mortality Reduction Benefit - Walking

Scenario	Monetized Value
No-Build Cost	$0
Build Cost	$25,415,000
Net Benefit	**$25,415,000**
Net Benefit Discounted @ 7% to $2021	**$7,839,000**

Mortality Reduction - Cycling

The 2023 USDOT BCA Guide recommends $6.42 ($2021) per induced cycling trip for monetizing reduced mortality risks associated with increased cycling. It is based on an assumed average cycling speed of 9.8 miles per hour, an assumed average age of the relevant age range (20-64 years) of 42, a corresponding baseline mortality risk of 217.9 per 100,000, an annual risk reduction of 4.3 percent per daily mile cycled, and an average cycling trip distance of 2.38 miles. This monetization value can only be applied to trips induced from non-active transportation modes within the relevant age ranges. A general assumption of 59% of overall induced trips falling into the cycling age range (20-64 years), assuming a distribution matching the national average, is applied in the absence of more localized data on the proportion of the expected users falling into the age range.

Equation **15** is used to estimate the mortality reduction benefits of induced cycling trips.

Equation 15. Mortality Reduction Benefits – Cycling

Mortality Reduction Benefits = Number of New Cycling Trips Induced from Non-Active Transportation Modes * 59% * $6.42

The accumulated benefits of mortality reduction benefits for the analysis period are quantified and discounted at a 7% rate, presented in Table 45.

Table 45. Mortality Reduction Benefit - Cycling

Scenario	Monetized Value
No-Build Cost	$0
Build Cost	$1,515,000
Net Benefit	**$1,515,000**
Net Benefit Discounted @ 7% to $2021	**$467,000**

Benefits 16: Congestion Externalities Reduction

Reductions in external costs from modal diversion may represent a source of potential benefits beyond those experienced directly by users of an improved facility or service. The operation of automobiles can cause negative impacts such as delays to other vehicles during congested travel conditions, increased external crash costs, emissions of air pollutants, noise pollution, and damage to pavements or other road infrastructure. These impacts impose costs on occupants of other vehicles and on the society at large. The methodology for modal diversion and VMT reduced is explained in the last section of this document (Modal Diversion and Reduced VMT).

No-Build Scenario

The current condition of the existing facilities is not conducive for pedestrians, cyclists, or transit riders.

Build Scenario

The Project will install new sidewalks and rehabilitate existing sidewalks to meet the COH's current design standards, as well as install new bicycle facilities and improve the existing transit facilities along the project corridor. These amenities will result in modal shift with a reduction in overall VMT.

Methodology/Summary

The 2023 USDOT BCA Guide provides recommended monetarized values for external highway use costs. The recommended costs per vehicle mile traveled including all kinds of vehicles in urban locations are $0.144 for congestion and $0.0048 for noise. Equation 16 can be used to determine the benefit of reducing congestion externalities.

Equation 16. Congestion Externalities Reduction

Congestion Externalities Reduction = VMT * ($0.144+$0.0048)
VMT = Vehicle Miles Traveled Reduced because of Modal Diversion

The accumulated benefits of increased walking and transit trips on reducing external highway use costs for the analysis period are quantified and discounted at a 7% rate, presented in Table 46.

Table 46. Congestion Externalities Reduction

Scenario	Monetized Value
No-Build Benefit	$9,682,000
Build Benefit	$10,731,000
Net Benefit	**$1,049,000**
Net Benefit Discounted @ 7% to $2021	**$333,000**

Benefits 17, 18, and 19: Emission Reduction Benefits

The EPA has classified the Houston-Galveston-Brazoria area in marginal nonattainment of the eight-hour ozone standard; air quality does not meet federal standards.[18] The investment in mobility infrastructure could produce environmental benefits due to decreased automobile use or vehicle delay which reduces air pollutants and is important to the region's future growth. The methodology for modal diversion and VMT reduced is explained in the last section of this document (Modal Diversion and Reduced VMT).

No-Build Scenario

The current condition of the existing facilities is not conducive for pedestrians, cyclists, or transit riders.

Build Scenario

The Project will install new sidewalks that can accommodate both pedestrians and bicyclists, as well as improve the existing transit facilities along the project corridor. These amenities will result in modal shift with a reduction in overall VMT.

Methodology/Summary

H-GAC models NOx using the following emissions factor:

- Nitrogen Oxides (NO_x): 0.19 grams (g) per VMT

United Environmental Protection Agency (EPA) using the following emissions factor for CO_2:[19]

- Carbon Dioxide (CO_2): 0.0089 metric tons per gallon of gasoline used

18 United States Environmental Protection Agency (2022). 8-Hour Ozone (2015) Nonattainment Area State/Area/County Report. Green Book. Retrieved September 2022 from https://www3.epa.gov/airquality/greenbook/jncs.html#TX

19 Environmental Protection Agency. (n.d.). EPA. Retrieved August 23, 2022, from https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

NOx and CO_2 have measurable societal economic impacts on the economy. The 2023 USDOT BCA Guide provides recommended monetized values of damage costs for NOx and CO_2 emissions per metric ton by year between 2022 and 2050. These values are used to calculate the Project's benefit derived from the reduction of harmful air pollutants.

For active transportation and transit improvements that improve the walkability and bikeability of an area and increase transit utilization, there is a presumed environmental benefit from automobile trips being converted into walking, biking, and transit trips. The VMT benefit is derived and converted into the amount of NOx and CO_2 grams reduced, which is then monetized based on the H-GAC emissions factor. VMT is assumed to grow annually at the same rate as the internal trips. Accumulated benefits for pedestrian and transit users are quantified over the 25-year analysis period and discounted at a 7% rate, shown in tables below.

Table 47. Emission Reduction Benefits - Walking

Scenario	Monetized Value
No-Build Benefit	$0
Build Benefit	$7,000
Net Benefit	**$7,000**
Net Benefit Discounted @ 7% to $2021	**$4,000**

Table 48. Emission Reduction Benefits - Cycling

Scenario	Monetized Value
No-Build Benefit	$0
Build Benefit	$3,000
Net Benefit	**$2,000**
Net Benefit Discounted @ 7% to $2021	**$1,000**

Table 49. Emission Reduction Benefits - Transit

Scenario	Monetized Value
No-Build Benefit	$14,799,000
Build Benefit	$16,267,000
Net Benefit	**$1,468,000**
Net Benefit Discounted @ 7% to $2021	**$794,000**

Benefits 20 and 21: Automobile Idling

EPA defines auto idling (not including truck) as waiting at traffic lights or sitting in congestion on highways or during emergencies. Reducing vehicle idling time saves fuel and money and decreases pollution and greenhouse gas emissions.

No-Build Scenario

Congestion on the roadway would increase throughout the planning horizon, which causes increased idling, fuel consumption, and harmful air emissions.

Build Scenario

The proposed improvements of the Project will increase fuel consumption, and harmful air emissions based on the modeling results.

Methodology/Summary

Fuel consumption and emissions are modeled for the AM and PM peak hours in the No-Build and Build scenarios. The 2021 U.S. Energy Information Administration shows that the fuel cost per gallon in Texas is $2.73. The Texas Comptroller shows the fuel taxes as $0.38. The total cost of fuel can be estimated with Equation 17.

Equation 17. Total Cost of Fuel

Total Cost of Fuel = (Fuel Cost per Gallon in Texas – Fuel Taxes) *Daily Gallons of Fuel Consumed * 365

The total cost of harmful emissions can be estimated with Equation 18.

Equation 18. Total Cost of Harmful Emissions

Total Cost of Harmful Emissions = Metric Ton of Harmful Emissions * Value of Harmful Emissions

Accumulated benefits for auto idling are quantified and discounted at a 7% rate, presented in the following tables.

Table 50. Environmental Benefit of Auto Idling

Scenario	Monetized Value
No-Build	$4,517,000
Build	$4,526,000
Net Benefit	**-$9,000**
Net Benefit Discounted @ 7% to $2021	**-$15,000**

Table 51. Fuel Consumption due to Auto Idling

Scenario	Monetized Value
No-Build	$9,709,000
Build	$9,880,000
Net Benefit	**-$170,000**
Net Benefit Discounted @ 7% to $2021	**-$65,000**

Modal Diversion and Reduced VMT

The benefits of active transportation improvements of the Project are mostly derived from the new projected walking and cycling trips divert from automobile usage. The additional transit users are derived from the addition of better amenities for access. The additional users of these alternative modes result in less passenger vehicle usage. This in turn leads to reduced VMT, which has a variety of benefits.

Sidewalk Improvements

Sidewalk Expansion

According to the USDOT's BCA Guidance, sidewalk width has a direct and significant impact on the comfort, convenience, and safety of the facility for pedestrian use, principally by increasing the allowance for distances between pedestrians and moving vehicles and among pedestrians themselves, leading to improved safety, decreased noise exposure, and increased comfort. Meanwhile, the research conducted by Aziz, etc. (2018) indicates that increasing sidewalk width will increase the likelihood of more people taking active transportation modes. The empirical results show that when the average width of sidewalks increased by 30 percent, 50 percent, or 65 percent, the probability to walk increases in the origin and destination tracts by 12.07 percent, 17.65 percent, and 21.67 percent correspondingly. The trips shift from driving to walking are mostly likely for commuting purposes.

For this Project, the sidewalk improvement would add 799 new daily pedestrian trips in the project open year (Equation 19). In other words, 799 daily pedestrian trips will be

converted from internal trips within half mile from the Project. The annual internal auto vehicle trips within half mile from the Project is obtained from the StreetLight Data.

Equation 19. New Daily Pedestrian Trips - Sidewalk Expansion

New Daily Pedestrian Trips = W * IAT
W = Increased Probability of Walking IAT = Internal Automobile Trips within Half-mile from the Project

Decreased Automobile Usage from New Walking Trips

The 2017 NHTS reports an average walking trip length of 0.86 mile.[20] Equation 20 can be used to estimate the reduction in VMT from newly converted auto to pedestrian trips. The annual reduction of VMT is used to calculate the benefit from reduced emissions and reduced automobile maintenance required.

Equation 20. VMT Reduction from New Walking Trips

Annual VMT reduced = New Daily Walking Trips * 260 * Trip Length
260 = Weekdays in the year (Annual trips) Trip Length = 0.86 Mile or Proposed Pedestrian Facility Length in Mile (whichever is smaller)

Reduced Auto VMT from Pedestrian Diversion (Opening Year)
Build Scenario Annual Reduction in VMT: 11,574

Bicycle Facility Improvements

New Cycling Trips

Measuring and forecasting the demand for bicycling in a project area is vital to calculate the benefits of a given facility. Based on research by the Texas A&M Transportation Institute, new bike trips within the 1- mile buffer of the Project corridors equal 1.36% of the internal trips within the same area.[21] The annual internal auto vehicle trips within half mile from the Project is obtained from the StreetLight Data.

20 Federal Highway Administration (2017). National Household Travel Survey. Retrieved in August 2022 from https://nhts.ornl.gov/

21 Lasley, P, M. Metzger-Galarza, S. Guo. (2017). Estimating Congestion Benefits of Transportation Projects with FIXiT 2.0: Updating and Improving the Sketch Planning Tool. Texas A&M Transportation Institute. Retrieved February 2022, from https://tti.tamu.edu/tti-publication/estimating-congestion-benefits-of-transportation- projects-with-fixit-2-0-updating-and-improving-the-sketch-planning-tool/

Equation 21. New Bike Trips

New Cycling Trips = 1.36%* Internal Trips

Total Bike Users Demand (Opening Year)
Build Scenario Daily Bike Trips: 62

Decreased Automobile Usage from New Cycling Trips

There is a presumed benefit from automobile trips being converted into both commuter and recreation bicycle trips for improvements that enhance bicycle access and mobility in an area. This benefit is based on the additional commuter and recreational travelers now using a bicycle as their mode of transportation.

To estimate this, the Build Scenario total bike demand trips were used. It is assumed that the reduction in automobile trips will increase in proportion to the increase in internal trips within the area. Additionally, the 2017 NHTS reports an average biking trip length of 2.38 miles; however, the proposed cycling facility, which is 1.54 miles, is less than the average bike trip length, thus the trip length of 1.54 miles is used to estimate the annual reduction in VMT as a result of new bicycle trips. The VMT saved is used tocalculate the benefit from reduced emissions and reduced automobile maintenance required.

Equation 22. VMT Reduction from New Cycling Trips

Annual VMT Reduction = New Cycling Trips * Trip Length *260
Trip Length = 2.38 Mile or Proposed Cycling Facility Length in Mile (whichever is smaller)
260 = Weekdays in the year (Annual trips)

Bike Diversion from Auto VMT Reduced (Opening Year)
Build Scenario Annual VMT Reduced: 4,289

Transit Improvements

New Transit Trips

Better access to transit amenities (e.g., shelters, sidewalks, ramps, signage) improve the transit level of service of an area, thus there is a presumed increase in transit usage. TCRP Report 163 *Strategy Guide to Enable and Promote the Use of Fixed Route Transit by People with Disabilities* reports that of the transit systems studied, updated or newly

installed transit amenities increase the stop ridership by 12.9%.[22] In addition, a study was conducted along the 56 Airline/Montrose route (north of the Project corridor) where BOOST shelters and improvements have already been installed. The ridership between BOOST and non-BOOST bus stations along the route showed an increase of 13% in ridership for the BOOST stops between 2019 and 2022.

According to METRO, in 2019 annual boarding and alighting counts (henceforth transit trips) at stops along the Project corridor totaled 412,334 annual transit trips (337,610 on the weekdays, 40,716 on Saturdays and 34,008 on Sundays) in the No-Build Scenario. The Build Scenario would result in an increase of transit trips by 13% in the project open year, and 0.39% annual growth in transit ridership, yielding 482,480 annual transit trips in 2029.

Transit Trips Demand (Opening Year)
No-Build Scenario Annual Transit Trips: 428,718
Build Scenario Annual Transit Trips: 482,480

Decreased Automobile Usage from New Transit Users

An average one-way transit trip length in the METRO service area is 5.67 miles.[23] The following formula is used to estimate reduced VMT due to new transit users. The annual reduction in VMT is used to calculate the benefit from reduced emissions and reduced automobile maintenance required.

Equation 23. New Transit Users to VMT Reduction

Annual VMT reduced = TrT * 5.67
VMT = Vehicle Miles Traveled TrT = Annual Transit Trips 5.67 = Average Transit Trip Length (Miles)

Transit Trips Diversion to Auto VMT Reduced (Opening Year)
No-Build Scenario Annual VMT: 2,429,041
Build Scenario Annual VMT: 2,733,647

22 Thatcher, Russell, C. Ferris, et al. (2013). TCRP Report 163: Strategy Guide to Enable and Promote the Use of Fixed-Route Transit by People with Disabilities. Transit Cooperative Research Program. Retrieved June 2019 from https://nacto.org/wp-content/uploads/2016/05/2-9_Thatcher-et-al-Strategy-Guide-to-Enable-and-Promote-the-Use-of-Fixed-Route-Transit-by-People-with-Disabilities-TCRP-Report-163_2013.pdf
23 National Transit Database. (2021). Houston METRO Annual Agency Report. Retrieved in February 2023 from https://www.transit.dot.gov/ntd/transit-agency-profiles/metropolitan-transit-authority-harris-county-texas