BAY AREA BICYCLE AND PEDESTRIAN SAFETY PLAN

SEPTEMBER 2024

HARRIS COUNTY PRECINCT 2

ADRIAN GARCIA
COMMISSIONER

REVIVE 2 THRIVE
Community Revitalization Initiative

H-GAC
Houston-Galveston Area Council

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NOTE FROM THE PROJECT TEAM

Safe and connected sidewalks, bike lanes, and trails play a key role in the mission to make Precinct 2 a great place to live, work, and play. The Bay Area Pedestrian and Bicycle Safety Plan aims to create an environment that is safe and welcoming for all who walk, bike, and roll in the Bay Area. To ensure that these roadways, sidewalks, and trails meet the needs of the community for years to come, the project team met with community members, stakeholders, and representatives of area school districts and employers to develop a long-term vision list of priority investments in pedestrian and bicycle infrastructure in the Bay Area.

Harris County Precinct 2 is excited to present the results of a year's worth of input, feedback, and involvement from the community that helped shape the future of walking and biking in the Bay Area. The project team listened to how you currently use our sidewalks, bike lanes, and trails, what you want to see more of, and how you think multimodal transportation options can best serve the community's needs – now and in the future.

Thank you to everyone that took part in making this project a reality: the Precinct 2 Planning Team, Precinct 2 Community Liaisons, the Houston-Galveston Area Council, the project consultants Halff, Toole Design Group, Transcend Engineers, and Hollaway Environmental, as well as all community members who provided valuable feedback, insight, and suggestions to the future of walking and biking.

This Pedestrian and Bicycle Safety Plan is a critical component in ensuring Precinct 2 is a great place to live, work, and play. Thank you for making this project a reality!

Houston-Galveston Area Council

HARRIS COUNTY PRECINCT 2

ADRIAN GARCIA COMMISSIONER

REVIVE 2 THRIVE
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1 CHAPTER ONE INTRODUCTION

Project Background

The Bay Area Bicycle and Pedestrian Safety Plan examines the existing conditions of bicycle and pedestrian facilities in the Bay Area through a holistic, data-driven approach to identify gaps and deficiencies in service or accessibility and identify potential recommendations. This plan serves as the guide for short- and long-term priorities for inclusive, non-motorized mobility including, but not limited to, walking, bicycling, and wheelchair uses. The Bay Area Bicycle and Pedestrian Safety Plan creates actionable infrastructure and policy recommendations to improve bicycle and pedestrian safety, accessibility, and connectivity to key destinations within the Study Area.

Exploration Green Bike Trail

Why Plan Now?

The *Dangerous by Design* report published in 2024 by Smart Growth America and the National Complete Streets Coalition highlights ongoing challenges for residents across the United States who depend on the bicycle and pedestrian infrastructure on our roadways. The Houston region is ranked 38th out of 101 metropolitan areas with 873 pedestrian deaths between 2018 and 2022. In the Study Area alone, there have been over 200 crashes involving a pedestrian or bicyclist, resulting in 20 fatalities and 36 serious injuries. Action must be taken to address these issues to create a safer environment for those who live, work, and visit the Study Area.

The challenge of improving bicycle and pedestrian safety is a multi-faceted problem that cannot be solved by funding, design, or practice shifts alone. A more comprehensive approach is required to successfully reduce the risk and severity of crashes involving pedestrians and bicyclists. This approach includes improved facilities, equity and accessibility, enhanced resiliency, education, and encouragement. The purpose of this plan is to identify areas of concern and provide actionable recommendations to improve walking and biking conditions within the Bay Area.

Benefits of a Safety Plan include:

1. *Generating and consolidating available data and understanding travel patterns*
2. *Bringing awareness to community resources and facilities*
3. *Reaching and connecting groups of people in the community*
4. *Generating ideas for improvements and funding opportunities*

Cyclist along NASA Parkway
Source: Halff

Plan Elements

The Bay Area Bicycle and Pedestrian Safety Plan is organized into four chapters that are reflective of the planning process:

1. **Introduction and Planning Context:** this section provides an introduction to the Plan and information regarding the importance of safe pedestrian and bicycle infrastructure and its impact on community members.
2. **Community Assessment:** this section provides an overview of the demographics of the planning area, existing and future multimodal transportation network, crash data, origin and destination analysis and environmental analysis, which provides the basis for the needs assessment.
3. **Strategies and Recommendations:** this section describes the analysis of the places and spaces which generate walking and bicycling trips and the corridors that support these modes of transportation. It includes both infrastructure and capital improvements as well a policy and programming opportunities.
4. **Implementation:** this section outlines a prioritized action plan and projects with identified funding sources and metrics to track progress for the build-out of the proposed network improvements.

Project Phases

The Plan was developed over a 12-month timeframe and involved staff from the Houston-Galveston Area Council (H-GAC), Harris County Commissioner Precinct 2, local public agencies, advocacy and grassroots organizations, and members of the community. The Plan follows four phases as provided below:

Phase 1: Project Initiation

- Initial Data Collection
- Stakeholder Outreach
- Preliminary Site Visits

Phase 2: Needs Assessment

- Existing Conditions
- Identify Community Needs and Preferences
- Network Mapping

Phase 3: Recommendations

- Plan Recommendations
- Conceptual Designs
- Project Prioritization
- Cost Estimates

Phase 4: Implementation

- Action Plan
- Project Implementation

Public Engagement (September 2023 - May 2024)

Host task force and community meetings, focus group workshops, conduct online community survey, and other public engagement and outreach events.

Trends in Bicycle and Pedestrian Planning

Understanding bicycling and walking activity, preferences, and trends is important when planning for and implementing improvements to the mobility network. In recent years, H-GAC has prioritized creating a transportation network that accounts for the movement of people and goods in a safe and efficient way. The following trends or topics represent ways in which bicycle and pedestrian planning and design have changed recently. Some of these trends or topics will be discussed further through the community assessment as well as proposed recommendations. This is not an exhaustive list of trends and should be used as a guide for Precinct 2, H-GAC, and member agencies within the Study Area to coordinate bicycle and pedestrian planning and design moving forward.

Land Use Density

Walkable, bikeable, and more dense neighborhoods are becoming increasingly attractive in areas throughout the country to promote a lifestyle where human needs, interactions, and desires are located close to households. Often referred to as the "15-minute city", this notion of land use and transportation dynamics plays a key role in providing more choices and accessibility creating an environment that is less reliant on the automobile. In order for transportation systems to be effective, safe and equitable infrastructure must be available for people to choose how people need or want to move.

Complete Streets

Complete streets is an implementation strategy as part of the Safe Systems Approach which emphasizes that no one should die or be seriously injured while using the roadway network. Similar to land use policies that support walking and bicycling, complete streets is an approach to planning, designing, and building streets that are safe and accessible for all road users. This includes people of all ages and abilities regardless of mode of travel. The complete streets policy approach may vary based on land use and community context. Elements to consider that relate to complete streets include sidewalks, bicycle lanes, bus lanes, public transportation stops, crossing opportunities, median islands, accessible pedestrian signals, curb extensions, travel lane widths, streetscape and landscape features.

Safe Routes to School

Increasing access to school by improving the walking and bicycling experience may encourage students, teachers, and parents to travel to and from school via non-motorized transportation more often. According to the Safe Routes Partnership, Safe Routes to School (SRTS) programs can improve air quality by reducing vehicle trips and miles traveled, reducing the risk of asthma in children.[1] Walking or biking to school may also reduce travel times for students and faculty.

SRTS is a program to improve the well-being of children by improving walking and bicycling conditions on the route to school and enabling and encouraging children to utilize these routes. According to the Safe Routes Partnership, there are enormous benefits for students who walk, bike, roll, and get physical activity; they are better able to focus in class, have higher attendance rates, and form healthy habits that last a lifetime and reduce the risk of chronic disease.

Complete Street Concept
Source: AARP

1: "Benefits of Safe Routes to School". Safe Routes Partnership.

Equity Considerations

According to the 2016 white paper report, *Pursuing Equity in Pedestrian and Bicycle Planning*, traditionally underserved populations may have a greater need for safe facilities for walking, bicycling, and rolling compared to other groups and calls for equitable planning of pedestrian and bicycle facilities.[2] Equity in bicycle and pedestrian planning seeks fairness in mobility and accessibility to meet the needs of all community members.

Improving the ability of traditionally underserved communities to travel safely and conveniently via walking, bicycling, or wheeling is essential to achieving a sustainable, equitable transportation system that can provide options in how people access jobs, schools, health care services, faith entities, social gatherings, and other destinations. A focus on improving the ability of all communities to travel safely and conveniently by walking, bicycling, or rolling is essential to achieving a balanced, equitable transportation system that can be used by everyone.

As a low-cost form of transportation, bicycles are well positioned to alleviate transportation insecurity, one of the more significant contributors to poverty that affects one-in-four Americans.

Concerted efforts to improve the ability of all communities to travel by walking and bicycling, and to safely reach transit stops, will help reduce transportation-based inequities and the negative outcomes that impact underserved communities. Pedestrian and bicycle planners and other transportation practitioners are uniquely positioned to lead, facilitate, advocate for, and otherwise contribute to those improvements and be informed by those traditionally underrepresented in the planning process.

All Ages and Abilities

According to the U.S. Census Bureau, the aging adult population is growing.[3] Many older adults may choose or need to stop driving and instead rely on alternative modes of transportation, such as walking or bicycling. Providing transportation networks that accommodate and prioritize older adult mobility can help aging community members build or maintain independence, prevent feelings of social isolation, and improve strength and physical endurance.

The All Ages and Abilities Network is intended to meet the needs of a broader demographic and potential bicyclists. The All Ages and Abilities Network considers different user capabilities and designs bicycle facilities that meet the needs of every user. In relation to Safe Routes to School, school-aged children are more likely to walk and bike to school if a comfortable and safe facility is provided for their use. Likewise seniors can make more trips and have increased mobility if safe riding networks are available.

Micromobility

More often seen in an urban environment or dense activity center or destination area, micromobility options like scooters and bike share programs provide a crucial link for first / last mile trips on the transportation network. These travel modes have expanded in recent years to complement traditional modes of travel with potential health, environmental, and congestion relief benefits. Bikeshare is currently unavailable in the Study Area.

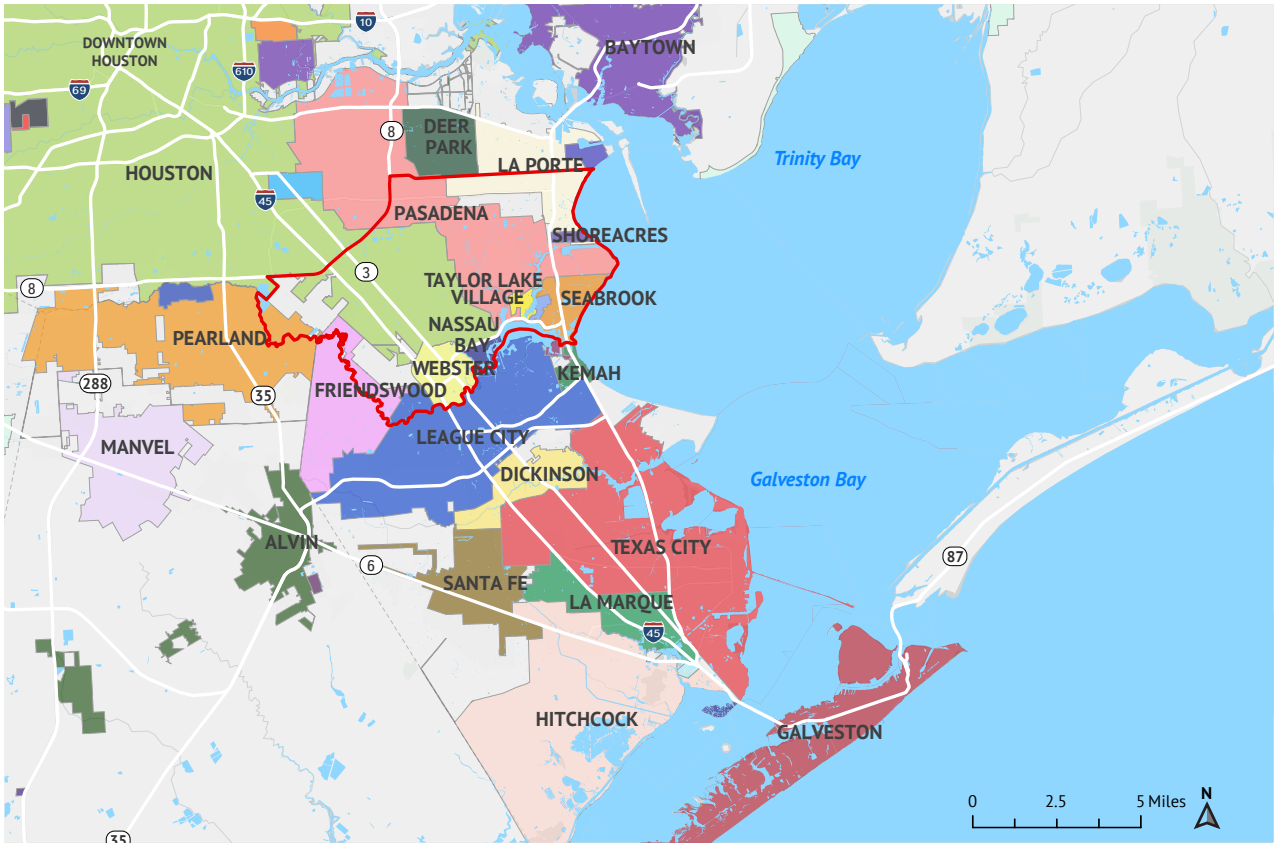
Former Houston Bike Share station at MacGregor Park
Source: Halff

2: "Pursuing Equity in Pedestrian and Bicycle Planning" Pedestrian and Bicycle Information Center. 2016.
3: "65 and Older Population Grows Rapidly as Baby Boomers Age." U.S. Census Bureau. 2020.

Study Area

The Study Area encompasses over 112 square miles and includes eight cities, shown in Figure 1, *Regional Context*. As shown in Map 1 (opposite page), the Study Area for this Plan is bounded by Spencer Highway to the north, Sam Houston Tollway to the west, Galveston Bay to the east, and Clear Creek to the south. The Study Area is home to nearly 240,000 residents. Major employers in the area include NASA Johnson Space Center, Ellington Air Force Base, Bayport Container Terminal, and University of Houston - Clear Lake.

Figure 1, Regional Context



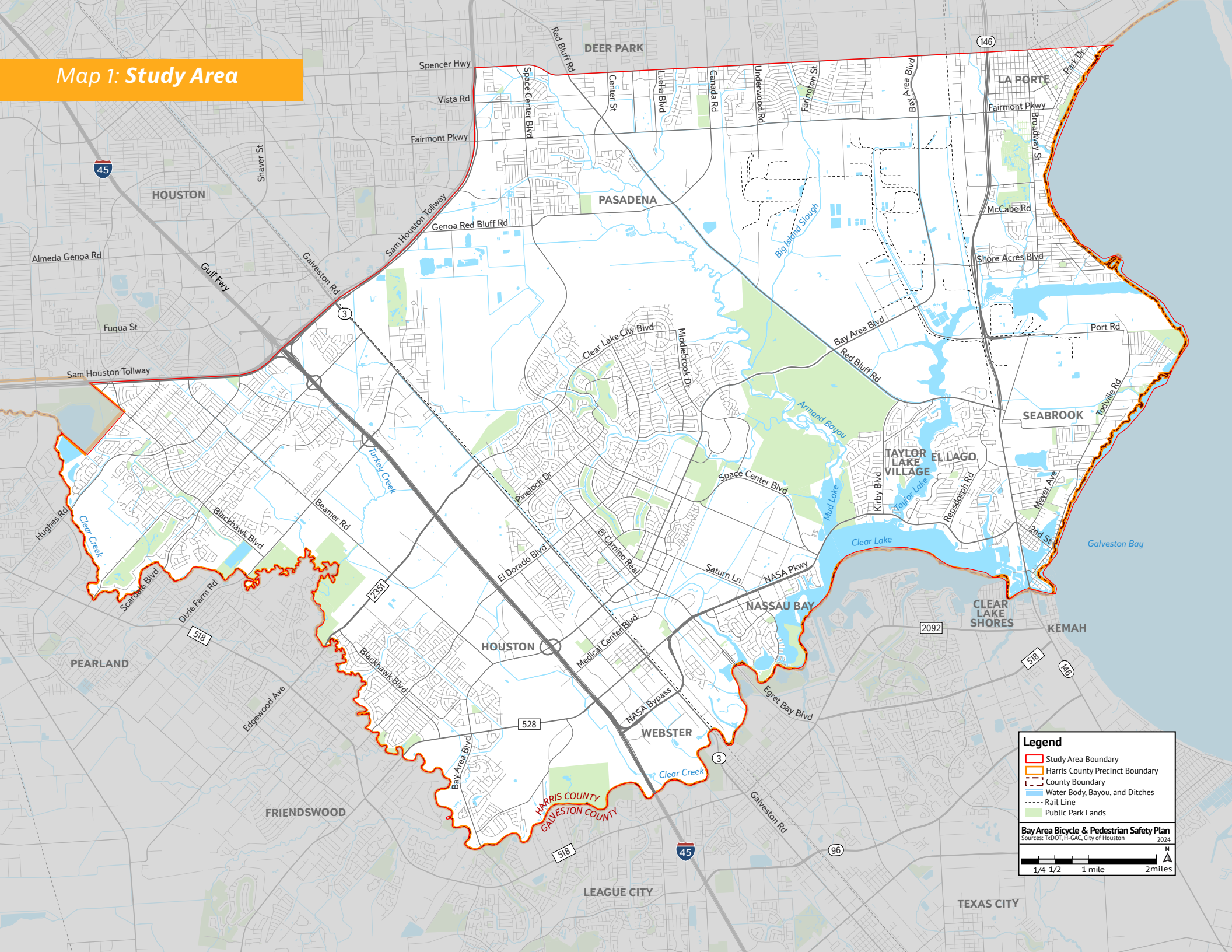
NASA Johnson Space Center
Source: NASA

Ellington Air Force Base
Source: Bay Area Houston Magazine

Bayport Container Terminal
Source: Port Technology

University of Houston Clear Lake
Source: UHCL

Map 1: **Study Area**



Previous Plans

Studies and plans pertaining to the Bay Area Bicycle and Pedestrian Safety Plan were reviewed to identify previous planning efforts, projects, and goals. This is to ensure that recommendations made within the Study Area correspond to and reflect prior planning actions and address challenges and efforts highlighted in the previous plans. This plan will build upon and enhance current goals and planning efforts within the community.

A summary of each planning study is provided along with highlighted goals that should be considered while planning for the Study Area. While many of the plans were not directly related to safety improvements to enhance bicycling and walking, many of them highlight the need for improving infrastructure throughout the Study Area to promote active living and a better quality of life. A similar takeaway from the plan review includes the need for infrastructure improvements that address the needs of all residents and mobility users of the roadway network.

Many of the plans highlight the need for improved infrastructure, the opportunity to implement off-street shared-use trails, and the supporting infrastructure to provide safe walking and bicycling options for Bay Area residents.

Further information regarding each plan that was reviewed can be found in Appendix A. Additional information regarding plan outreach efforts, analysis, and overall project recommendations can be found by visiting the respective City, County, or H-GAC website for plan documentation.

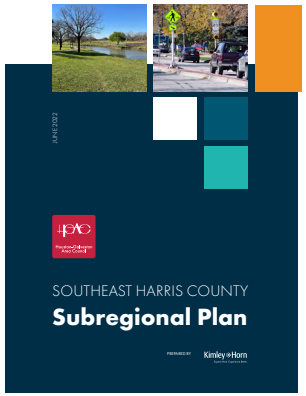
The following plans were reviewed to determine potential recommendations and which projects were still applicable to the Study Area. Map 2 on the facing page represents projects identified through Precinct 2, H-GAC Transportation Improvement Program and Unified Transportation Program. Due to complexity and vast number of projects recommended through each of the plans reviewed, the map only represents those projects that have been approved for funding. Many of the other project recommendations will be reviewed for consistency and potential coordination opportunities to address safety concerns.

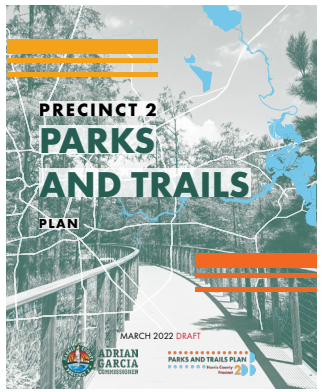
Regional or District

- Southeast Harris County Subregional Plan (2022)
- Precinct 2 Parks and Trails Plan (2022)
- Tollways to Trailways (2022)
- H-GAC Vision Zero Policy (2020)
- Houston Vision Zero Action Plan (2020)
- 2045 Regional Transportation Plan (2019)
- 2045 Regional Active Transportation Plan (2019)
- H-GAC Regional Safety Plan (2018)
- 2035 Regional Bikeway Plan (2007)

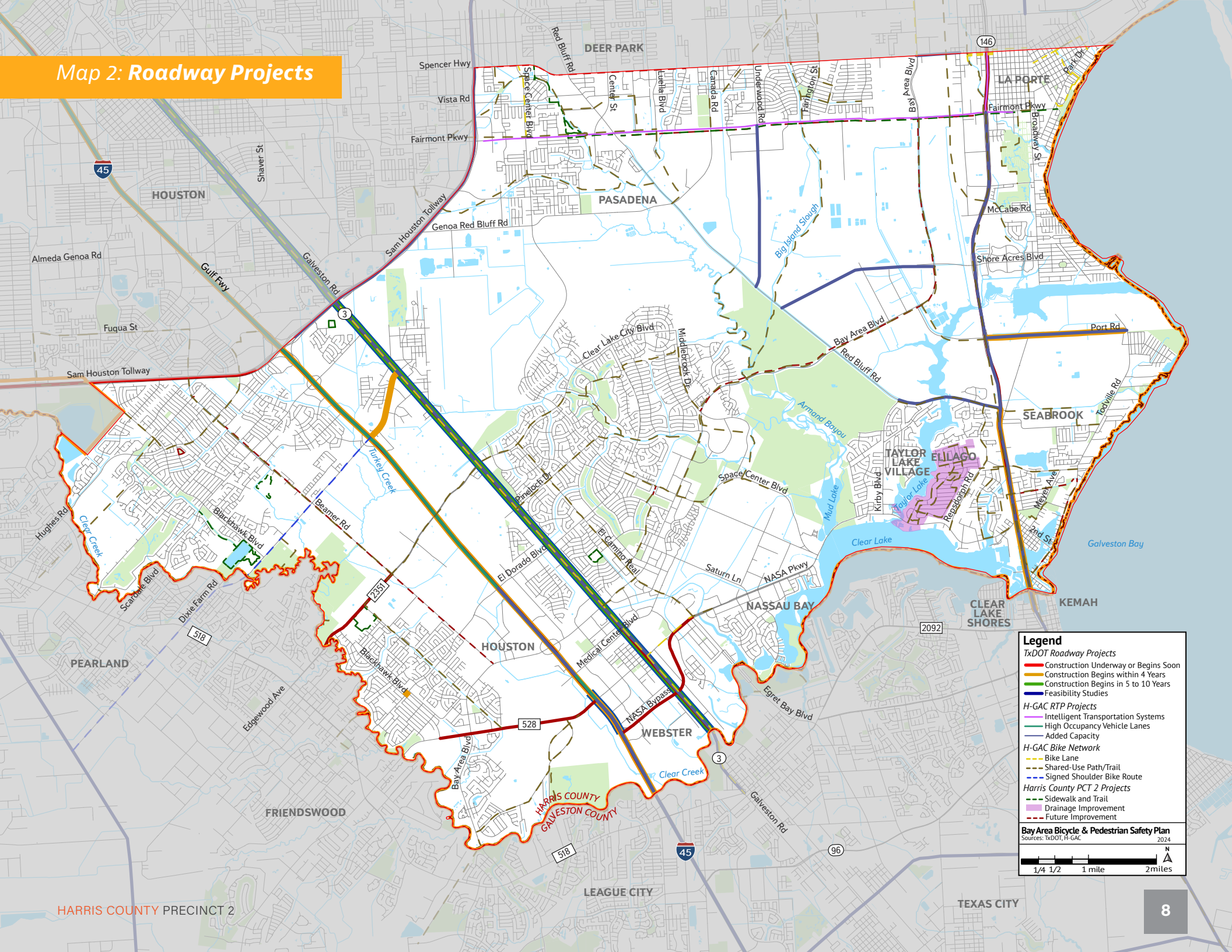
City

- La Porte Comprehensive Plan (2024)
- Houston Major Thoroughfare and Freeway Plan (2024)
- Old Seabrook Livable Centers Study (2021)
- Pearland Multi-Modal Master Plan (2021)
- Pearland Parks, Recreation, and Open Space Master Plan (2021)
- La Porte Parks, Recreation and Open Space Master Plan (2020)
- Pasadena Healthy Parks Plan (2020)
- Webster Comprehensive Plan (2020)
- Seabrook Open Space and Parks Master Plan (2020)
- Houston Vision Zero Action Plan (2020)
- Friendswood Comprehensive Plan (2018)
- Houston Bike Plan (2017)
- NASA Area Management District Livable Centers Report (2012)
- Clear Lake Pedestrian and Bicycle Study (2011)
- Seabrook Hike and Bike Trails Master Plan (2010)





Map 2: **Roadway Projects**



Legend

TxDOT Roadway Projects
- Construction Underway or Begins Soon
- Construction Begins within 4 Years
- Construction Begins in 5 to 10 Years
- Feasibility Studies

H-GAC RTP Projects
- Intelligent Transportation Systems
- High Occupancy Vehicle Lanes
- Added Capacity

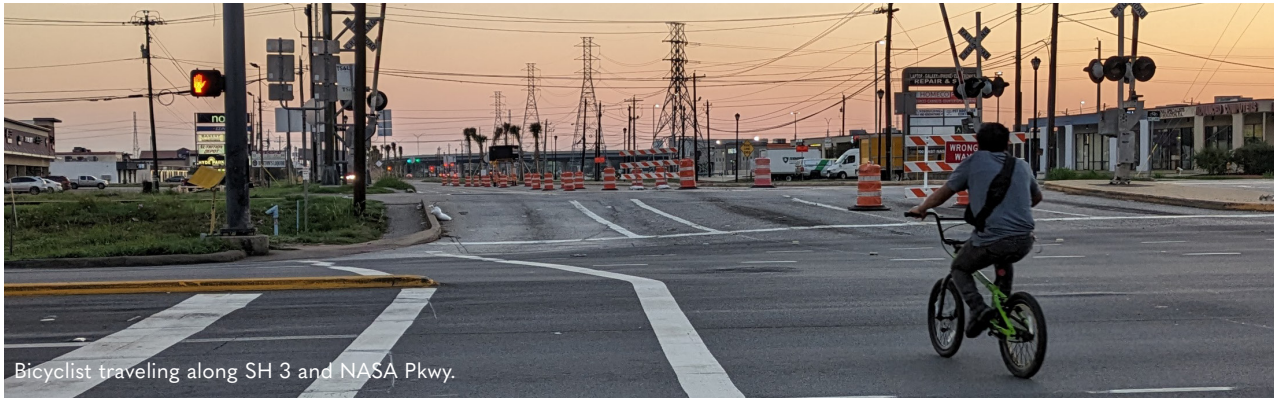
H-GAC Bike Network
- Bike Lane
- Shared-Use Path/Trail
- Signed Shoulder Bike Route

Harris County PCT 2 Projects
- Sidewalk and Trail
- Drainage Improvement
- Future Improvement

Bay Area Bicycle & Pedestrian Safety Plan
Sources: TxDOT, H-GAC 2024

N
1/4 1/2 1 mile 2miles

2 CHAPTER TWO COMMUNITY BACKGROUND


Bicyclist traveling along SH 3 and NASA Pkwy.

Demographics

Demographic and socioeconomic information for the Study Area was analyzed using the Demographic Data Explorer Tool created by H-GAC. Demographic and socio-economic information in this tool utilizes data from the 2017-2021 American Community Survey (ACS) 5-Year Estimate data generated by the U.S. Census Bureau. Data was analyzed at the Census Block Group level to determine total population, household income, employment, and housing characteristics for those living in the Study Area.

Population, Race, and Age

According to the ACS data, the estimated population for the Study Area is 239,358. As shown in Map 3, *Population Density*, block groups with higher population densities are in the western, southern, and central areas of the Study Area within the cities of Pearland, Friendswood, and Houston. Figure 2, *Population by Race*, represents the racial and ethnic breakdown of the Study Area.

As shown in Figure 3, *Population by Age*, the distribution of age groups in the Study Area is wide ranging. The plurality of residents, representing nearly 27 percent of population, are school aged children. There is also a high percentage of the population older than 55, representing an opportunity to provide safe and accessible infrastructure to commute to local destinations, schools, parks, and community centers. Additional considerations to safe and equitable pedestrian and bicycle infrastructure, as well as transit access, will be critical to network improvements and expansion in the Study Area.

As discussed on page 4 regarding the trends in bicycle and pedestrian planning, age and race play a critical role in the design of facilities and more importantly the prioritization of infrastructure improvements to meet the needs of the community. Equity will be an important consideration when determining project prioritization. Areas of the Study Area that represent a higher need for safe and accessible infrastructure will be identified and prioritized.

Figure 2, Population by Race

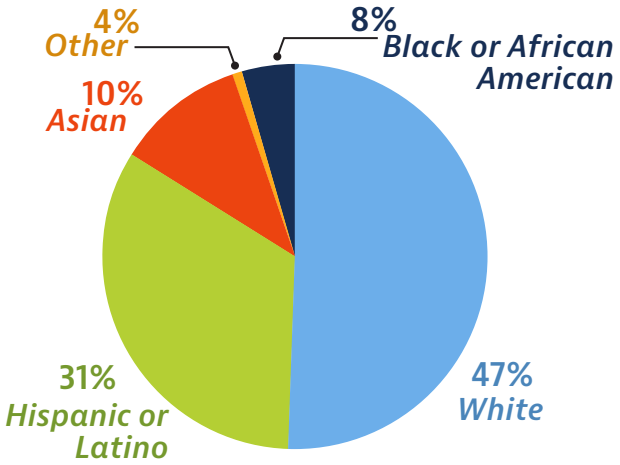
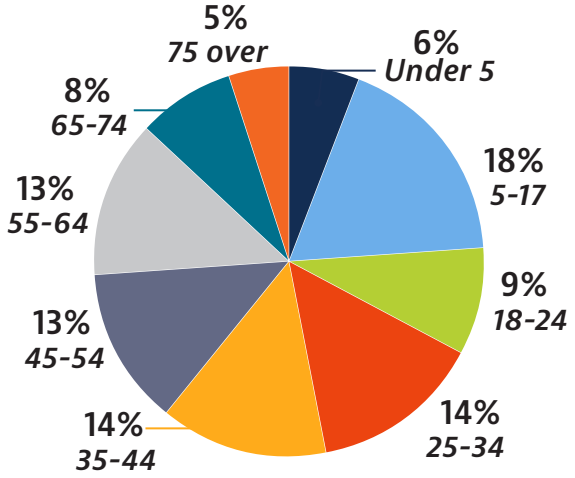
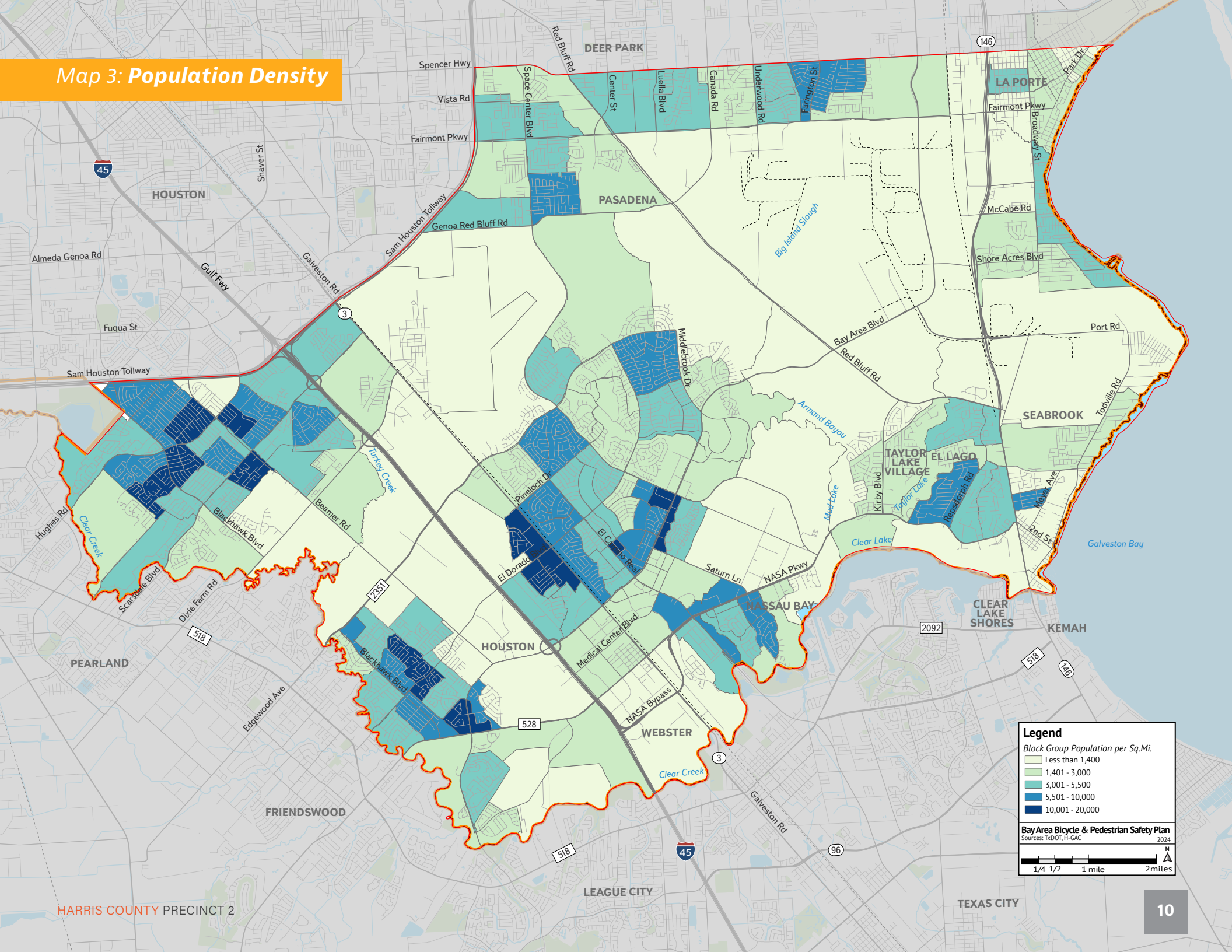


Figure 3, Population by Age



Map 3: **Population Density**



Vulnerable Population Index (VPI)

The H-GAC Regional Equity tool is an interactive mapping application that identifies the distribution of vulnerable populations throughout the H-GAC 13-county region. Vulnerable populations identified include:

- Household poverty
- Non-Hispanic, non-white
- Hispanic
- Limited English proficiency
- Disabled families
- Elderly populations
- Zero car households
- Single female householder with child or children

This tool helps planners and policymakers better understand the sociodemographic and community characteristics of a given project area and enhance decision-making processes to be more equitable and mindful of impacts on disadvantaged populations.

VPI Methodology

H-GAC uses data from the U.S. Census Bureau to determine the concentrations of vulnerable populations for the region and for each Census block group. A block group with a higher number of sensitive populations relative to the concentration of the entire H-GAC region is "vulnerable" for the sensitive population. H-GAC calculates a Vulnerable Population Index (VPI) to identify the number of vulnerable populations for each block group and provides a general indication of the extent to which each block group is considered vulnerable.

Bay Area VPI

Approximately 16 percent of Study Area block groups have a population where 50 percent or more residents are identified as vulnerable populations. As shown in Map 4, *Vulnerable Population Index*, the southern and western portions of the Study Area have higher concentrations of vulnerable population indexes greater than 50 percent. These areas may be more reliant on the pedestrian and bicycle network to reach destinations and should be closely analyzed to determine opportunities for infrastructure safety improvements. According to the data, the largest vulnerable population in the Study Area is Hispanic minority groups, with concentrations in the northern and western portions of the Study Area.

Zero Car Households

According to the Regional Equity Tool, approximately four percent of the Study Area population is without a car. Locations in the Study Area with zero car households are located in Census block groups with overall high concentrations of vulnerable population groups, shown in orange in Map 4. These locations with zero car households are also similar to locations with high percentage of poverty and high percentages of non-Hispanic minorities. These areas are also not served by transit but may be an opportunity to provide local service or improve pedestrian and bicycle infrastructure to park and ride bus services or on-demand transit services.

According to the Transit Needs Index developed as part of the 2022 Regionally Coordinated Transportation Plan, there are locations west of I-45 along Beamer Road between Hughes Road and Dixie Farm Road that have a high transit need. Other areas include locations adjacent to Baybrook Mall between Bay Area Blvd and FM 528.

Poverty

According to the Regional Equity Tool, approximately 10 percent of the Study Area population live in poverty. Locations in the Study Area with the highest percentage of residents in poverty, greater than 50 percent, are located in residential areas along El Camino Real between Reseda Dr and Bay Area Blvd and along Scarsdale Blvd between Blackhawk Blvd and Beamer Road.

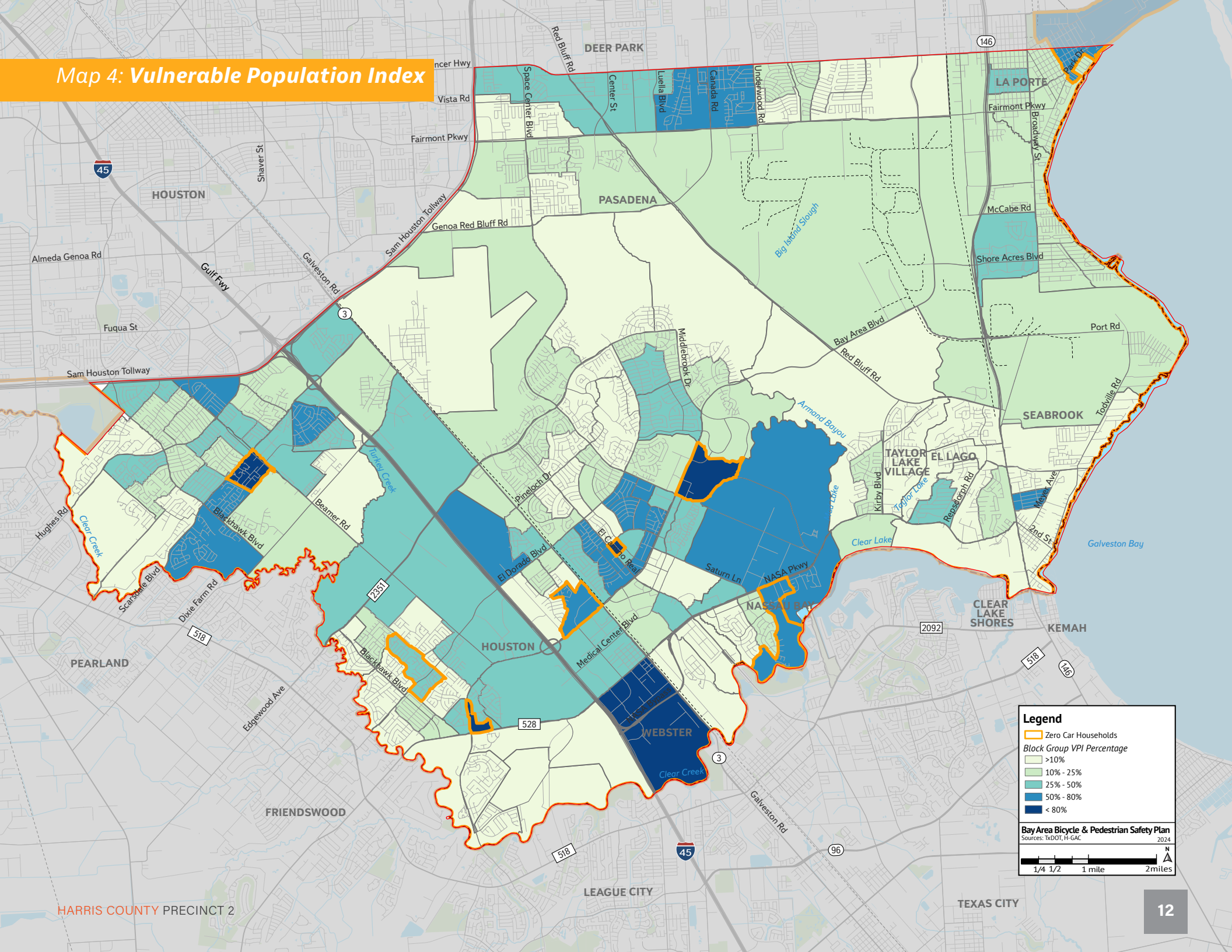
Disabled Family

According to the Regional Equity Tool, approximately 23 percent of the Study Area population represents a household with at least one person with a disability. The U.S. Census Bureau defines individuals as disabled if they report difficulties working at a job, leaving home, or report long-lasting sensory, physical, mental, emotional, or self-care disabilities. Locations in the Study Area with the highest percentage of a household with at least one person with a disability are located east of SH 146 between E Meyer Ave and 2nd Street.

"Improving the ability of all communities to travel safely and conveniently by walking, biking, and rolling is essential to achieving a balanced, equitable transportation system for everyone."

- Pursuing Equity in Pedestrian and Bicycle Planning

Map 4: **Vulnerable Population Index**



Legend

- Zero Car Households

Block Group VPI Percentage

- >10%
- 10% - 25%
- 25% - 50%
- 50% - 80%
- < 80%

Bay Area Bicycle & Pedestrian Safety Plan

Sources: TxDOT, H-GAC

2024

N

1/4 1/2 1 mile 2miles

Health Assessment

The purpose of this Health Assessment is to gain a better understanding of health measures and outcomes as it relates to active transportation. The Health Assessment compares factors across eleven indicators in each census tract within the Study Area boundaries against average conditions across the H-GAC region.

The composite score developed through this analysis highlights the locations in the Study Area that would benefit more from public infrastructure investments. The census tracts identified through this analysis will be used as part of the project prioritization criteria when determining projects in subsequent phases.

Across the eleven indicators, the Bay Area Study Area has similar rates compared to the H-GAC region. All of the health indicators are better than the regional average which indicates that Bay Area Study Area residents may have increased access to infrastructure that supports a healthier lifestyle. Indicators such as obesity, mental and physical health, and no leisure-time physical activity are still relatively high and present opportunities for safe, equitable, and accessible bicycle and pedestrian infrastructure investments to improve these conditions and provide a better quality of life for residents.

Health Score Methodology

To analyze health outcomes at a more local level, data for each indicator of the Health Assessment are compared to the average percentage for the H-GAC region. Relative need or health status is based on a percent difference between the conditions in an individual census tract compared to the regional average. Point values for each indicator are assigned on a scale from one to five, with the most points assigned to tracts with the highest need or greatest deficiency relative to the regional average.

The Composite Score is the sum of points across all indicators for each tract. It ranges from a minimum of 11 points, or one point per indicator, to a maximum of 55 points, or five points for every indicator.

For example, consider the Tract A outlined in purple in Map 5. Table 1 outlines points that Tract A earned for each of its indicators as well as its composite score, which is 35. The average composite score in the Study Area is 34, so this tract is relatively consistent when compared across indicators to the regional average.

Table 1: Example Tract A Indicators

Measure	Indicator	Score
Health Status	Mental Health	4
	Physical Health	3
Disability	Mobility Disability	3
Health Risk Behaviors	No Leisure-time Physical Activity	3
Health Outcomes	Current Asthma Prevalence	3
	High Blood Pressure	3
	Depression	4
	Obesity	3
	Cancer	3
	Diagnosed Diabetes	3
	All Teeth Lost	3
COMPOSITE SCORE		**35**

Map 5 depicts the composite scores for all eleven indicators used in the Health Index. Higher scores, shown in the darker green shades, reflect areas with generally higher rates of worse health measures and outcomes. These census tracts may also lack access to leisure-time physical activity and may be in poor or fair health. Areas with higher composite scores are located in areas of the Study Area that also have a high prevalence of industrial land uses and environmental constraints.

11 indicators were included in the scoring system:

Source: CDC PLACES

Health Status
- Mental health not good for 14 days or more among adults aged 18 and up
- Physical health not good for 14 days of more among adults aged 18 and up

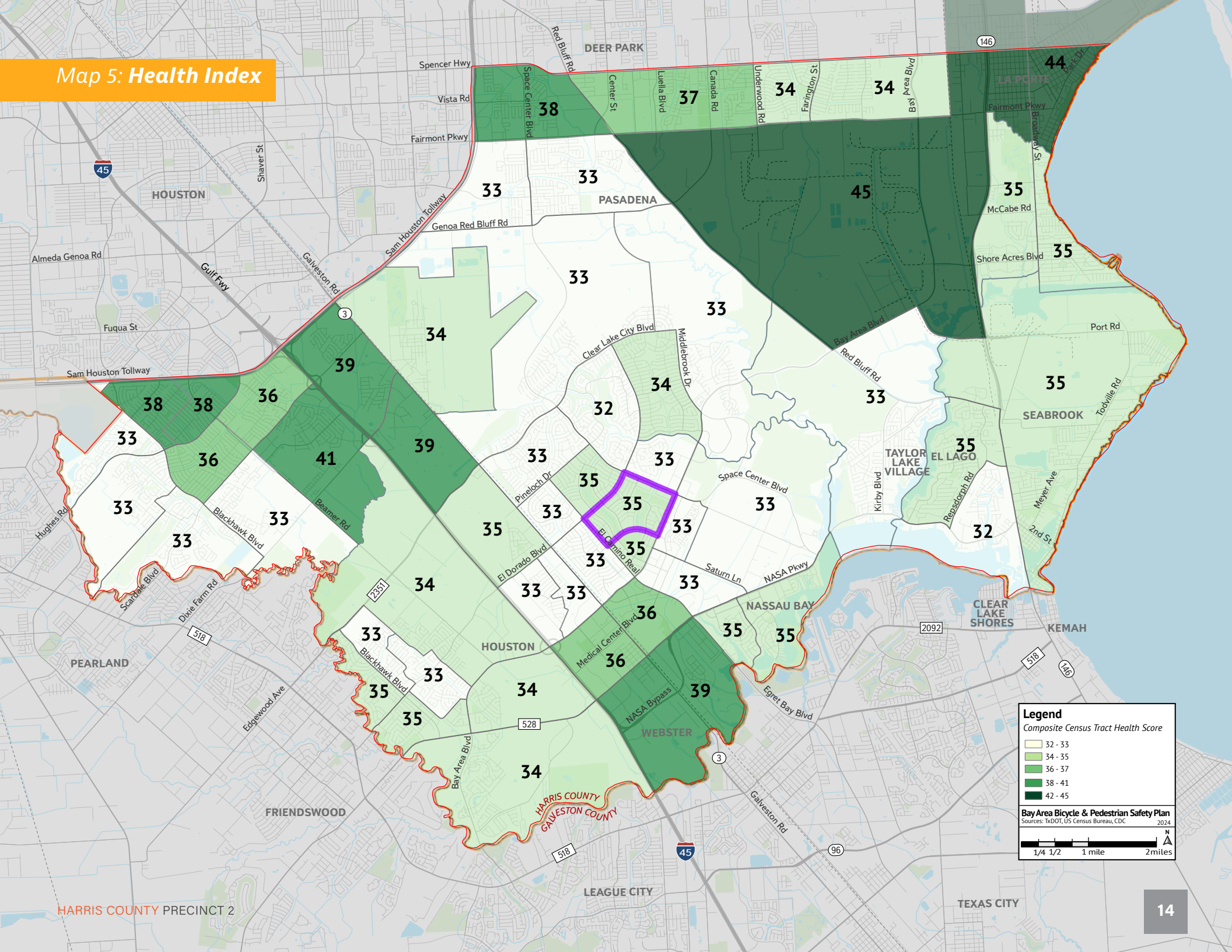
Disability
- Mobility Disability among adults aged 18 and up

Health Risk Behaviors
- No leisure-time physical activity among adults aged 18 and up

Health Outcomes
- Current Asthma Prevalence among adults aged 18 and up
- High blood pressure among adults aged 18 and up
- Depression among adults aged 18 and up
- Obesity among adults aged 18 and up
- Cancer among adults aged 18 and up
- Diagnosed diabetes among adults aged 18 and up
- All teeth lost among adults aged 65 and up

Access to safe and comfortable facilities may aid in reducing poor health factors
Source: Halff

Map 5: **Health Index**



Legend

Composite Census Tract Health Score

- 32 - 33
- 34 - 35
- 36 - 37
- 38 - 41
- 42 - 45

Bay Area Bicycle & Pedestrian Safety Plan

Sources: TxDOT, US Census Bureau, CDC 2024

N

1/4 1/2 1 mile 2miles

Existing Land Use

The Study Area is primarily composed of commercial/retail, industrial, and single-family residential land uses. As shown in Map 6, *Existing Land Use*, commercial land uses are primarily along major freeways and thoroughfares such as I-45, NASA Parkway, Spencer Highway, and SH146. Generally, these commercial and retail land uses take the form of strip centers and big-box retail centers. Residential land uses are found throughout the Study Area primarily in six clusters separated by commercial and industrial land uses. A majority of residential housing is single-family detached units, with minor multi-unit condominiums and apartments mainly within Webster, the Clear Lake City area, and along NASA Parkway.

The Study Area has over 10,000 acres of industrial or undevelopable land uses, which are mainly found in the central and northeastern sections of the Study Area along I-45 and northeast of the Armand Bayou. These industrial centers are primarily storage, shipping, and processing of natural gas, goods, and chemicals.

Table 2, *Existing Land Uses*, identifies the percentage of each land use within the Study Area.

Table 2: Existing Land Uses

Category	Acres	% of Total
Residential	17,291.5	29.0%
Commercial	7,055.4	11.8%
Governmental-Institutional	4,152.7	7.0%
Parks and Open Space	5,817.4	9.7%
Industrial	7,633.4	12.8%
Multiple	3,552	6.0%
Other	498.1	0.8%
Vacant Developable / Farming	7,107.1	11.9%
Undevelopable	5,835.5	9.8%
Unknown	742.7	1.2%
	59,685.8	100%

Example of new multi-family residential land uses
Source: Halff

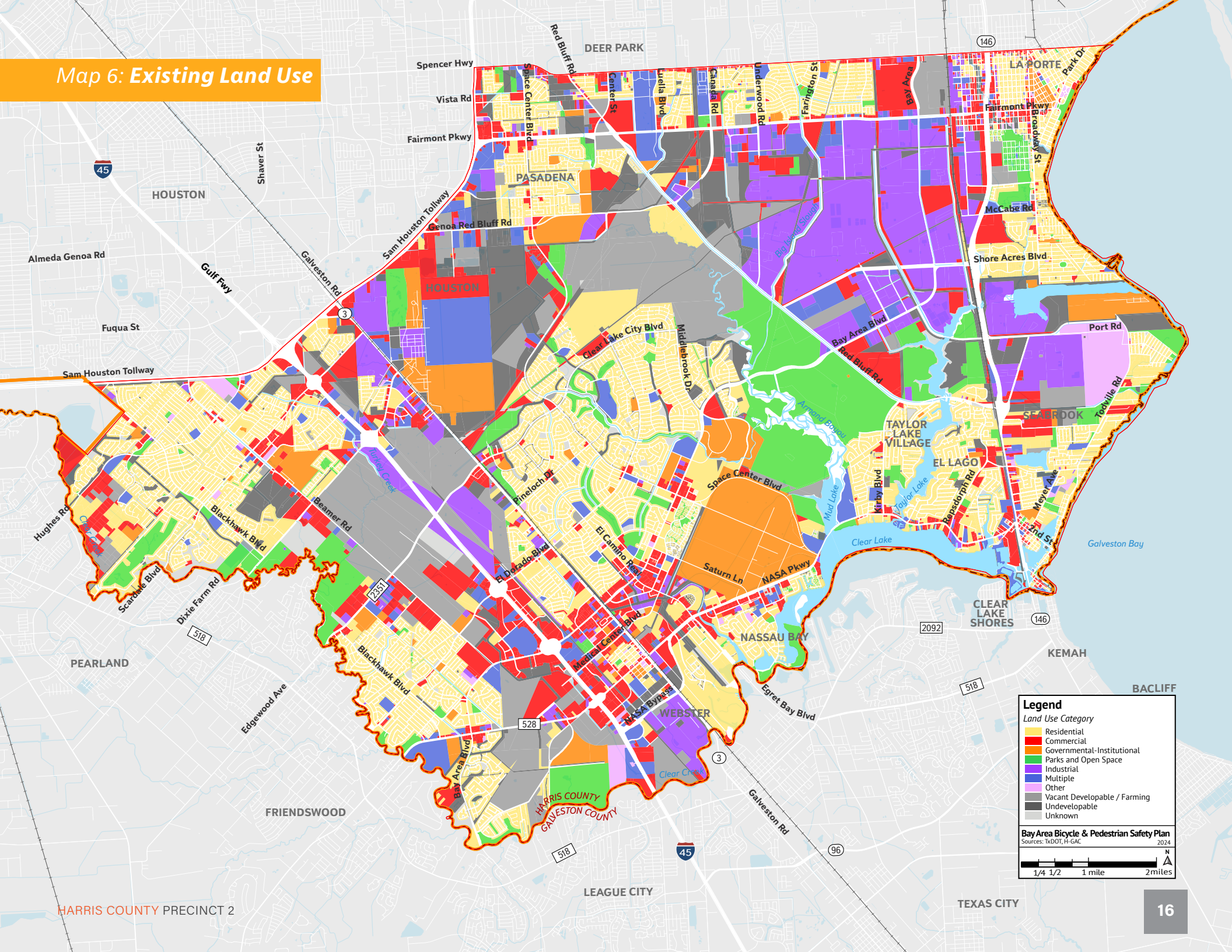
Drainage corridors provide opportunities for off-street trails
Source: Halff

Undeveloped land along Red Bluff Road
Source: Halff

El Dorado Square commercial center
Source: Halff

Sylvan Beach Park
Source: Halff

Map 6: **Existing Land Use**



Legend

Land Use Category

- Residential
- Commercial
- Governmental-Institutional
- Parks and Open Space
- Industrial
- Multiple
- Other
- Vacant Developable / Farming
- Undevelopable
- Unknown

Bay Area Bicycle & Pedestrian Safety Plan

Sources: TxDOT, H-GAC 2024

1/4 1/2 1 mile 2miles

Destinations

Destinations idenitified as part of this study are locations that residents and visitors are likely to visit by way of trail and bicycle facilities. Assessing these destinations helps determine how to provide direct connections between residents and where they are likely to travel on a regular basis. Map 7, *Destinations* (opposite page), illustrates Study Area destinations that are potential pedestrian and bicycle trip generators.

Tourism and Recreational Destinations

The Bay Area is a major regional destination known for its tourism and recreational opportunities. Many of these locations are located along NASA Parkway and SH 146. Major tourism centers include:

- NASA Johnson Space Center and Museum
- Ellington Air Force Base
- The future Flyway Center
- Downtown Kemah and Seabrook
- Clear Lake marinas and boating centers
- El Jardin Beach
- Sylvan Beach
- Armand Bayou Nature Center
- Challenger Seven Memorial Park
- Clear Creek Nature Center

Employment and Educational Destinations

Residents of the Study Area are likely to attend or have children who attend one of the several public schools and local colleges or universities. A majority of schools are located directly adjacent to residential areas on lower capacity local roadways. Additionally, increased safety measures should be taken on adjacent roadways and intersections to ensure youth safety and convenient access to schools.

In addition to NASA Johnson Space Center and local schools, other major employment centers include retail, industrial, and medical facilities. Regional hospitals are located near or along I-45 including Clear Lake Hospital and United Methodist Hospital. Additionally, major industrial and shipping zones exist in the center north and east of the Study Area in the Bayport Industrial Park and Bayport Container Terminal.

Retail and Commercial Destinations

Retail and commercial areas are major destinations which can be accessed by way of bicycle and pedestrian facilities, specifically retail zones located near or adjacent to residential areas. For example, the Kroger supermarket located along El Camino Real Street is directly adjacent to high-density multi-family housing, where residents can easily walk or bike to the grocery store. Major retail areas are primarily located along high-speed corridors such as the Baybrook Mall area along I-45 and South Houston Gardens near Fairmont Parkway, with minor retail nodes scattered throughout the Study Area. Precinct 2 and local municipalities should continually assess short trip indicators where major retail destinations are closest to residents that provide safe and comfortable pedestrian and cyclist options.

Short-Trips

People are more likely to use a car than active modes for traveling to a destination if the trip would take them longer than 15 minutes. Roughly, walking distance for a 15-minute trip is about a half-mile to a mile, and biking distance for a 15-minute trip is about three miles. In 2023, approximately 67 percent of average daily trips made by motor vehicles within the Study Area were three miles or shorter. Due to the density of destinations in the Study Area and their proximity to residential developments, there is an abundance of opportunity to transform these short vehicle trips into bicycle and pedestrian trips with the construction and improvement of active modes infrastructure. There are 10 "traffic analysis zones" within the Study Area that generate the highest volume of short trips, accounting for 33 percent of all short-trips or 22 percent of all trips made in the Study Area overall. These zones are shaded in purple in Figure 4, and contain countless stores, restaurants, small health care clinics, single-family homes, and apartment complexes as well as the following major destinations:

Shopping

- Baybrook Mall
- Kroger

Health Care

- UTMB Health Clear Lake Campus Hospital
- HCA Houston Healthcare Clear Lake
- Houston Methodist Clear Lake Hospital

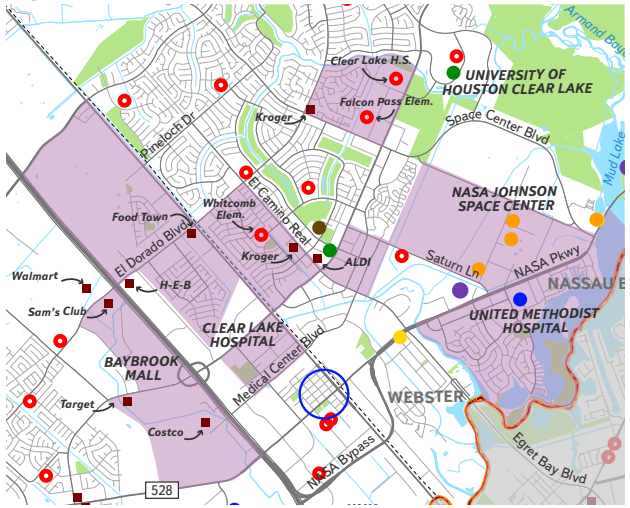
Recreation

- Nassau Bay Yacht Club and Marina
- Nassau Bay Peninsula Wildlife Park
- NASA Johnson Space Center

Institutional

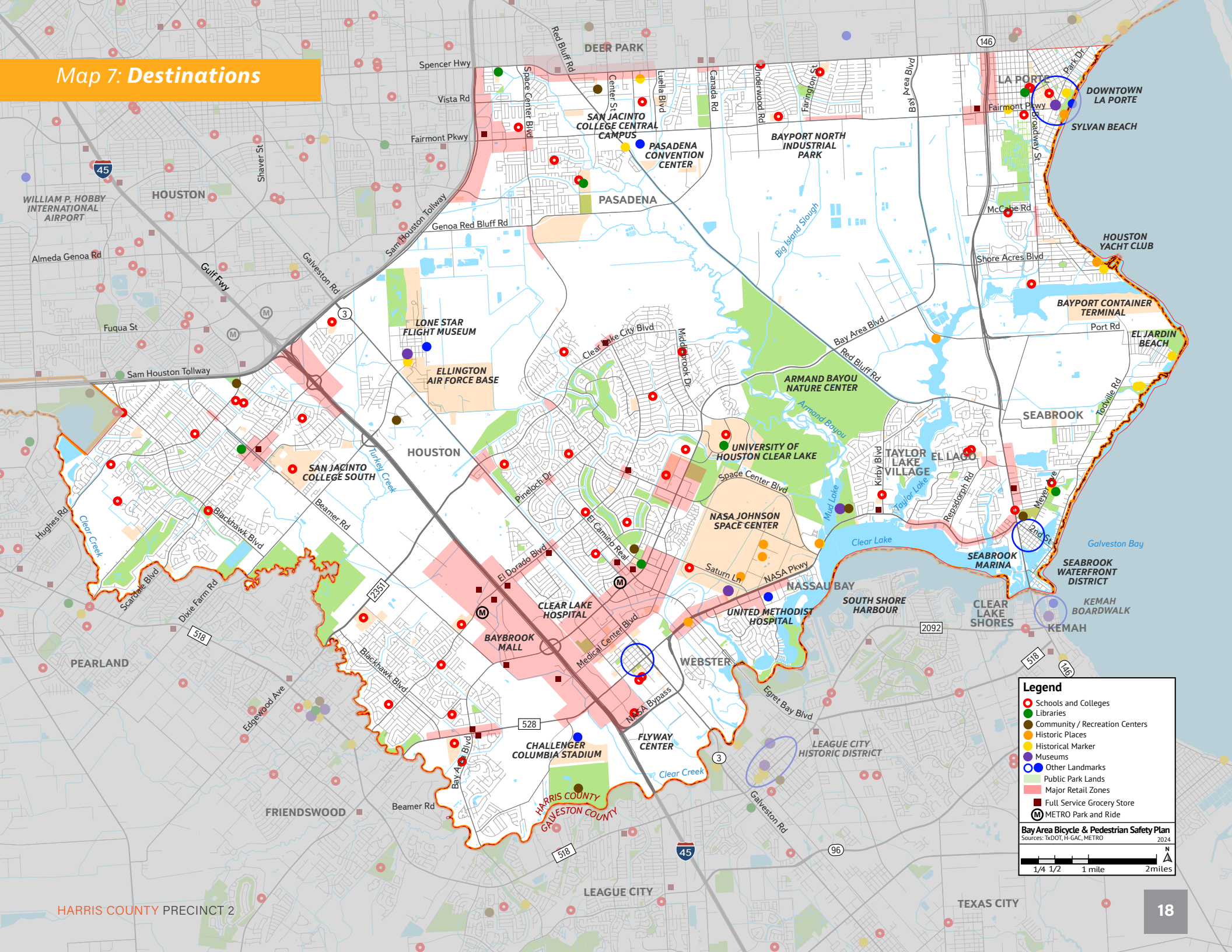
- Clear Lake High School
- Falcon Pass Elementary School
- Whitcomb Elementary School

Figure 4, Short-trip Zones



Source: H-GAC Travel Demand Model

Map 7: **Destinations**



Environmental Review

A desktop review of publicly available data was conducted to identify environmental constraints for the Study Area and further assist with determining regulatory strategies, such as permitting requirements, and/or impacts to the Study Area.

Water Resources

According to the Federal Emergency Management Agency's (FEMA) National Flood Hazard Layer (NFHL), approximately one percent of the Study Area is located within the coastal zone riverine floodway, five percent is within the floodway, 31 percent is within the 100-year floodplain, and 28 percent is within the 500-year floodplain. Additionally, the desktop analysis identified 1,557 United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) features totaling approximately 8,263 acres.

Review of the United States Geological Survey (USGS) National Hydrography Dataset (NHD) indicates that there are 381 stream segments within the Study Area, totaling approximately 253 linear miles of stream. Major streams within the Study Area include Clear Creek, Armand Bayou, Big Island Slough, Cow Bayou, and Horsepen Bayou. According to the United States Army Corps of Engineers, Clear Creek, Armand Bayou, Taylor Bayou, Horsepen Bayou, and Little Cedar Bayou are identified as traditionally navigable waters and measures approximately 34 linear miles.

Many of these creeks, bayous, and tributaries may serve as an opportunity to provide additional network connectivity. These types of facilities generally have fewer conflict points with vehicles and could pose a significant opportunity for safe and accessible travel.

As identified on Map 8 (opposite page), roadways that intersect or are within the 100-year and 500-year floodplain are those areas that may be inundated during a flood event. Design of safe and accessible pedestrian and bicycle infrastructure at these locations should take into account flooding and inundation along these roadways. If facilities are constructed with an express purpose to be inundated, then redundant infrastructure with similar travel times should be implemented. In addition to creeks and bayous throughout the Study Area, utility easements may also serve as off-street network connectivity opportunities. Locations in the Study Area include along SH 3 and between I-45 and Texas Avenue.

Cow Bayou Tributary along Gemini Street
Source: Halff

Cow Bayou Tributary adjacent to Bay Area Park and Ride
Source: Halff

Biological Resources

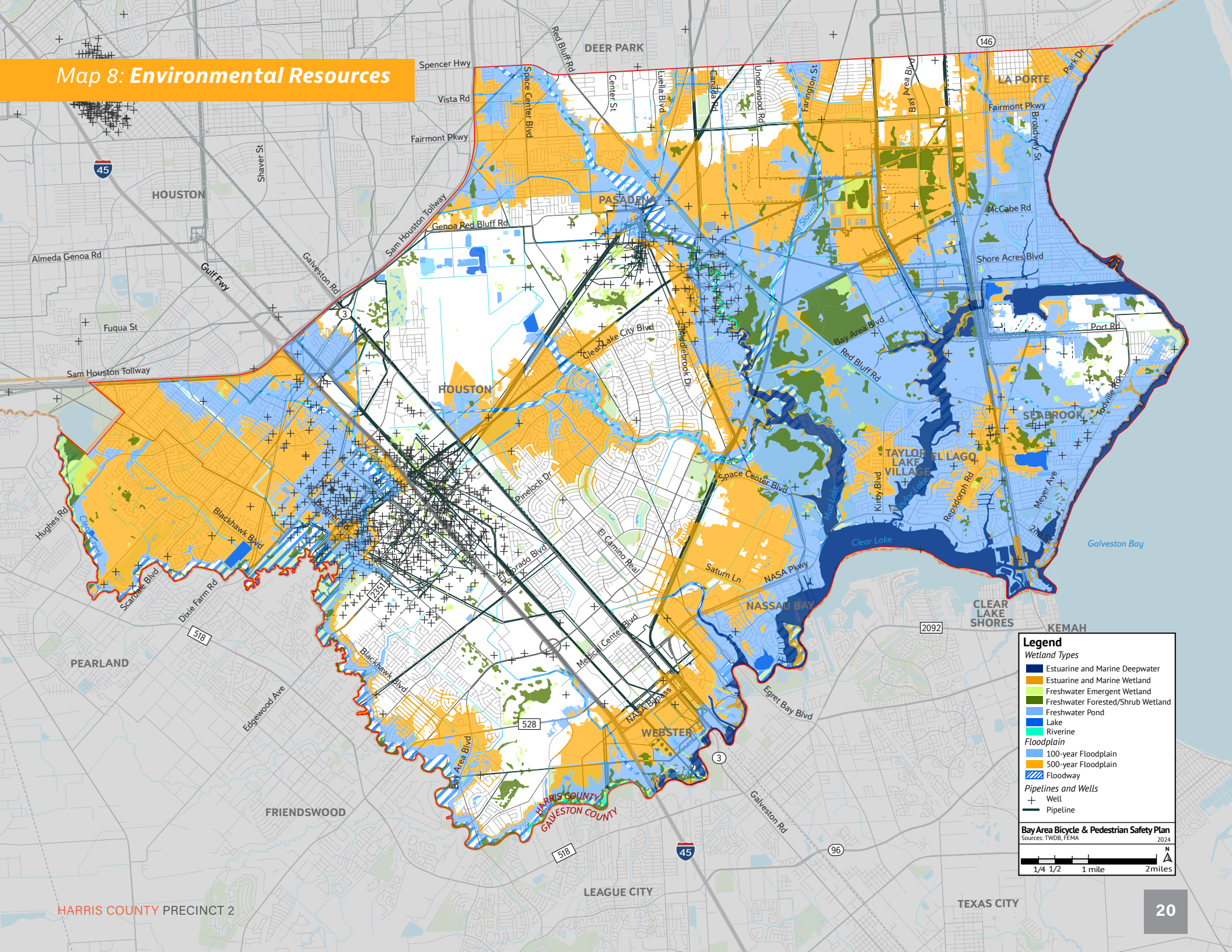
Review of the USFWS Information for Planning and Consultation (IPaC) Official Species List and Texas Parks and Wildlife (TPWD) List of Rare Species of Harris and Galveston Counties, identified 37 species listed as Endangered, Threatened, Listed Endangered, Listed Threatened, and/or Proposed Threatened. Based on the TPWD Natural Diversity Database (NDD) information, four observations of listed threatened and endangered species have been recorded within the Study Area. Additionally, there are no critical habitats located within the Study Area.

Hazardous Materials

According to the Texas Commission on Environmental Quality (TCEQ) publicly available data, there are potential hazardous materials present within the Study Area. Additionally, the Texas Railroad Commission (RRC) publicly available data identified 1,538 pipelines transecting the Study Area that transport a variety of chemicals including, but not limited to, natural gas, crude oil, and highly volatile liquids. Additionally, 781 surface wells, 786 bottom wells, and 195 surface-bottom wells are located within the Study Area.

The presence of the Bay Port Container Terminal and many industrial/warehousing land uses in the Study Area present a significant challenge to safe and accessible bicycle and pedestrian infrastructure. Roadway and intersection design will need to not only accommodate pedestrian and bicyclists but also take into account freight traffic accessing these facilities.

Map 8: **Environmental Resources**



Legend

Wetland Types

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Floodplain

- 100-year Floodplain
- 500-year Floodplain
- Floodway

Pipelines and Wells

- Well
- Pipeline

Bay Area Bicycle & Pedestrian Safety Plan

Sources: TWDB, FEMA 2024

N

1/4 1/2 1 mile 2miles

Existing Network

The Study Area's existing transportation network is made up of infrastructure that supports multiple modes of travel including sidewalks, multi-use trails, on-street bikeways, public transit, rail facilities, and many miles of roadways. This varied infrastructure is critical to ensure the safe movement of people and goods throughout the Study Area and the region. In addition to enabling motorized- and non-motorized movement, the transportation network helps shape the community's physical landscape, health and wellness, social expectations, and safety.

Existing Roadway Conditions

As shown in Map 9, *Roadway Classifications*, existing roadway network within the Study Area is comprised of high capacity freeways and principal arterials that facilitate fast moving vehicular traffic, minor arterials, major collectors, and local streets. While these roadways may move vehicles efficiently from one destination to the next, they may not facilitate safe pedestrian or bicycle mobility due to driver behavior and roadway design. Many roadways in the Study Area have posted speed limits of 30 miles per hour (MPH); however, vehicle speeds are typically much faster due to roadway design encouraging higher speeds.

Vehicular speeds have a significant impact on roadway safety, not only for the person driving the vehicle, but also for other road users. Depending on the design of the roadway, landscape buffers between the vehicular travel lane and pedestrian sidewalk are not adequate enough to enhance safety for all road users. In addition to the high traffic volumes and speeds along many Study Area roadways, there are existing infrastructure issues like bridge transitions and maintenance of the roadway infrastructure that pose additional challenges to residents walking and bicycling.

A majority of Bay Area residents, nearly 80 percent commute to work using a single-occupancy vehicle. Only one percent of Bay Area residents commute to work by walking or bicycling with one percent commuting by transit. These rates are consistent with the regional average; however, many residents could benefit from improved transit as discussed in the Health Assessment and Vulnerable Population Index.

Traffic Volumes

Historical Annual Average Daily Traffic (AADT) volumes provide information on traffic history and changing trends on the Study Area's roadway network and can illuminate opportunities for improvements. Corridors with the highest traffic volumes include NASA Parkway, SH 3, Bay Area Boulevard, and Spencer Highway. Design of safe and accessible pedestrian and bicyclist infrastructure will need to consider innovative approaches to increase awareness of all roadway users. Right-of-way along many of these roadways is between 100' to 120' with wide medians to provide for additional turning movements. These medians may create opportunities for mid-block crosswalk enhancements where trails traverse the roadway as well as pedestrian refuge islands at intersections.

Commute Mode to Work

80% of workers commute to work by single occupancy vehicle

1% of workers walk/bike to work

10% of workers carpool to work

1% of workers commute to work by bus

8% of workers telework

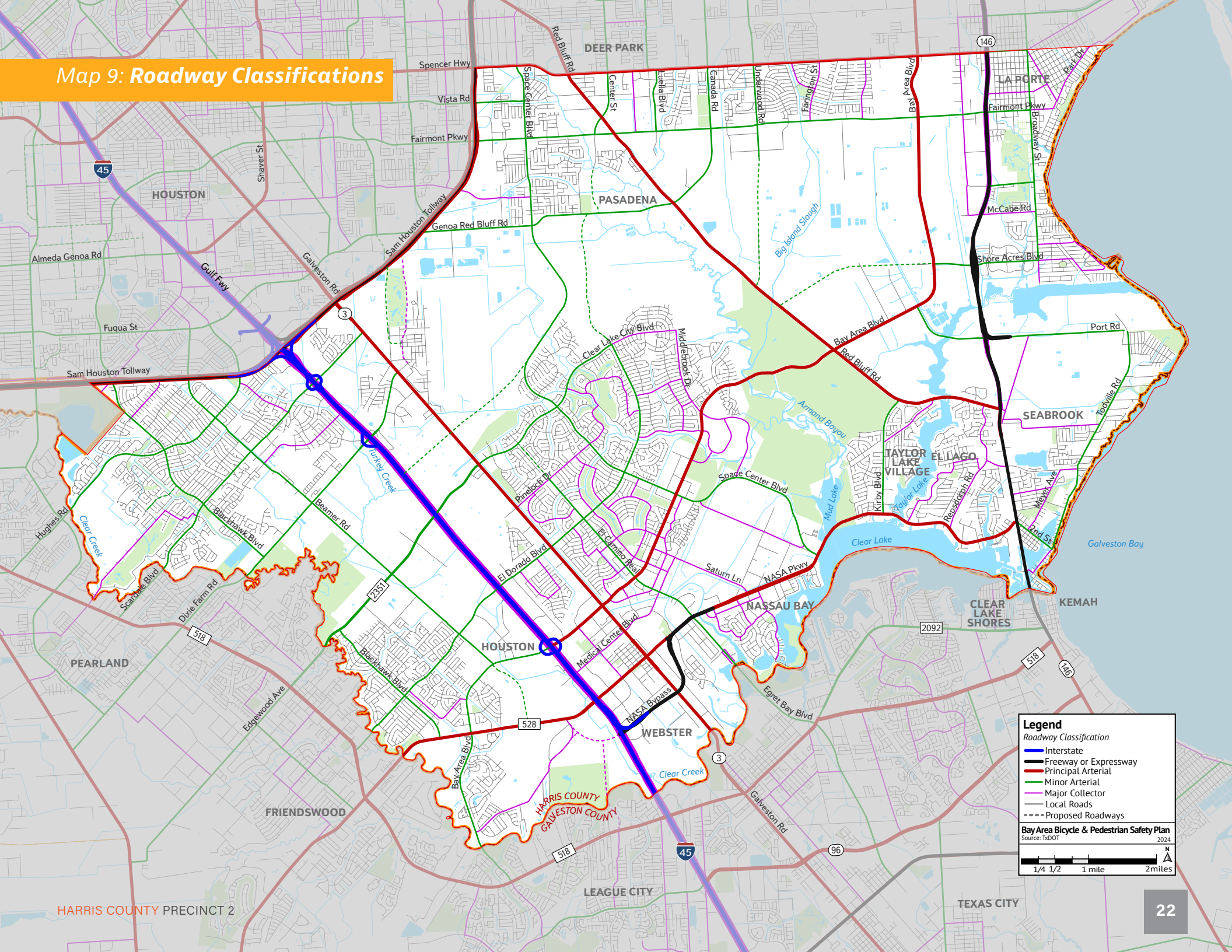
Source: 2017-2021 American Community Survey 5-year Estimate

Residential street within the Study Area
Source: Halff

Wide, high speed roadways may encourage unsafe driving behaviors
Source: Halff

The wide, high speed nature of Spencer Highway creates safety concerns for non-motorized road users
Source: Halff

Map 9: **Roadway Classifications**



Transit Service

Data retrieved from the 2020 Longitudinal Employer-Household Dynamics (LEHD) from the U.S. Census Bureau shows that nearly 81 percent of Study Area residents work outside of the Study Area and 19 percent live and work within the Study Area boundary. While most Study Area residents work outside of the Study Area boundary, approximately 40 percent of commutes are less than 10 miles, indicating the possibility for reduced single-occupancy vehicle (SOV) trips through improvements to the multimodal transportation network throughout the region.

As shown in Map 10, *Commuting Patterns*, residents who live in the Study Area travel to work in areas northwest toward Downtown Houston and the Texas Medical Center, south to the City of League City, and north to the cities of Pasadena and Deer Park. Study Area residents that work in the Study Area commute from areas in League City, Friendswood, Deer Park, and Baytown. Major employment centers within the Study Area include NASA/Johnson Space Center, Bayport Terminal, and major shopping centers such as Baybrook Mall. While many of these areas are not served well by transit, there is an opportunity to enhance transit service and improve first / last mile connectivity to these bus stops and transfer centers.

There are two Harris County Transit routes that travel through the northeastern portion of the Study Area in the City of La Porte. Similarly, the Metropolitan Transit Authority (METRO) operates four bus routes through the Study Area. Routes 246, 248, and 249 operate as Park & Ride routes connecting commuters to Downtown Houston and Route 88 operates as a local route connecting residents to Hobby Airport and San Jacinto College. Park & Ride routes operate Monday through Friday but parking lot locations are open seven days a week.

Within the Study Area, there are two Park & Ride bus locations: the El Dorado Park & Ride and the Bay Area Park & Ride. These Park & Ride locations provide opportunities for Study Area residents to commute to and from work in Downtown Houston by public transit rather than SOV. Creating bicycle and pedestrian connectivity to these transit locations will be important to consider as the multimodal transportation network continues to grow in the Bay Area.

Bay Area Residents Live/Work Characteristics

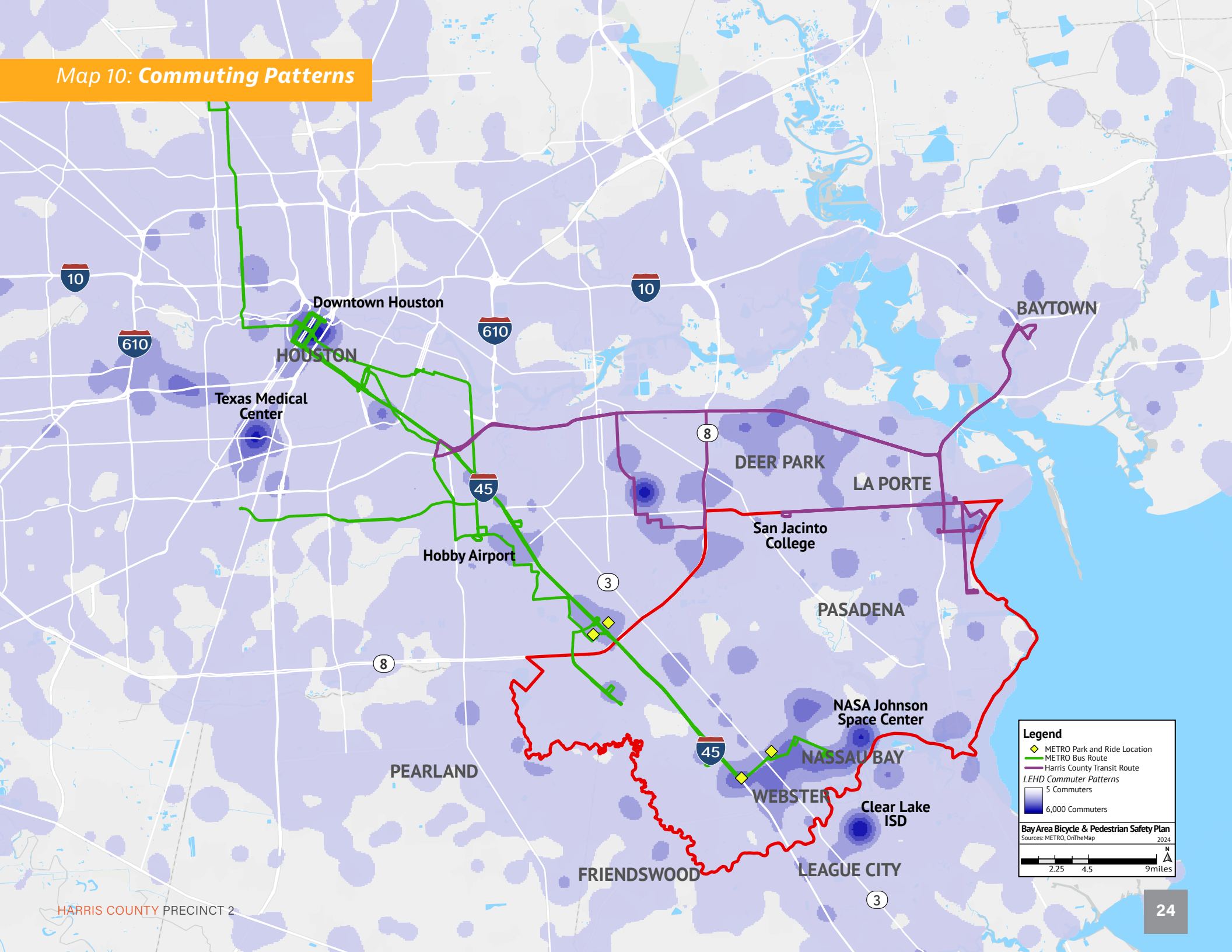
Source: 2020 Census Longitudinal Employer Household Dynamics

Harris County Transit Bus
Source: Halff

Sign for El Dorado and Bay Area Park & Rides
Source: Halff

Harris County Transit Bus Stop along Spencer Highway
Source: Halff

Map 10: **Commuting Patterns**



Bicycle Network

Sidewalks and trails bring people to spaces for social interaction among neighbors and encourage citizen participation at the local level. The five-minute walk, or "pedestrian shed" is the distance people are willing to walk to a destination before opting to drive. Based on the average walking speed, a five-minute walk is represented by a radius measuring one-quarter mile or approximately 1,300 feet. This means that the scale of development, length of blocks, width of streets, and depth of parking lots directly impacts the perception that a destination is reachable by walking or bicycling.

Many existing on-street bicycle lanes, bike routes, recreational trails, and shared-use paths are found throughout the Study Area. There are nearly 40 miles of dedicated bicycle lanes within the Study Area. Additional pedestrian and bicycle facilities have been proposed from prior planning efforts led by City, County, and regional entities looking to connect existing facilities. As shown in Map 11, *Existing and Proposed Facilities,* the existing bicycle facilities are primarily located along major thoroughfares such as NASA Parkway and Bay Area Boulevard.

Unprotected shoulder bike facility along Bay Area Boulevard
Source: Halff

Sidewalk Network

The Study Area has more than 1,000 miles of sidewalks, a majority of which are found within subdivisions and neighborhoods connecting residential land uses and parkland. Sidewalks also serve as the main connection between residents and public transportation opportunities and their final destination once exiting public transportation. Most local, collector, and arterial thoroughfares within the Study Area have four- to five-foot-wide sidewalk facilities connecting to commercial land uses. In many cases, the sidewalks are heavily damaged and at intersections crossing ramps are damaged or may be impassable. Sidewalk gaps exist between internal subdivision sidewalk networks and public thoroughfare sidewalks.

On-street bike lane along E Street in La Porte
Source: Halff

Existing Facilities

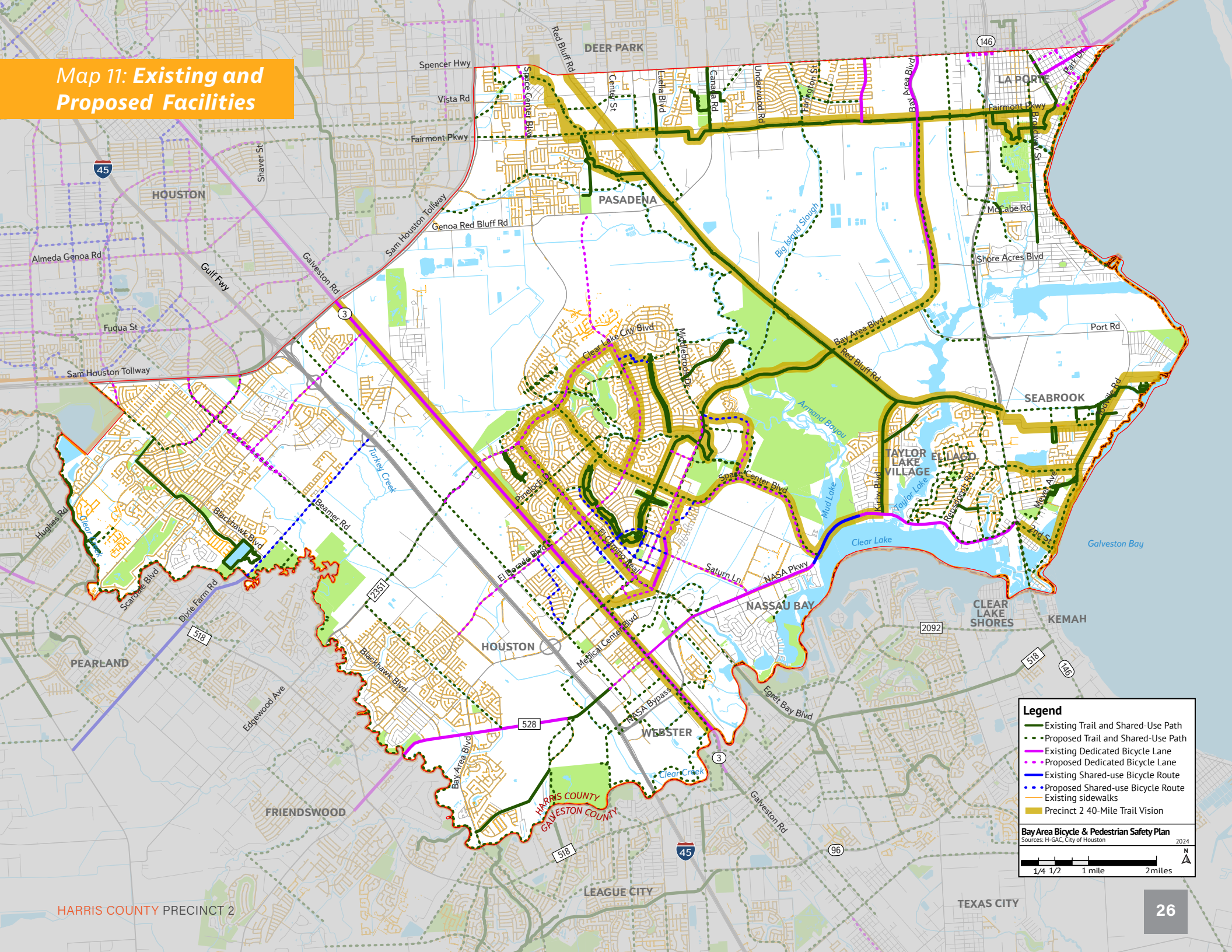
38.6 MILES
OF DEDICATED BICYCLE LANES
Dedicated bicycle lanes are lanes that are lined only for cyclist use, such as along SH 3 or Bay Area Boulevard.

37.5 MILES
OF TRAILS
Trails are typically eight to 12 foot wide facilities which connect parkland along drainage easements and provide additional opportunities for non-motorized travel.

22.1 MILES
OF SHARED-USE PATHS
Shared-use paths are eight to 12 foot wide facilities along major thoroughfares. Shared-use paths can be thought of as high capacity sidewalks that facilitate both bicycle and pedestrian travel.

1,001+ MILES
OF SIDEWALKS
Typically four to six foot wide, sidewalks are low capacity paths connecting residential land uses and commercial corridors.

Map 11: **Existing and Proposed Facilities**



Existing Facilities Overview

As previously highlighted, several existing bicycle lanes, bicycle routes, recreational trails, and shared-use paths are found throughout the Study Area. This is intended to provide a brief overview of existing facilities and detail any constraints and challenges that may pose an opportunity for additional safety improvements.

Existing Bicycle Lanes

FM 528 / NASA Parkway

The existing bicycle lane along FM 528/NASA Parkway is an unprotected five-foot bike lane facility which connects Clear Creek, Downtown Webster, NASA Space Center, and Seabrook. As the bike lane transitions across Mud Lake, it turns into a bike route that shares the road with vehicles. There is currently no safe and accessible way for bicyclists to navigate this transition.

SH 3

The existing bicycle lane along SH 3 is a buffered five-foot shoulder facility which connects South Houston to Downtown League City. The bicycle lane runs along fast moving 50 MPH traffic and offers limited to no shade from the sun. While the bicycle lane does have a two-foot buffer between vehicle travel lanes, the bicycle lane does not feature any bollards or protective barriers and right turning vehicle traffic crosses the bicycle lane at intersections.

SH 3 bicycle lane in Downtown Webster
Source: Halff

Bay Area Boulevard

The existing bicycle lane along Bay Area Boulevard runs along mostly industrial land uses connecting limited commercial and residential land uses. The bicycle lane is a six-foot-wide unprotected shoulder facility. Notably, the bicycle lane abruptly ends just south of the Choate Road/Shore Acres Boulevard intersection, where cyclists have to share a lane with vehicles until reaching the Red Bluff Trail. Additionally, a six-foot-wide unprotected bicycle lane is along Driftwood Drive connecting residential land uses to minor commercial land uses along Fairmont Parkway and Spencer Highway.

Gemini Street

The existing bicycle lane along Gemini Street is a buffered bicycle lane along commercial/office park and multi-family residential land uses. The bicycle lane runs from El Camino Real Street to Reseda Drive, and features green painted markings where driveways cross the bicycle lane, which increases cyclist visibility and safety.

Dixie Farm Road

The existing bicycle lane along Dixie Farm Road provides connectivity from Friendswood and Pearland to the Clear Lake area. The bicycle lane is substandard at only 4 feet wide along roadways with high volumes of traffic and high speeds. Similar to NASA Parkway, the bicycle lane does not have good transitions at intersections or when it crosses bridges.

Bay Area Boulevard bicycle lane
Source: Halff

Dixie Farm Road bicycle lane
Source: Halff

FM 528 / Nasa Pkwy bicycle lane
Source: Halff

Existing Trails and Shared-Use Paths

Exploration Green/Clear Lake City South

Exploration Green/Bay Area Boulevard Exploration Green Trails, Bay Area Boulevard Trail, and the Bay Area Hike and Bike Trail connects residents of the Clear Lake City area with a series of 10-foot paved concrete trails along detention ponds and canals. Notable destinations along the trails include Clear Lake High School, Clear Lake Community Association Park, University of Houston Clear Lake, and Bay Area Park. Notably, the bridge crossing at Armand Bayou offers a narrow bridge crossing for trail users, while a trail crossing at Space Center Boulevard is not provided to connect the Bay Area Hike and Bike Trail and Exploration Green.

Clear Lake City North Trail Systems

The Clear Lake City region has a number of smaller disconnected 10-foot concrete paved trails which include the Brook Forest/Middlebrook Walking Trail, Bay Knoll Greenbelt Walking Trail, and Brookwood Trails. These trails primarily connect residential land uses to civic association pools and local schools along canal and drainage corridors.

Southbelt Hike and Bike Trail

The Southbelt Hike and Bike Trail is an approximately 3.7 mile long 10-foot wide asphalt paved trail. The trail connects residences to Dixie Farm Road Park, Weber Elementary School, and Bishop Park along a drainage canal tributary of Clear Creek.

Clear Creek Trails / Hope Village Trail

A number of small trail systems are found along Clear Creek and its tributaries connecting residential land uses and natural areas along drainage canals. The Clear Creek Trail is part of a larger system which extends into Pearland and Friendswood in Brazoria County. The Hope Village Trail runs along Cedar Gully, a Clear Creek tributary, connecting wetland areas and Dinosaur Park. The trail currently dead ends at Constitution Lane and does not connect to Clear Creek.

Red Bluff Trails

A trail system parallel to Red Bluff Road and Armand Bayou connects the Armand Nature Center, SH 146, and Holly Bay Court Park. The trails are eight- to10-feet-wide constructed of packed decomposed granite. The trails serve as a major north to south trail connection for the region, but may pose issues for users who are not comfortable on unpaved trails. The trail also has many locations with muddy conditions, overgrown vegetation, and uneven surfacing.

Seabrook Trails

Seabrook's trails primarily serve to connect residential land uses to parklands through a series of five- to 10-foot-wide decomposed granite pathways. A north-south trail section along Todville Road connects to other smaller trail spurs connecting to Evelyn Meador Library, Robinson Park, Pine Gully Park, and Downtown Seabrook.

Challenger Seven Memorial Park / FM 528 Trails

Several shared-use paths connect residents of League City and Webster to Challenger Seven Memorial Park. The section of shared-use paths along FM 528 serves to provide a safer crossing for cyclists utilizing the bicycle lane when crossing I-45. An eight-foot concrete paved shared-use path along Grissom Road connects residents to Challenger Seven Memorial Park and the bicycle lane along FM 528.

La Porte / Broadway Trails

Several 10-foot-wide concrete paved trails connects major destinations in La Porte including La Porte High School, Sylvan Beach, Main Street, and Little Cedar Bayou. Notably, a paved trail connects residents of Shore Acres to La Porte and serves as the only pedestrian-cyclist connection for residents.

Kirby Boulevard Trails

The Kirby Boulevard Trails are 10-foot-wide concrete-paved trails which connect residents of Taylor Lake Village to NASA Parkway.

Fairmont Parkway Trail and Pecan Parks Trails

The Fairmont Parkway Trail and Pecan Park Bike Path connect Downtown La Porte to Pecan Park, near Canada Road, along Fairmont Parkway. The trail is a 10-foot-wide paved concrete trail set 15 to 30 feet from Fairmont Parkway with several shaded areas and park connections. The crossing of South 16th Street and the nearby rail line bridge may be difficult or feel unsafe for some users due to the narrow pedestrian walkway over the bridge and unconventional crossings. These unconventional crossings place users in a precarious position to cross entrance/exit ramps to the bridge facility with limited to no signage or pavement markings.

Red Bluff Trail
Source: Halff

Fairmont Parkway Trail
Source: Halff

Existing Walking and Bicycling Trips

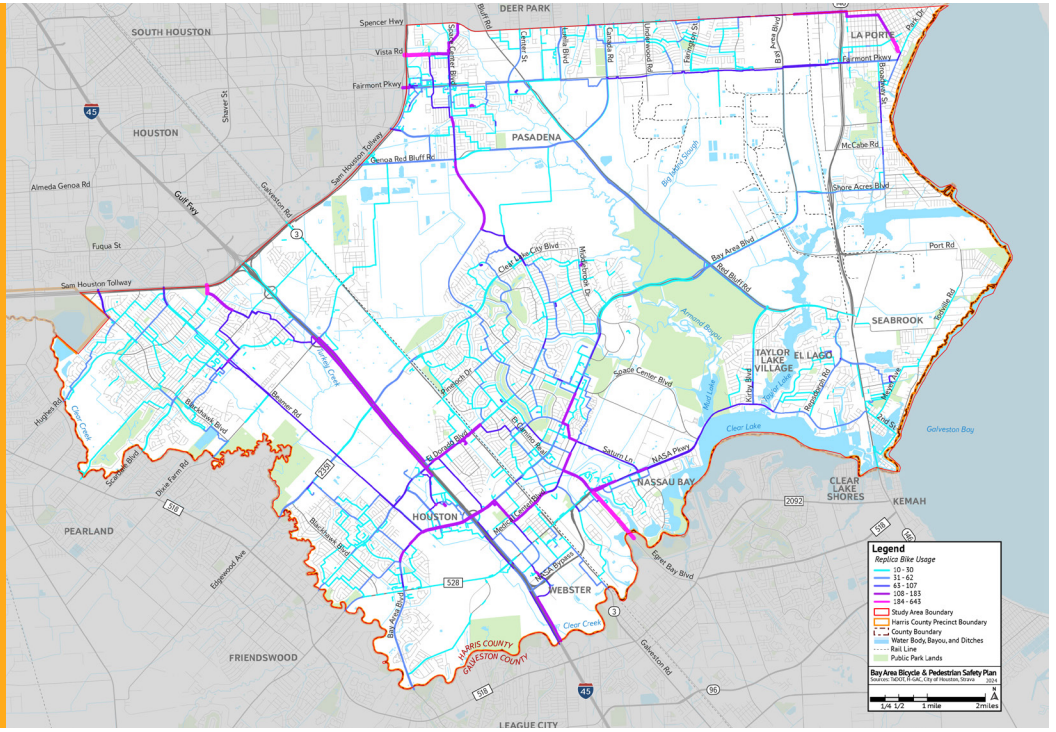
To better understand existing walking and bicycling trips within the Study Area, the project team utilized several resources including REPLICA and Strava data. REPLICA data not only identified network link level information but also information regarding origin-destination of walking and bicycling trips. This information can be supplemented with the short-trip destinations identified in Figure 5 to correlate potential infrastructure improvements to support safer walking and bicycling trips.

REPLICA data was retrieved for the Spring 2023 time period which represents typical weekday (Thursday) for a 13-week period. REPLICA data was retrieved for both walking and bicycling trips within the Study Area. While there are some similarities between walking and bicycling trips using this dataset, there are differences in number of trips and trip lengths.

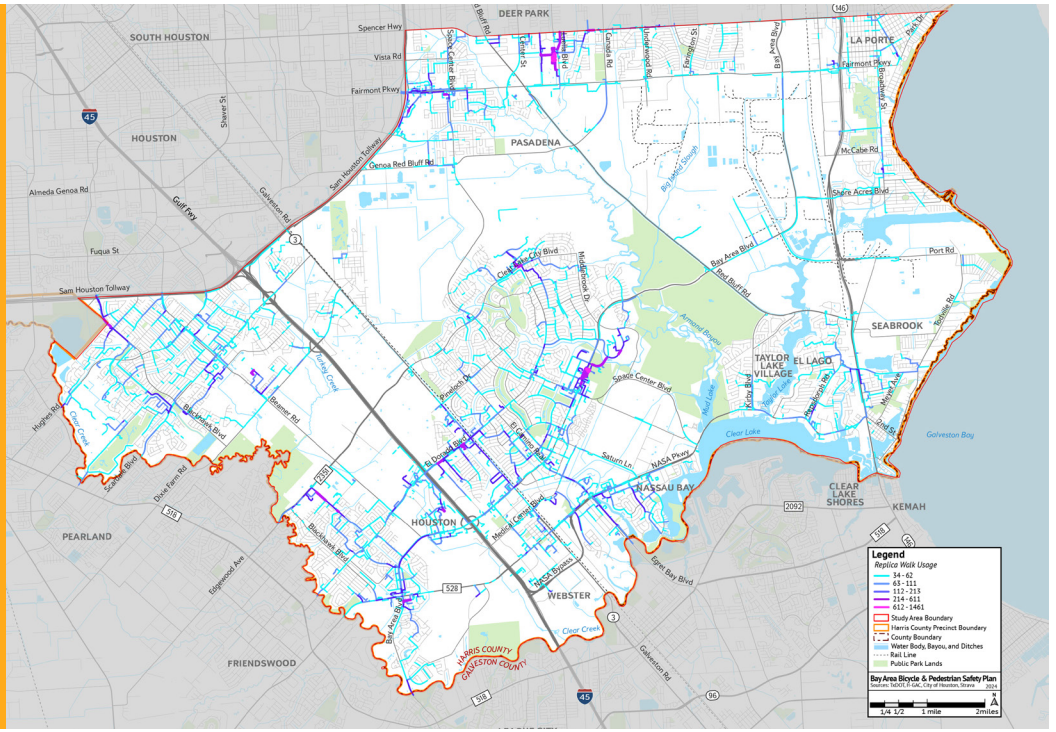
As shown in Map 12, some of the roadways with the highest documented bicycle trips include Egret Bay Blvd., El Camino Real, Medical Center Blvd., Bay Area Blvd., San Jacinto St., Vista Rd., and Sageglen Dr. It is also notable that there are high trip counts along the I-45 frontage roads. Egret Bay Blvd. has an existing shared-use path along the roadway while other high bicycle trip roadways have either an on-street, unprotected bike lane or no bike lane present.

As shown in Map 13, walking trips within the Study Area are much more granular and are concentrated within local, neighborhood roadways. High walking trips occurred along roadways adjacent to schools such as Clear Lake High School and San Jacinto College. These locations are also consistent with areas in the Study Area identified as zero-car households and high vulnerable population index.

*Map 12: **REPLICA Bike Data***



*Map 13: **REPLICA Walk Data***



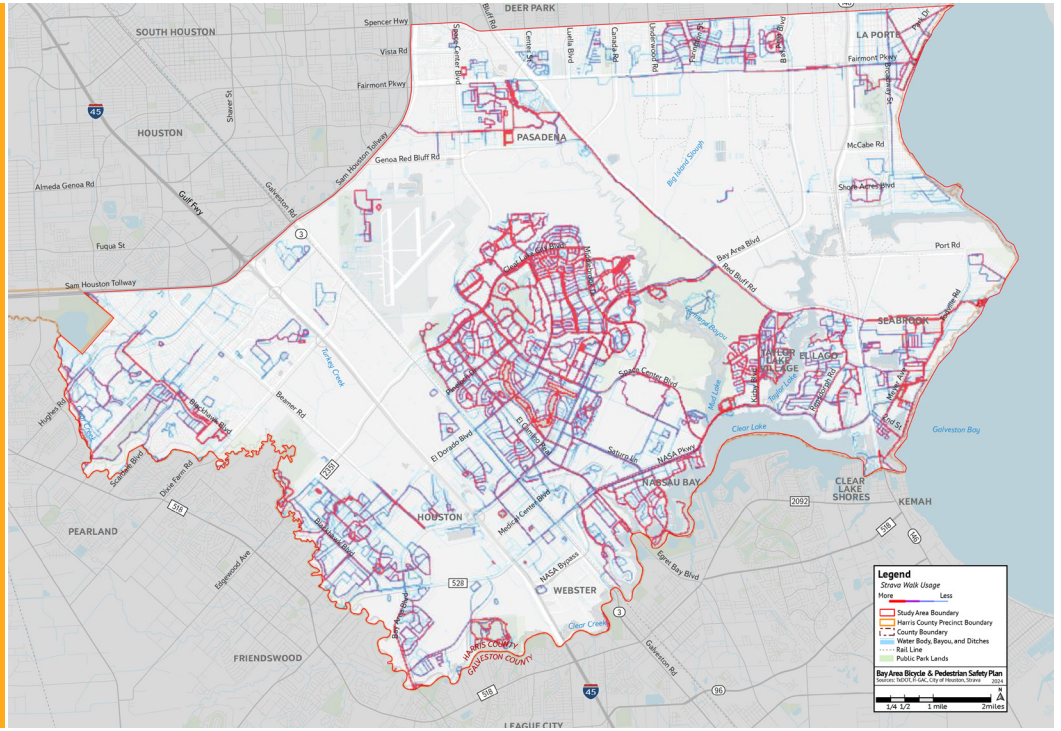
Strava data was also collected to better understand walking and bicycling trips in the Study Area. Strava data requires the mobile device app which is typically utilized during recreation or leisure use. This information shows relative densities of activities that have occurred over the last 13 months. This information was retrieved from the Strava online map in January 2024 and represents the 2023 calendar year of walking and bicycling trips.

As shown in Map 14, many of the bicycle trips are occurring along major roadways within the Study Area. Locations with the highest documented bicyclist trips include Nasa Parkway, FM 2351, SH 3, Space Center Blvd. and Bay Area Blvd. A majority of these trips are more than likely associated with the FHWA classification of 'highly confident' bicyclist that feels comfortable riding with traffic for long distances. Shared-use paths and trail facilities with high bicyclist trips include Exploration Green, Red Bluff Rd., Fairmont Pkwy and the Southbelt Hike and Bike Trail.

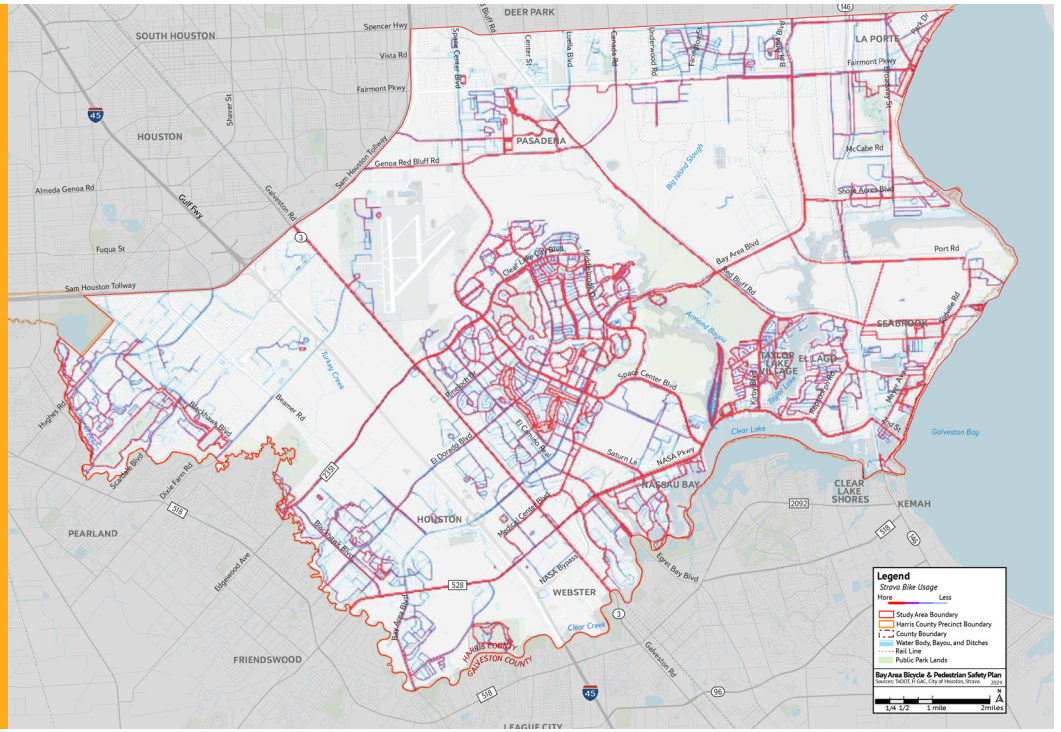
As shown in Map 15, higher density of walking trips in the Study Area are primarily located within local, neighborhood roadways. While many of these local, neighborhood roadways have sidewalks located along one or both sides of the street, it will be important to consider elements such as crosswalk markings, signage, lighting and ADA accessible ramps to enhance comfort and accessibility.

Roadways with a higher density of walking trips include Clear Lake City Blvd (east of I-45), Space Center Blvd, Crenshaw Rd., and Todville Rd. Similar to the bicycling trips, shared-use paths and trial facilities have high trip counts from Strava data.

Map 14: ***Strava Bike Data***



Map 15: ***Strava Walk Data***



Access to Schools

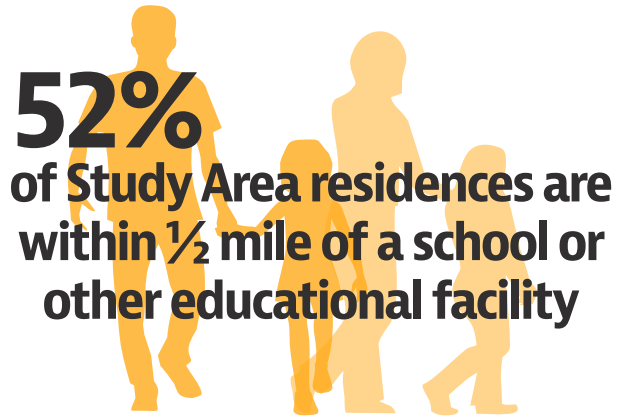
Today more than ever, there is a need to provide options that allow all children and school employees, including those with disabilities, the opportunity to walk, bicycle, or roll to school safely. Many communities struggle with traffic congestion around schools and motor vehicle emissions polluting the environment. According to the CDC, in recent years, children have engaged in less physical activity, which has contributed to a prevalence of childhood obesity.[3] While these problems may appear to be separate issues, direct pedestrian access to schools promotes physical activity for children, parents, and guardians while simultaneously reducing traffic congestion and improving air quality.

As represented in Map 16, approximately 52 percent of residential parcels are within a half-mile radius of a school or other educational facility. Typically, school districts do not provide bus transportation to students within a two-mile radius of a school property, meaning that students must be driven by personal vehicle or utilize pedestrian and bicyclist facilities to get to school. Additionally, most public charter and magnet schools require students to find their own transportation to and from school, rather than provide bussing. This limits access to and the choice for students to select specialized programs. As part of the focus group meetings with cities and independent school districts, many schools in the Study Area conduct their own infrastructure analysis to evaluate conditions and opportunities for improvements.

It will be important for Precinct 2 to continue to work with these school districts to implement safety improvement projects along adjacent roadways to school campuses. There is currently only one school within the Study Area - Westbrook Intermediate School - that has a SRTS group but not an active program. Many school campuses are located in residential neighborhoods which pose an opportunity for additional SRTS programs.

Residents near El Jardin Beach, Shore Acres, Genoa Red Bluff Road, Nassau Bay, El Dorado Boulevard and Dixie Farm Road between SH 3 and I-45 have the least amount of access to school properties (labeled one through nine, on Map 16). School properties which are adjacent to high-speed roadways (35 MPH or above) are primarily located in Clear Lake City (Space Center Boulevard and Bay Area Boulevard) and in the far west of the Study Area along Scarsdale Boulevard, Beamer Road, and Blackhawk Boulevard.

Students and parents walking along a trail bridge connecting residential areas to Falcon Pass Elementary
Source: Halff



School buses picking up children from Study Area apartments
Source: Halff

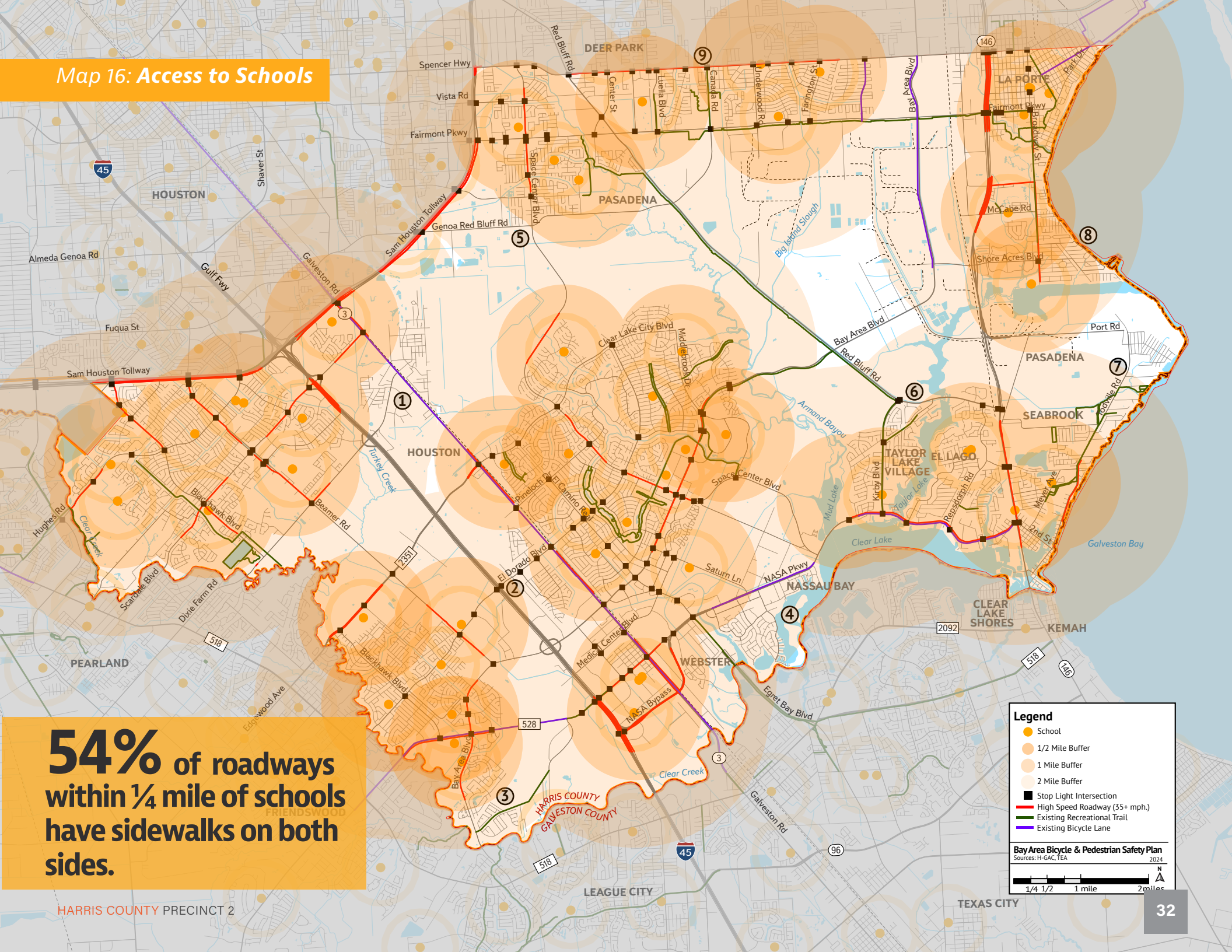
Safe Routes to School

The City of Pasadena, in partnership with Harris County Public Health, Pasadena ISD, and Pasadena Vibrant Community, created a Safe Routes to School Plan to address disparities and challenges for children walking and biking to school. The overall goal of the Plan is to increase the number of children actively commuting to school, increase kids' safety, and reverse the nationwide trend toward childhood obesity and inactivity. The Plan provides recommendations to improve safety and increase active transportation at 15 priority schools throughout Pasadena ISD, however, these priority schools are not within the Study Area.

Pasadena Walk to School Encouragement Activity
Source: Harris County Public Health

3: "CDC Healthy Schools". Centers for Disease Control and Prevention

Map 16: **Access to Schools**



54% of roadways within ¼ mile of schools have sidewalks on both sides.

Legend

- School
- 1/2 Mile Buffer
- 1 Mile Buffer
- 2 Mile Buffer
- Stop Light Intersection
- High Speed Roadway (35+ mph.)
- Existing Recreational Trail
- Existing Bicycle Lane

Bay Area Bicycle & Pedestrian Safety Plan
Sources: H-GAC, TEA
2024

N
1/4 1/2 1 mile 2 miles

Access to Parks and Trails

Much like streets and sidewalks, parks and open spaces are integral components of municipal infrastructure. According to the National Recreation and Park Association (NRPA), community parks are a tangible reflection of the quality of life in a community. Access to quality parks is essential for communities who wish to improve the overall health and wellness of its residents. Parks have a value to communities that transcend the amount of money invested or revenues gained from fees; parks provide a sense of public pride and cohesion to every community.

As represented in Map 17, approximately 72 percent of residential parcels within the Study Area are within a half-mile radius of parkland and open space. A half-mile is considered a 10-minute walk and is the typical distance a resident is willing to walk to access parkland. Residents of La Porte, southern Seabrook, and southern Clear Lake City have the greatest access to parkland, while residents in areas labeled one through six, on Map 17, have the least amount of access to parkland. Note that private golf courses are considered parkland, but do not provide public access facilities.

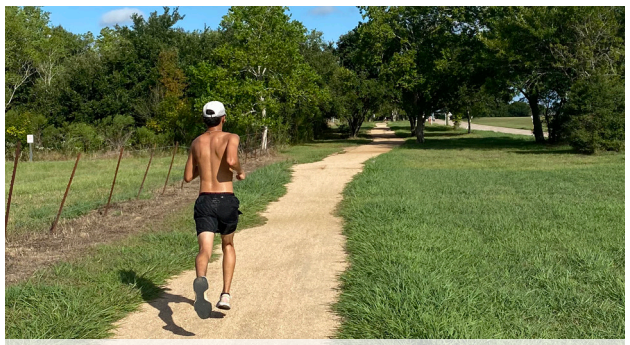
Nearly 30 percent of residential parcels within the Study Area are within a quarter-mile radius of public recreational trails. Residential areas located farthest from trail facilities include residents in areas labeled A, B, C, D, and E, on Map 17.

72%
of Study Area residences are within ½ mile of a park facility

Trail facilities which are adjacent to or have a high number of at-grade crossings include the Fairmont Parkway Trail between Canada Road and Farmington Street, trails within the City of La Porte, Bay Area Hike and Bike trail near University of Houston Clear Lake and Armand Bayou Park, and along Meyer Avenue in Seabrook. A high number of at-grade trail crossings increases the likelihood of bicycle- or pedestrian-related crashes.

Trails can provide the connectivity necessary to traverse the entire Study Area for any purpose, including work commute, recreation, and access to commerce. Trails can provide a safe facility for pedestrians and bicyclists who do not wish to travel alongside moving vehicles, whereas shared-use paths along Red Bluff Road and Fairmont Pkwy could provide connectivity from residential neighborhoods to local retail and community destinations. Providing sidewalk connectivity to the off-street trails like Clear Brook City Park will provide additional network connectivity for bicycle and pedestrian users.

It will be important to consider safety improvements as these trails cross major roadways within the Study Area. These locations present conflict points between pedestrians, bicyclists, and vehicles and may warrant additional safety improvements to improve visibility.

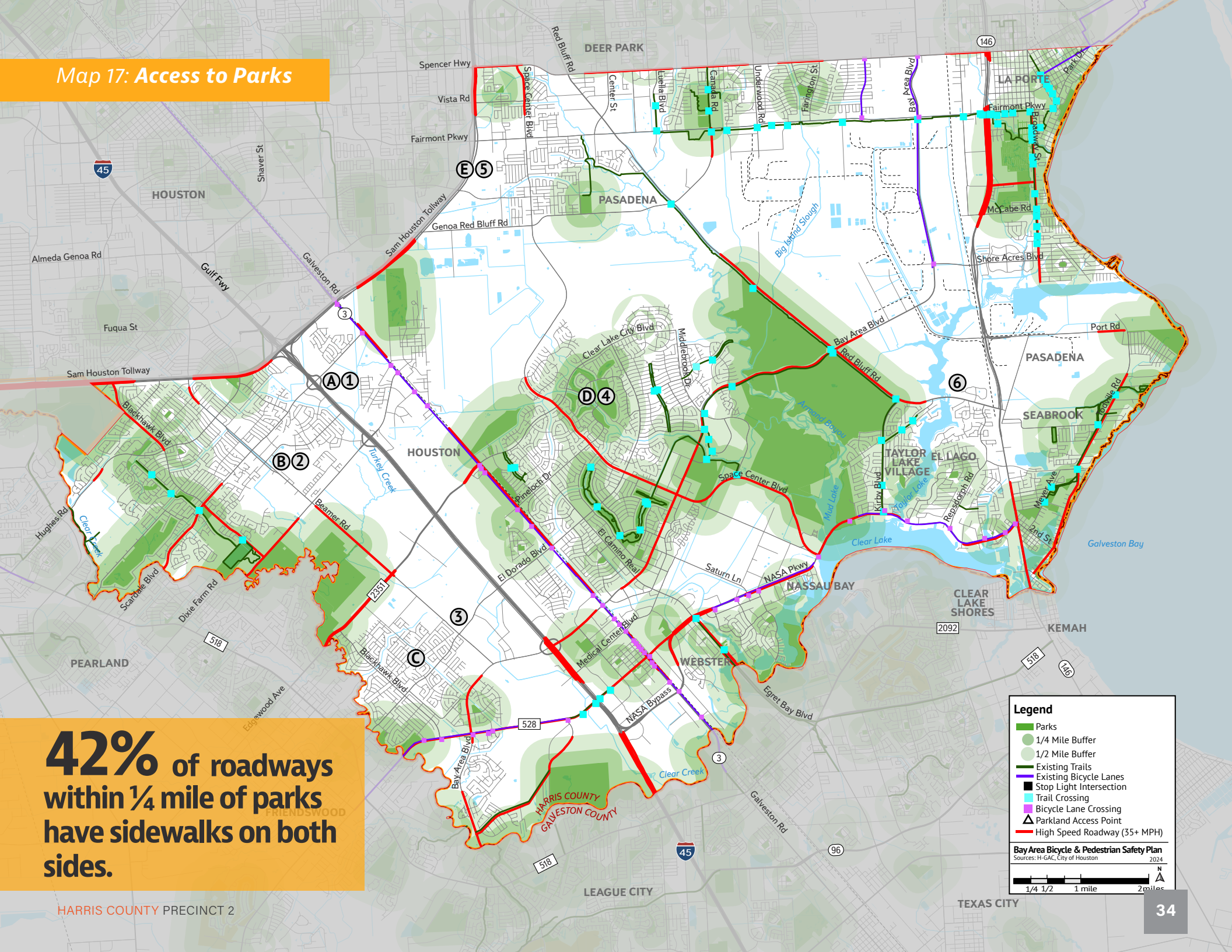


Jogger along Red Bluff trail
Source: Halff

Clear Brook City Park trail
Source: Halff

30%
of Study Area residences are within ¼ mile of a recreational trail facility

Map 17: **Access to Parks**



42% of roadways within ¼ mile of parks have sidewalks on both sides.

Legend
- Parks
- 1/4 Mile Buffer
- 1/2 Mile Buffer
- Existing Trails
- Existing Bicycle Lanes
- Stop Light Intersection
- Trail Crossing
- Bicycle Lane Crossing
- Parkland Access Point
- High Speed Roadway (35+ MPH)

Bay Area Bicycle & Pedestrian Safety Plan
Sources: H-GAC, City of Houston 2024
N
1/4 1/2 1 mile 2 miles

Barriers to Connectivity

Barriers to connectivity are infrastructure and built features of transportation which limit a pedestrian's or cyclist's access to destinations or adjacent land uses. An assessment of barriers can help identify population centers or regions of the Study Area which may not have safe or adequate access outside of their immediate location.

Local Barriers

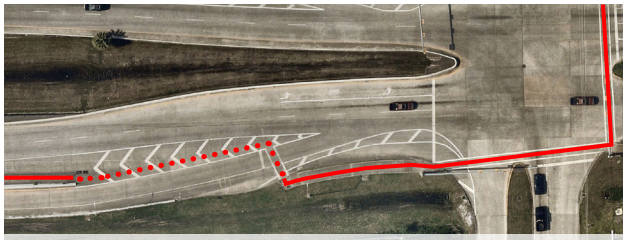
Major freeways and limited access facilities such as I-45, SH 3, and SH 146 are major barriers to connecting residents in an east west direction throughout the Study Area. Intersection spacing along these facilities is typically 1.2 to 1.5 miles apart which may restrict the convenience or ease of non-motorized travel. As shown in Map 18, residents of Seabrook and La Porte are geographically isolated from the Clear Lake City region by several rail lines, industrial sites, SH 146, and Taylor Lake.

The Galveston, Houston, and Henderson Railroad, which runs parallel to SH 3, does not provide sidewalks or designated crossings within the railroad right of way. This leads to stepping paths or "desire paths" where a sidewalk would otherwise be located. These paths, along with the uneven metal rails themselves, are impassable for wheelchair or motorized scooter users. Designated pedestrian and cyclist crossings at railroad lines are often restricted due to safety concerns. Notably, access to HCA Houston Clear Lake Hospital in Webster is restricted to nearby residents due to their proximity between I-45 and the rail corridor. Lastly, the railroad bridge crossings at West Fairmont Parkway and Spencer Highway do provide pedestrian facilities but may be unsafe or underutilized due to a lack of vehicle visibility, proximity to fast moving cars, and a non-traditional crossing design.

Many major thoroughfares in the Study Area often see vehicle speeds above 45 MPH with two to four driving lanes in each direction. Intersections along these roadways can be unsafe due to distance between crossing opportunities, turning vehicles, distance across travel lanes, and insufficient ADA curb ramps. This often leads to intersections that are high crash locations for vehicles and bicyclists/pedestrians.

In addition to these major infrastructure barriers, natural barriers such as streams, creeks, and bayous throughout the Study Area also pose a challenge for bicyclists and pedestrians. Typically, sidewalks that traverse these natural barriers are narrower and accumulate debris that make them unsafe. This presents a challenge for bicyclists and pedestrians as they may have to access the travel lanes to continue along their route.

Utility infrastructure impeding pedestrian ramp and sidewalk
Source: Halff

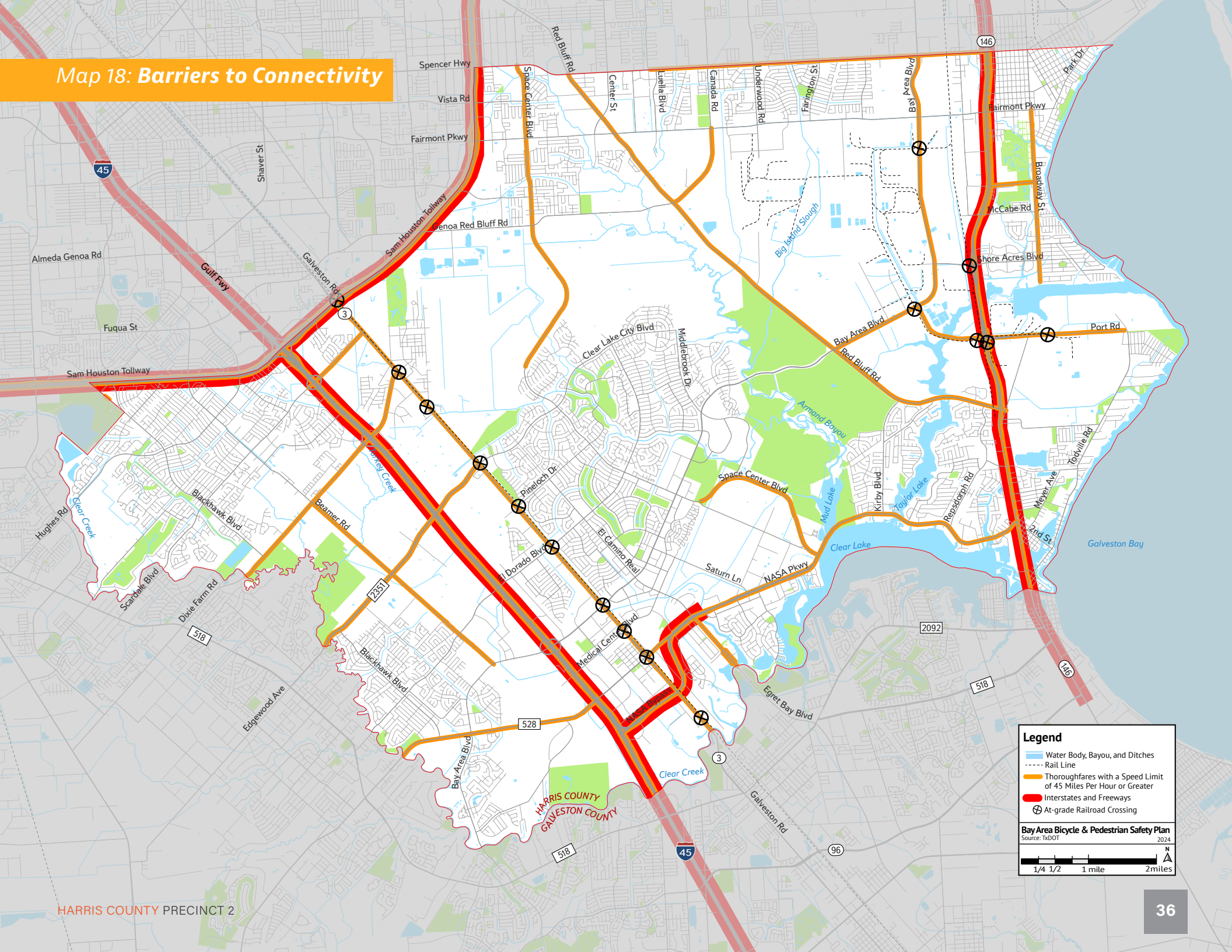


Fairmont Parkway rail bridge crossing conditions
Source: Nearmap

Crossing conditions along El Dorado Blvd. and SH 3
Source: Halff

End location of Bay Area Blvd. bike trail
Source: Halff

Map 18: **Barriers to Connectivity**



Legend

- Water Body, Bayou, and Ditches
- Rail Line
- Thoroughfares with a Speed Limit of 45 Miles Per Hour or Greater
- Interstates and Freeways
- At-grade Railroad Crossing

Bay Area Bicycle & Pedestrian Safety Plan
Source: TxDOT 2024

1/4 1/2 1 mile 2miles

Crash Overview

Crash data for Bay Area was obtained from the TxDOT Crash Records Information System (CRIS) database for the years 2018 through 2022 and crashes were extracted that are geographically located within the Study Area boundary. Crash data was analyzed to determine the crash density, crash rates, common crash types/manner of collisions, and opportunity areas within the Bay Area. The project team completed crash analyses along all roadways in the Study Area, non-interstate/highway roadways, and pedestrian/bicyclist crashes. Further information regarding each analysis can be found in Appendix B.

Area Wide Crash Analysis

A total of 15,556 crashes occurred on non-interstate roadways between the years 2018 and 2022 within the Study Area. Of the total crashes, there were 64 fatalities and 241 seriously injured crashes. Crashes that resulted in fatalities or serious injuries account for 0.4 percent and 1.6 percent of all crashes, respectively. Table 3, *Crash Severity by Year*, summarizes crash severity by year for the Study Area for all non-interstate roadways. Map 19, *Area Wide Crashes*, shows the density of crashes within the Study Area.

As shown in Figure 5, over half of all crashes were non-intersection related and 46 percent occurred in or at the approach to an intersection or were intersection-related. Most of the crashes occurred during daylight and dry surface conditions.

The top three manner of collisions in the Study Area were Angle/Both Going Straight, Same Direction - Straight/Stopped, and Single Vehicle - Straight, which account for 18 percent, 16 percent, and 13 percent of total crashes, respectively. Approximately 16 percent of crashes were caused by driver inattention, six percent were caused by failure to control speed, and five percent were caused by failure to yield to right of way. A total of 150 bike and pedestrian crashes occurred on Non-Major Highways within the study area of which seven are fatal and 22 are seriously injured crashes.

Figure 5, Crash Type

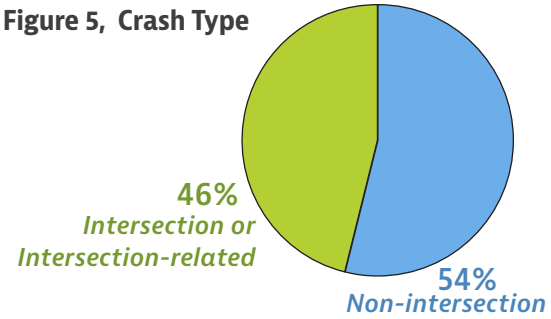


Table 3: Crash Severity by Year

Year	Fatal	Serious Injury	Non-Incapacitating Injury	Possible Injury	No Injury	Unknown Injury	Total Crashes
2018	7	51	229	523	2,322	98	3,230
2019	13	48	221	535	2,385	103	3,305
2020	18	35	190	404	1,815	80	2,542
2021	13	56	247	454	2,326	181	3,214
2022	13	51	299	443	2,370	89	3,265
Total	64	241	1,186	2,359	11,218	488	15,556

Nearly nine percent of the overall crashes were concentrated in 10 clusters within the Study Area. Table 4, *Intersection Clusters with High Crashes*, identifies these 10 clusters with total crashes and fatal and serious injury crashes per location.

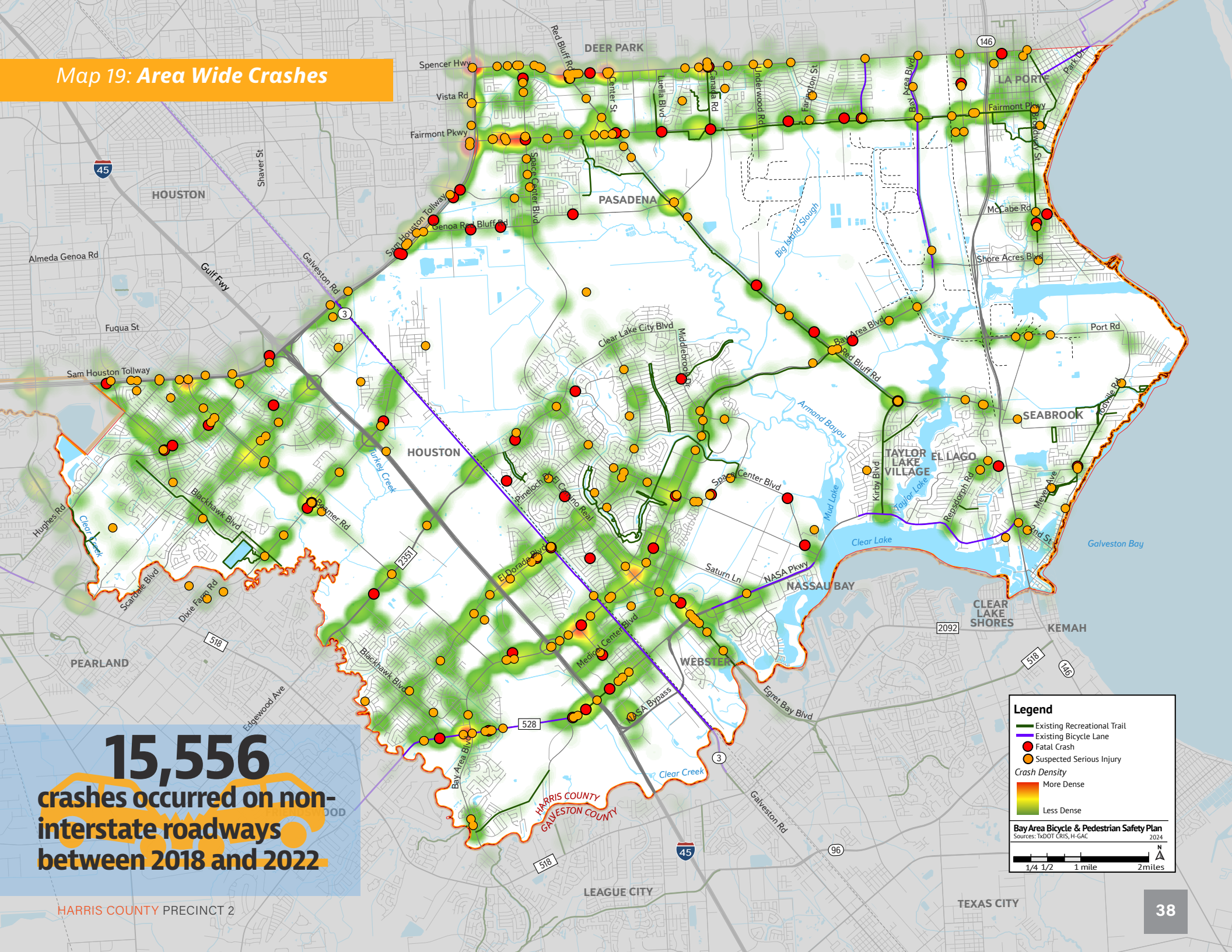
Table 4: Intersection Clusters with High Crashes

Cluster Locations	Fatal	Serious Injury	Total
Spencer Hwy. & Center St.	0	3	291
Bay Area Blvd. & Gatebrook Dr.	1	1	271
Fairmont Pkwy. & Fairway Plaza Dr.	0	4	266
NASA Pkwy. & Egret Bay Blvd.	0	3	259
NASA Pkwy. & Water St.	0	4	257
FM 528 & Bay Area Blvd.	0	2	253
Spencer Hwy. & Red Bluff Rd.	1	6	239
Bay Area Blvd. & El Camino Real	0	2	230
Fairmont Pkwy. & Space Center Blvd.	1	4	224
El Dorado Blvd. & Galveston Rd.	3	3	203
Total	6	32	2,493

Four out of the 10 identified crash clusters - FM 528 & Bay Area Blvd, Spencer Highway & Red Bluff Road, Spencer Highway & Center Street, and Bay Area Boulevard & El Camino Real - overlap with areas experiencing high rates of bike and pedestrian crashes. Implementing safety improvements targeted at these clusters will enhance safety for all road users throughout the study area.

Although the Spencer Highway and Center Street cluster has the most number of crashes, El Dorado Boulevard and Galveston Road/SH 3 has the highest number of fatal crashes. Clusters with high crashes and clusters with high fatal and serious injury crashes should be considered a higher priority or require higher urgency for safety improvements.

Map 19: **Area Wide Crashes**



15,556
crashes occurred on non-interstate roadways between 2018 and 2022

Legend
- Existing Recreational Trail
- Existing Bicycle Lane
- Fatal Crash
- Suspected Serious Injury

Crash Density
- More Dense
- Less Dense

Bay Area Bicycle & Pedestrian Safety Plan
Sources: TxDOT CRIS, H-GAC 2024

1/4 1/2 1 mile 2miles

Pedestrian and Bicyclist Involved Crashes

As represented in Map 20, a total of 233 pedestrian- and bicyclist-involved crashes occurred between 2018 and 2022 within the Study Area. Of the total crashes, there were 20 fatalities and 36 serious injuries, accounting for 8.6 and 15.5 percent of crashes, respectively. Table 5, *Pedestrian and Bicycle Crash Severity by Year*, summarizes crash severity for all pedestrian- and bicycle-involved crashes within the Study Area. Roadways identified as high pedestrian- and bicyclist-involved crash corridors include Spencer Highway, El Dorado Boulevard, Bay Area Boulevard, and NASA Parkway. This indicates that there may be high pedestrian or bicycle traffic along these roadways without safe facilities to support non-motorized transportation.

The top three manner of collisions for pedestrian and bicycle crashes within the Study Area were Single Vehicle/Straight, Single Vehicle/Left Turn, and Single Vehicle/Right Turn, which account for 73 percent, 14 percent, and 11 percent of pedestrian and bicycle crashes, respectively. The same three manner of collisions topped the fatal and severe injuries for pedestrian and bicycle crashes. According to the crash data, approximately 18 percent of all crashes were caused by pedestrian failure to yield right of way to vehicle, potentially indicating a lack of adequate pedestrian infrastructure, or crosswalks placed too far from desired destinations.

As part of the pedestrian and bicycle crash analysis, proximity of those crashes to Study Area schools was also analyzed. Table 6, below, summarizes the top 10 schools with high numbers of crashes within a one-half mile distance. Some crashes were found to be located within one-half mile of one or more schools. Clear Path Alternative School has a high number of pedestrian and bicycle crashes along with serious injury crashes, while Bay Elementary School has high fatal crashes. This indicates the need for infrastructure improvements to safely facilitate pedestrian and bicycle mobility to and from school.

Table 6: Crashes Near Schools

Cluster Locations	Fatal	Serious Injury	Total Crashes
Clear Path Alternative School	0	25	1,190
Fred Roberts Middle School	2	0	563
Vista Academy of Pasadena	1	8	513
Bay Elementary School	4	6	500
P.H. Greene Elementary School	1	4	406
Thompson Intermediate School	0	8	385
Clear View High School	1	4	373
Burnett Elementary School	0	3	273
James H. Baker Sixth Grade Campus	0	4	220
Jennie Reid Elementary School	1	2	200
Total	10	64	4,623

Table 5: Pedestrian and Bicycle Crash Severity by Year

Year	Fatal	Serious Injury	Non-Incapacitating Injury	Possible Injury	No Injury	Unknown Injury	Total Crashes
2018	4	7	13	16	6	1	47
2019	7	8	16	11	6	0	48
2020	4	4	13	10	5	0	36
2021	3	9	18	10	2	0	42
2022	2	8	24	16	10	0	60
Total	20	36	84	63	29	1	233

Pedestrian and Bicycle Crash Statistics

233 TOTAL CRASHES

20 FATAL CRASHES

36 SERIOUS INJURY CRASHES

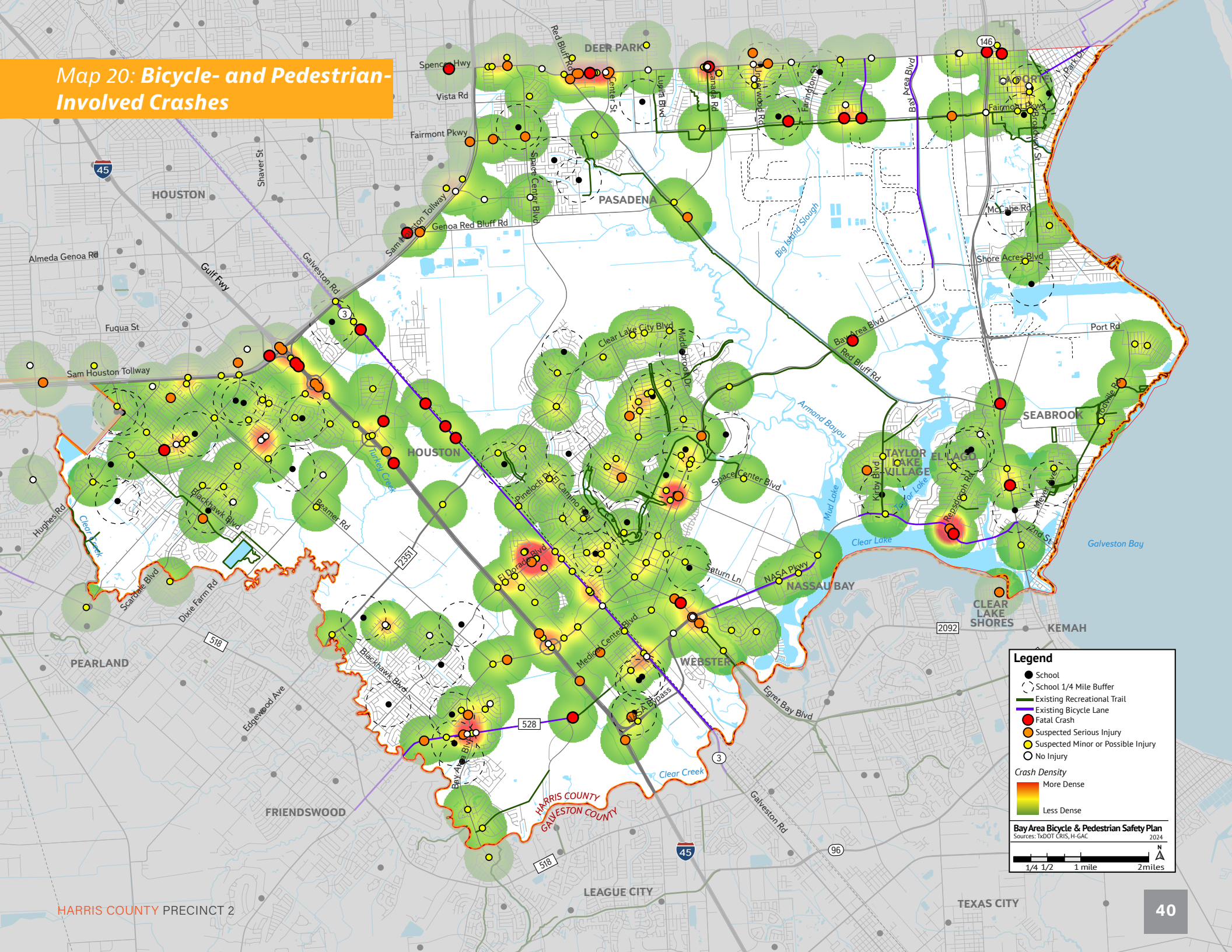
66% INCREASE IN TOTAL CRASHES BETWEEN 2020-2022

71% DECREASE IN FATAL CRASHES BETWEEN 2019-2022

Top 3 Contributing Factors:

1. Pedestrian failed to yield right of way to vehicle
2. Vehicle failed to yield right of way to pedestrian
3. Driver inattention

Map 20: **Bicycle- and Pedestrian-Involved Crashes**



Legend

- School
- School 1/4 Mile Buffer
- Existing Recreational Trail
- Existing Bicycle Lane
- Fatal Crash
- Suspected Serious Injury
- Suspected Minor or Possible Injury
- No Injury

Crash Density

More Dense

Less Dense

Bay Area Bicycle & Pedestrian Safety Plan

Sources: TxDOT CRIS, H-GAC 2024

N

1/4 1/2 1 mile 2miles

Technical Analyses

To better inform project recommendations, the following analyses were completed by the project team: origin-destination analysis, bicycle level of traffic stress, pedestrian crossing analysis, and sidewalk gap analysis. The origin-destination analysis can be seen in the existing conditions assessment of this plan report. The origin-destination analysis was used to further refine locations that already exhibited high bicycle and pedestrian traffic and would benefit from safety improvements at crossings and intersections and along corridors of travel. Further information on the origin-destination analysis can be found in the Existing Conditions section on page 29. Additional analyses were conducted to better inform project team members of existing conditions and potential recommendations.

Bicycle Level of Traffic Stress (BLTS)

The existing roadway network in the Study Area consists of many arterial and collector roadways that exhibit high speeds and high traffic volumes. There is currently no low or medium stress subregional routes for travel from one side of the Study Area to the other, whether north / south or east / west. Facilities like the existing bike lane along SH 3 provides some regional connectivity but need additional improvements to provide an all ages and abilities bicycle network. While neighborhood roadways are considered lower-volume, lower speed facilities, these roadways are still signed as posted speed limit of 30 MPH. To provide safe and accessible bicycle and pedestrian infrastructure in the Study Area, improvements will need to be made to existing facilities that provide delineation and reduce conflict points.

BLTS analysis identifies the stress of street networks for people bicycling based on the built environment, traffic speed, and traffic volume characteristics. The methodology used by the Toole Design team is an update of the Mineta Transportation Institute (MTI) method and uses a more nuanced classification analysis based on AADT information. The LTS analysis scores streets on a scale from 1 to 4, with LTS 1 and 2 indicating low-stress and LTS 3 and 4 indicating high-stress. Map 21 represents the bicycle level of traffic stress along Study Area roadways. Due to traffic volumes and speed, many thoroughfares exhibit a high level of traffic stress while neighborhood roadways have lower levels of traffic stress. There is still an opportunity to implement traffic calming measures along local and neighborhood roadways to reduce speeding and cut-through traffic and provide alternative travel modes to area destinations.

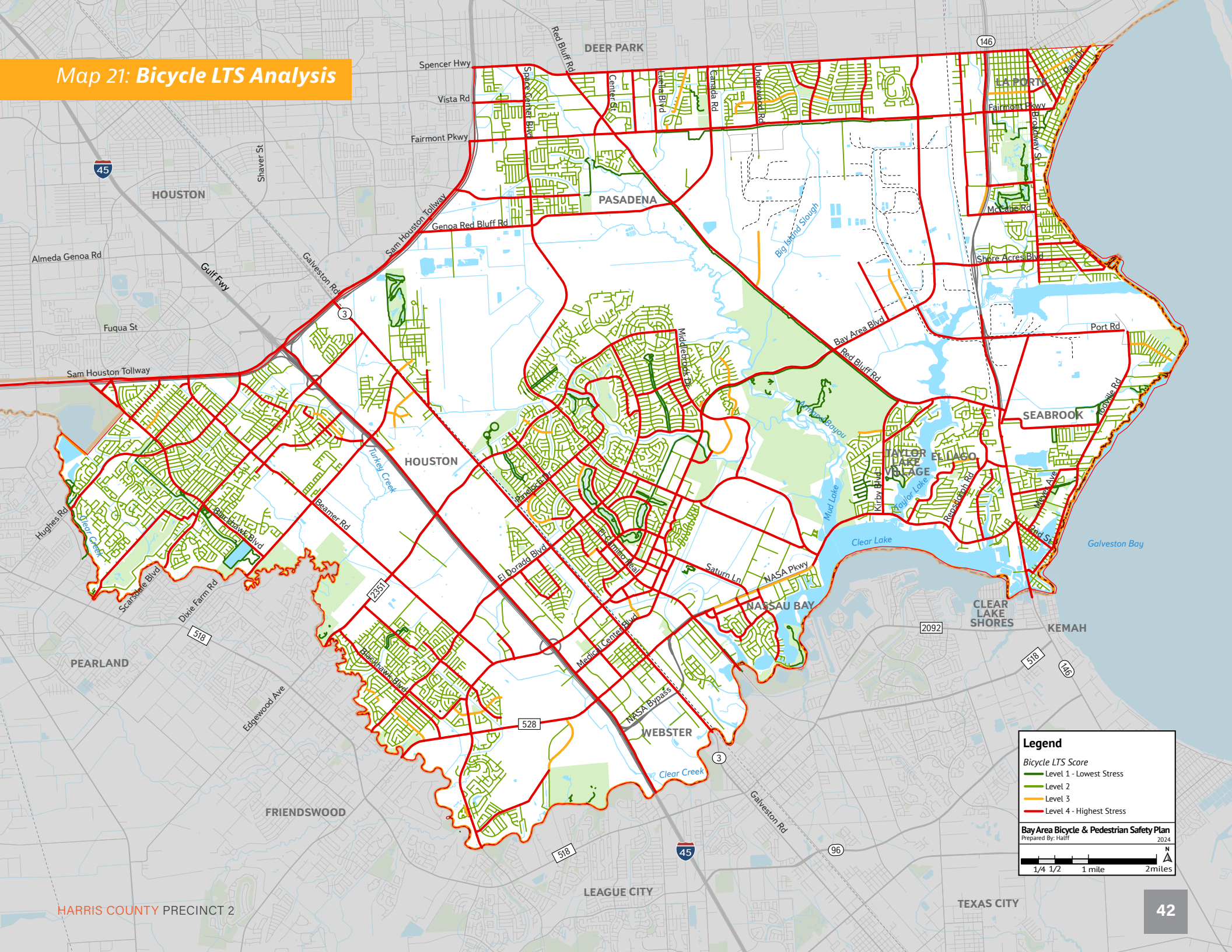
The stress that individuals feel when bicycling is inherently subjective. Some people are more comfortable riding with more and / or faster-moving motor vehicle traffic and with less separation. However, people generally identify with four main groups based on differing levels of bicycling comfort, shown in the graphic to the right (note that, on average, 30-40 percent of the population is not interested in cycling).

Though the methodology applied for this analysis was developed specifically to consider the types of bicyclists who would feel comfortable riding on a particular facility, the analysis provides an indication of the level of stress that other non-motorized road users, including pedestrians, may experience since lower stress bikeways are the result of more moderate speeds and traffic volumes. In addition, wider or separated bikeways provide separation between motorists and pedestrians and can increase the level of comfort for pedestrians along the corridor.

Table 7: Level of Traffic Stress Analysis

# of Lanes	ADT	Posted Speed Limit						
		≤ 20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50+ MPH
2-way street (no centerline)	0 - 750	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	751 - 1,500	LTS 1	LTS 1	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4
	1,501 - 3,000	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
	3,000 +	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
1 thru lane per direction (1-way, 1-lane street, or 2-way street w/ centerline)	0 - 750	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	751 - 1,500	LTS 2	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4
	1,501 - 3,000	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4
	3,000 - 6,000	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
	6,001 - 10,000	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
	10,001 +	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
2 thru lanes per direction	0 - 6,000	LTS 3	LTS 3	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
	6,001 - 12,000	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
	12,001 +	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
3+ thru lanes per direction	any ADT	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4

Map 21: **Bicycle LTS Analysis**



Legend

Bicycle LTS Score

- Level 1 - Lowest Stress
- Level 2
- Level 3
- Level 4 - Highest Stress

Bay Area Bicycle & Pedestrian Safety Plan
Prepared By: Halff 2024

N

1/4 1/2 1 mile 2miles

Pedestrian Crossing Analysis

The Oregon Department of Transportation (ODOT) has a framework for evaluating pedestrian traffic stress—that is, how comfortable or safe it feels to walk along or cross a street as a pedestrian. The framework applies the simple logic of the BLTS to pedestrian crossings. The methodology considers basic details including the speed of cross traffic, distance to cross, and mitigating features like signals and refuge islands. Like the BLTS, there are no north-south or east-west routes and crossings along major corridors in the Study Area that exhibit low or moderate pedestrian stress.

The thresholds identified by ODOT result in a Pedestrian Level of Traffic Stress (PxLTS) score from 1 through 4 representing the following conditions, as described in ODOT's Analysis Procedures Manual[3] (PxLTS descriptions are quoted from the manual with edits for clarity):

- PxLTS 1 – Represents little to no traffic stress and requires little attention [by the pedestrian] to the traffic situation.
- PxLTS 2 – Represents little traffic stress for most adults but requires more attention to the traffic situation than young children [defined as ages 10 and younger] may be capable of.
- PxLTS 3 – Represents moderate stress; a higher level of attention to traffic is needed, and adults may feel some discomfort using this facility.
- PxLTS 4 – Represents high traffic stress. Only pedestrians with limited route choices would use this facility.

ODOT's manual identifies PxLTS 2 as a reasonable target for most situations. PxLTS 2 conditions are considered appropriate for people of all ages and abilities. Note that this analysis does not include an assessment of accessibility for people with disabilities. Lack of ADA-compliant curb ramps, poor pavement in the crossing, and other factors impact accessibility and therefore the real-world comfort of crossings.

The methodology described here includes several modifications to the original ODOT tables to better reflect conditions in Study Area. As with the original ODOT methodology, these modifications are informed by FHWA's Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations and FHWA's Crash Modification Factors (CMF) Clearinghouse. Unless otherwise stated, the tables in this section refer to the configuration, speeds, and traffic volumes of the street that is being crossed.

Signalized Crossings

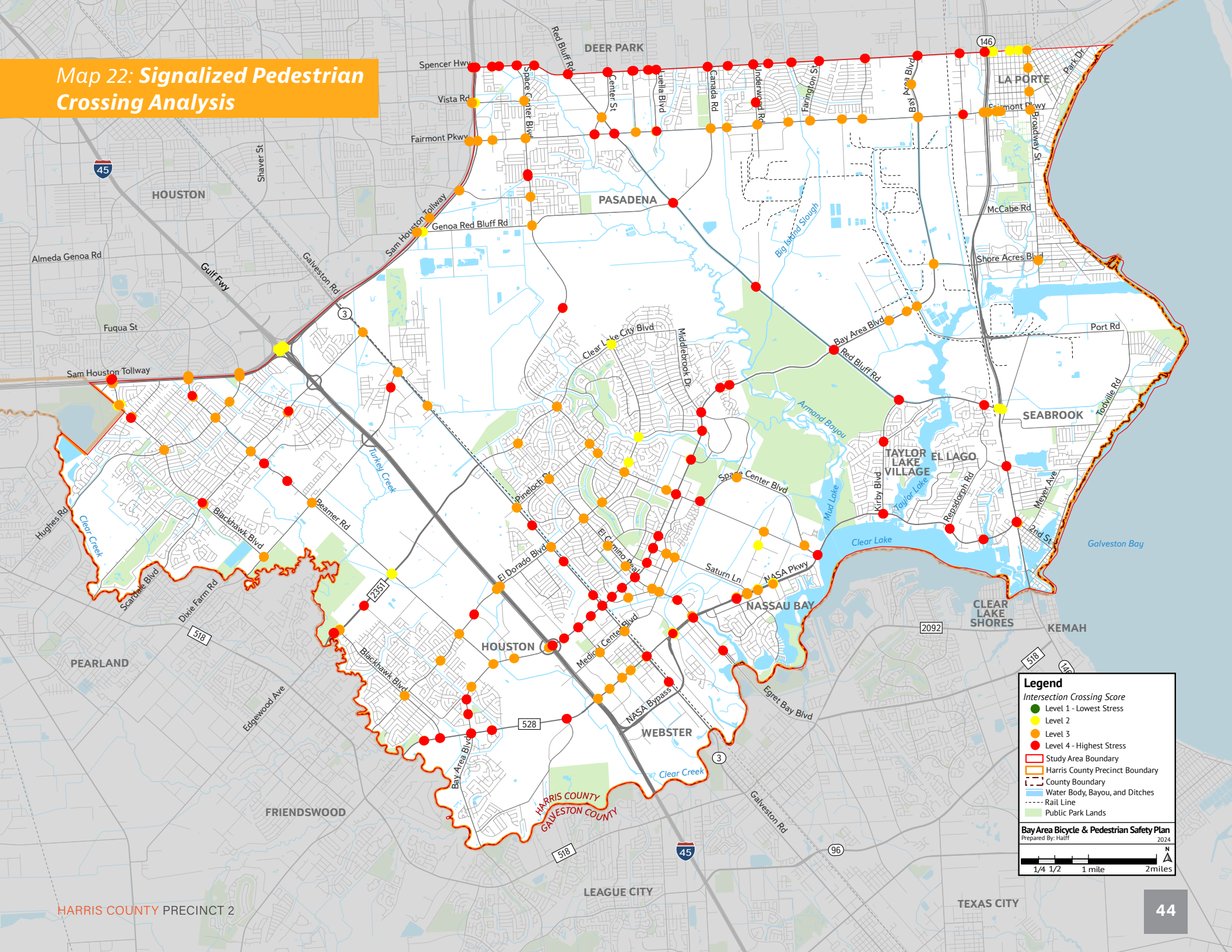
Because cross traffic is stopped by the signal, speed and volume of traffic on the street that is being crossed has a different degree of influence on comfort and safety. Instead, roadway width and interactions with turning traffic are the primary factors for safety and comfort at signalized intersections.

Various other factors influence the comfort and safety of a signalized intersection (including presence of turn lanes on the street being crossed and on the intersecting street, whether right-turn-on-red is allowed, whether left turn signals are "permissive" or "protected", and the speed and volume of turning traffic from the intersecting street). However, data and computational limitations may prevent many of these nuances from consistently being incorporated into a citywide analysis of this scale. Therefore, assumptions are made based on street classification as to the number of lanes and presence of features such as medians, traffic control signals, and ADA ramps and sidewalk presence. These assumptions are based on the roadway network and sidewalk shapefiles provided to the consultant team for analysis. Map 22 represents the pedestrian level of traffic stress analysis for signalized intersections throughout the Study Area.

Table 8: Pedestrian Crossing Stress Analysis

Configuration of the intersecting street	Total Lanes Crossed				
	2 Lanes	3 Lanes	4 Lanes	5 Lanes	6+ Lanes
PHB / HAWK midblock crossing	LTS 1	LTS 2	LTS 3	LTS 3	LTS 3
2 Lanes	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4
3 Lanes	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4
4 Lanes	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4
5 Lanes	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
6 + Lanes	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4

Map 22: **Signalized Pedestrian Crossing Analysis**



Legend

Intersection Crossing Score

- Level 1 - Lowest Stress
- Level 2
- Level 3
- Level 4 - Highest Stress
- Study Area Boundary
- Harris County Precinct Boundary
- County Boundary
- Water Body, Bayou, and Ditches
- Rail Line
- Public Park Lands

Bay Area Bicycle & Pedestrian Safety Plan
Prepared By: Halff 2024

N
1/4 1/2 1 mile 2miles

Sidewalk Coverage Analysis

Using the sidewalk data and the roadway network data, the presence and absence of a sidewalk was evaluated based on the roadway segment and calculated on the percentage of roadway segment that is covered by sidewalk on either side. This was converted to an overall classification of the street segment having coverage on both sides, one side only, or not at all. This analysis helped to identify priority project locations for sidewalk gap projects. While small, these sidewalk gap projects will help provide network connectivity thus increasing the likelihood of someone walking and bicycling to local destinations. Map 23 represents the sidewalk coverage along Study Area roadways that will be utilized for potential recommendations. Further analysis related to sidewalk coverage can be found in additional documentation provided by Toole Design Group.

E Nasa Pkwy Sidwalk Conditions impede mobility
Source: Halff

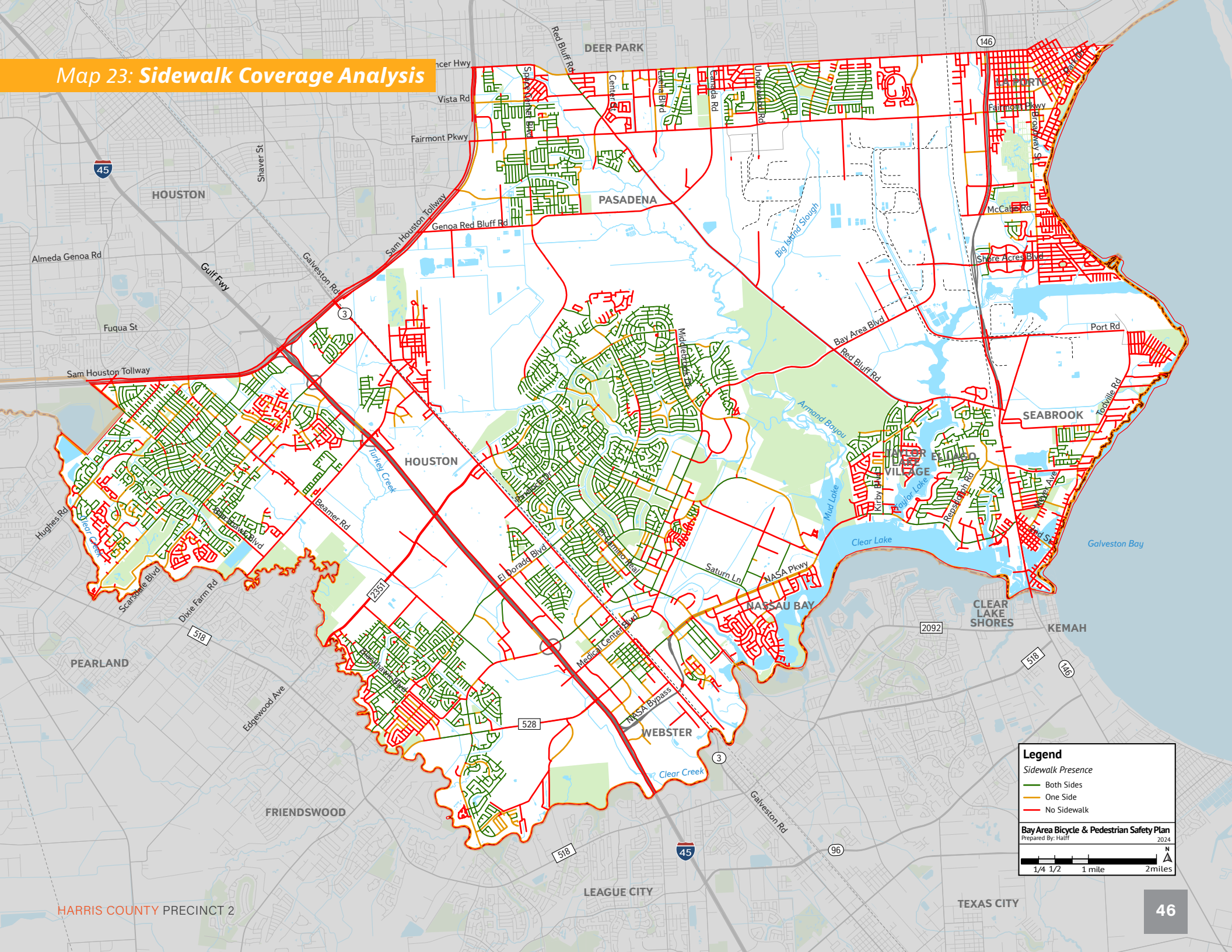
Bay Area Blvd at IH 45 - Desire Path Along North Side of Bay Area Blvd, East of IH 45
Source: Halff

Spencer Highway sidewalk conditions impede mobility
Source: Halff

Space Center Bldv sidewalk conditions impede cmobility
Source: Halff

Bay Area Blvd at IH 45 - Audit Team Walking East Along Bay Area with No Sidewalk
Source: Halff

Map 23: **Sidewalk Coverage Analysis**



Legend

Sidewalk Presence

- Both Sides
- One Side
- No Sidewalk

Bay Area Bicycle & Pedestrian Safety Plan
Prepared By: Halff
2024

N
1/4 1/2 1 mile 2miles

3 CHAPTER THREE PUBLIC ENGAGEMENT


Community Kick-off Event

Engagement Methods

Various public engagement methods were used throughout the planning process to ensure that recommendations align with the needs of the Bay Area community. Residents were encouraged to share their experiences and concerns about existing pedestrian and bicycle safety in the Bay Area and provide input on desired improvements.

In addition to public meetings, the project team engaged with representatives of local organizations such as TxDOT, METRO, LINK Houston, and Bay Area Houston Transportation Partnership (BAYTRAN). Representatives of these organizations and additional community members and advocates were invited to form the Bay Area Task Force and assist the project team by guiding project recommendations and be the "voice" of the community during the planning process.

Additional information regarding each meeting and engagement method, as well as key findings, is outlined in the following sections. Further detail regarding additional methods used for engagement can be found in Appendix C, *Public Engagement*.

Exploration Green Ribbon Cutting

The project team was invited to the Exploration Green ribbon cutting event by Harris County Precinct 2 on September 30, 2023. At the event, members of the public were able to visit the project booth and learn more about the upcoming study and take the online community survey. Visitors also had the opportunity to speak with project team members about pedestrian and bicycle needs throughout the Study Area.


Exploration Green ribbon cutting event.
Source: Halff

Task Force Meeting #1

The first Task Force meeting for the Bay Area Bicycle and Pedestrian Safety Plan was held virtually on October 13, 2023. The purpose of this meeting was to provide the Task Force with an overview of the project and its intended outcomes. At the beginning of the meeting, Task Force members were asked to briefly describe what bicycle and pedestrian safety means to them. Many of the attendees mentioned a sense of comfort and security while using non-motorized transportation options. Others mentioned that non-motorized users should not fear getting hurt while using safe bike lanes and trails. Task Force members shared their experiences with walking and biking in the Study Area and identified locations in need of improvement.

"Bike lanes need to be separated from the street. I don't feel safe going on the bike lanes on NASA Pkwy. If more streets had paths like Egret Bay Blvd., it would be more attractive to bike."

- Community Survey Respondent

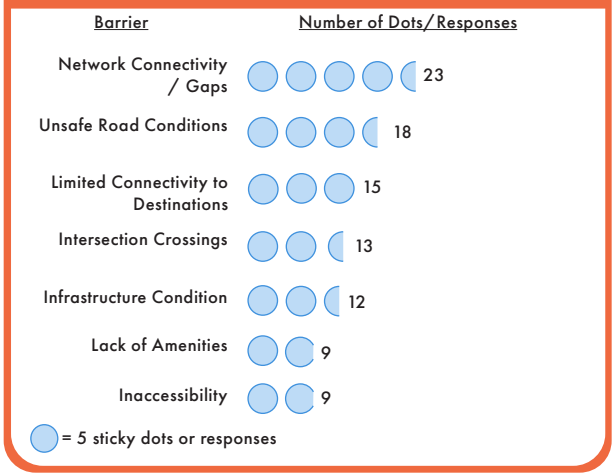
Public Meeting #1

The first public meeting for the Bay Area Bicycle and Pedestrian Safety Plan was held on October 18, 2023, at the Bay Area Community Center in Seabrook, Texas. Nearly 50 residents, task force members, and elected officials were in attendance and had an opportunity to learn about the planning process and voice their opinions or concerns regarding current walking and biking conditions in the Study Area. Key takeaways from the first public meeting are summarized to the right.

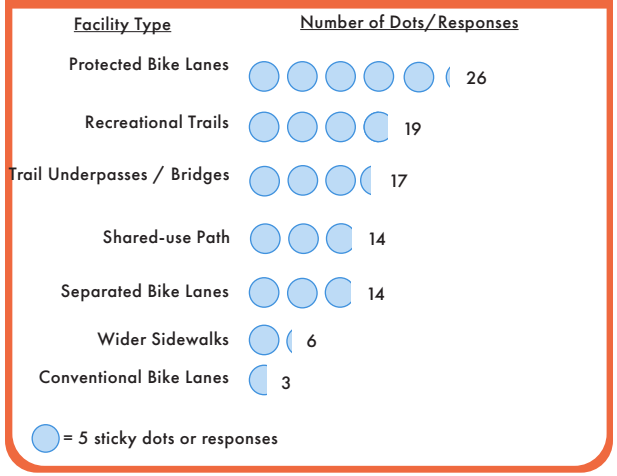
Key Takeaways:

- Separated facilities such as sidepaths or recreational trails are desired by walkers and bikers.
- Opportunities for traffic calming at trail crossings along roadways with speeding vehicles.
- Inconsistent bicycle/pedestrian networks throughout the area make non-motorized travel difficult for some users (missing sidewalk segments, bike lane termination, etc.)
- Respondents would like to see increased maintenance of existing facilities (street sweep bike lanes, maintain existing sidewalks, etc.) to reduce safety risks for those walking and biking in the area.
- Respondents would be more willing to walk/bike to destinations if the bicycle and pedestrian network could support it. (safe connections to grocery stores, schools, shopping, etc.)

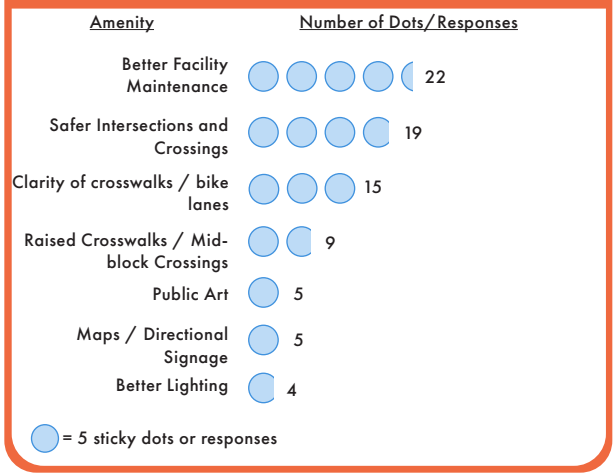
WHAT BARRIERS PREVENT YOU FROM USING SIDEWALKS, BIKEWAYS, OR TRAILS MORE?



WHAT BICYCLE AND PEDESTRIAN FACILITY TYPES DO YOU DESIRE THE MOST?



WHAT ADDITIONAL AMENITIES WOULD ENCOURAGE YOU TO WALK/BIKE MORE?



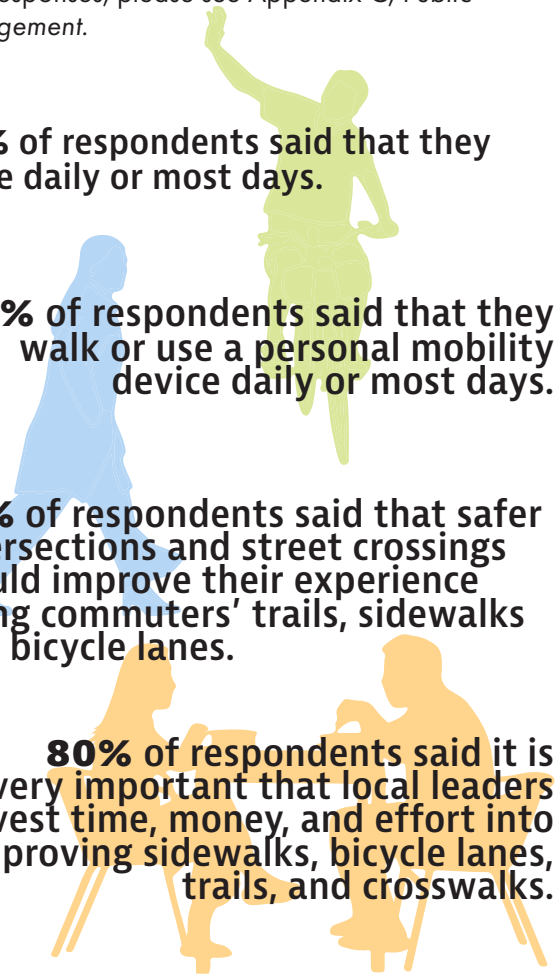
Commissioner Adrian Garcia reviewing project materials
Source: H-GAC

Project members engaging with resident at public meeting #1
Source: H-GAC

Project members engaging with resident at public meeting #1
Source: H-GAC

Community Survey

A 20-question online community survey was conducted using the SurveyMonkey platform to gather feedback regarding community interest in walking and biking in the Study Area, as well as areas of concern and opportunities for improvement. The survey asked a variety of questions ranging from user comfort on existing bike lanes, trails, and sidewalks, to what facility types the community would like to see implemented in the future. The survey was open from August 2023 to November 2023 and received 407 responses. To view all survey questions and responses, please see Appendix C, *Public Engagement.*

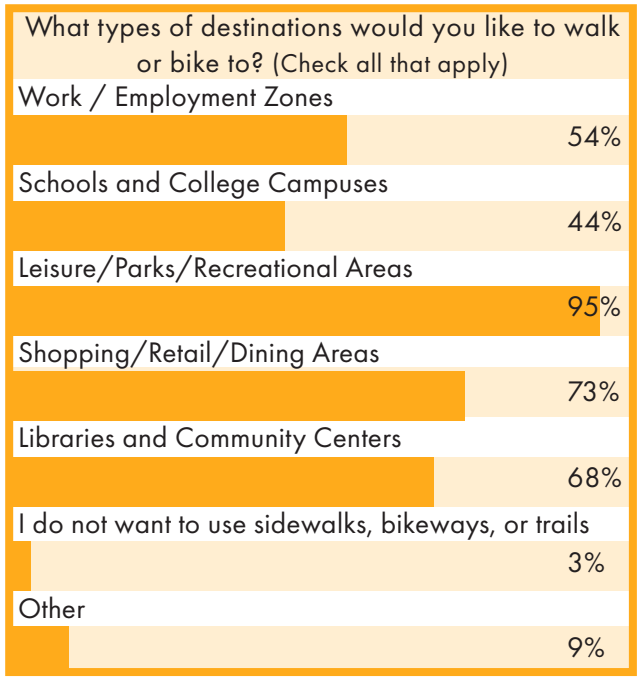


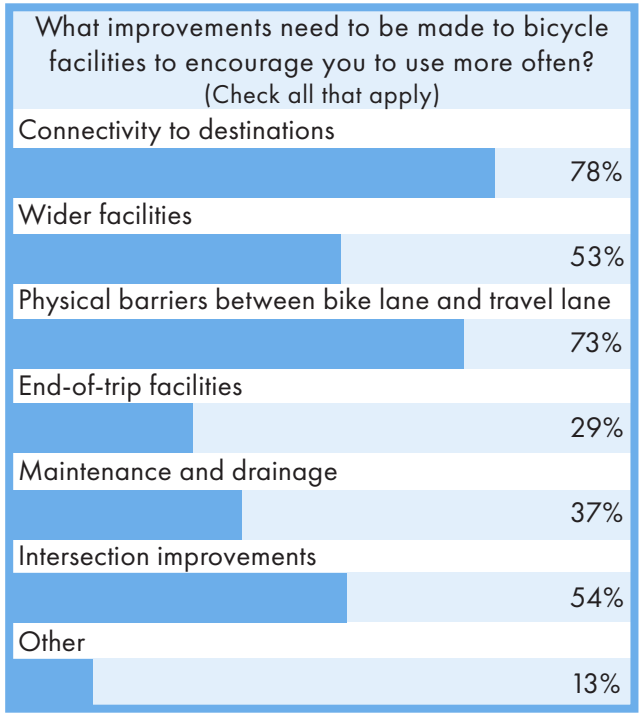
23% of respondents said that they cycle daily or most days.

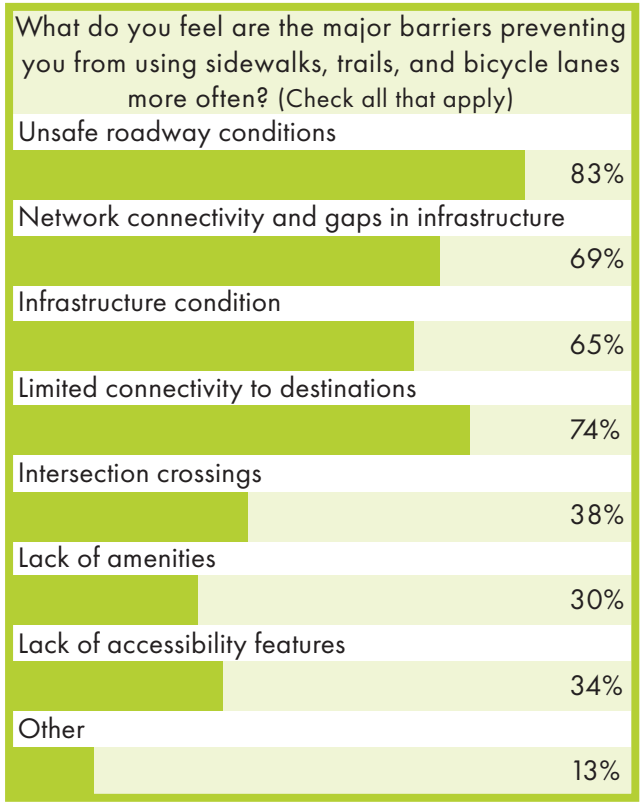
38% of respondents said that they walk or use a personal mobility device daily or most days.

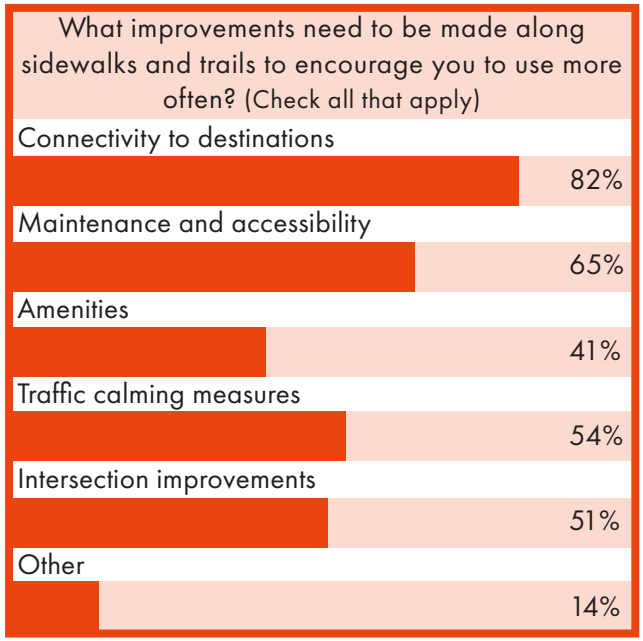
75% of respondents said that safer intersections and street crossings would improve their experience along commuters' trails, sidewalks and bicycle lanes.

80% of respondents said it is very important that local leaders invest time, money, and effort into improving sidewalks, bicycle lanes, trails, and crosswalks.









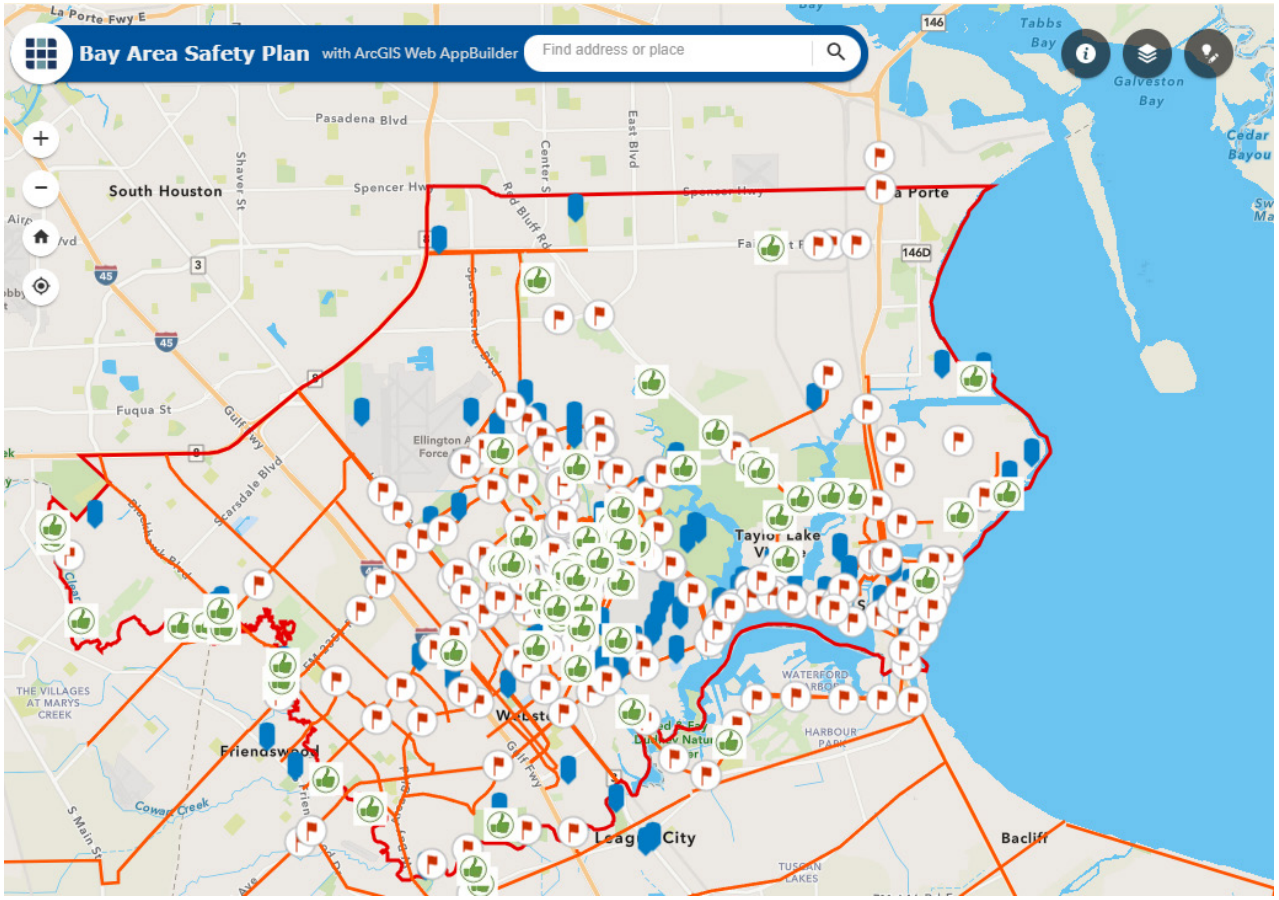
Online interactive Map

To broaden the reach of public engagement, the project team utilized Esri mapping software to create an online interactive map for community members to plot points and lines in areas they like to visit by foot or bike, locations in need of improvement, safety concerns, and areas they would like to see new pedestrian and bicycle infrastructure. The interactive map was hosted on the project website and received over 500 data points from residents, visitors, and other members of the community.

73% of respondents disagree or strongly disagree with the statement: "I can comfortably, safely, and conveniently access public transportation locations".

66% of respondents disagree or strongly disagree with the statement: "I can comfortably and safely walk to destinations"

68% of respondents said that bikeability, walkability, and access to trails is very important in choosing where to live.



Key Takeaways from Interactive map:

NASA Parkway, Space Center Blvd and Bay Area Blvd identified as core corridors for connectivity and improved bicycle and pedestrian facilities.

Schools, community centers, retail areas, parks and open spaces are popular destinations, specifically H-E-B, Kroger, Baybrook Mall, Armand Bayou, Brummerhop Park, Clear Lake Park and Exploration Green.

Respondents are concerned about sidewalk and intersection safety conditions along El Dorado, Space Center Blvd and NASA Parkway.

Task Force Meeting #2

The second Task Force meeting was held virtually on December 6, 2023. The purpose of the second Task Force meeting was to provide an update regarding public engagement methods and feedback received from the community at the first public meeting. The project team also presented the findings from the needs analysis and discussed the methods of analysis that would be used to create an All Ages and Abilities Network for safe walking and biking in the Study Area.

Task Force Meeting #3

The third Task Force meeting was held virtually on April 25, 2024. The purpose of this meeting was to update the Task Force on the development of the All Ages and Abilities Network as well as other project and policy recommendations that can facilitate the creation of safe walking and biking conditions. This meeting gave the project team the opportunity to "vet" project recommendations with the Task Force before presenting them to the community at the final public meeting.

Task Force members were given the opportunity to vote on how they feel recommendations should be prioritized for implementation using the Mentimeter online polling platform. Using this method of engagement, Task Force members were able to anonymously vote on which recommendations should be prioritized by local sponsors and partners of this plan. Pedestrian improvement projects, such as building out the sidewalk network, received the highest amount of votes, followed by bicycle network improvement projects.

Task Force members shared their excitement for the future of walking and biking in the Study Area with the project team, and asked for ways to "rally the troops" to bring awareness to the recommendations and hold local organizations accountable for the implementation of desired improvements.

Public Meeting #2

The second public meeting for the Bay Area Bicycle and Pedestrian Safety Plan was held on June 6th, 2024, at the Bay Area Community Center in Seabrook, Texas. Nineteen residents and Task Force members were in attendance.

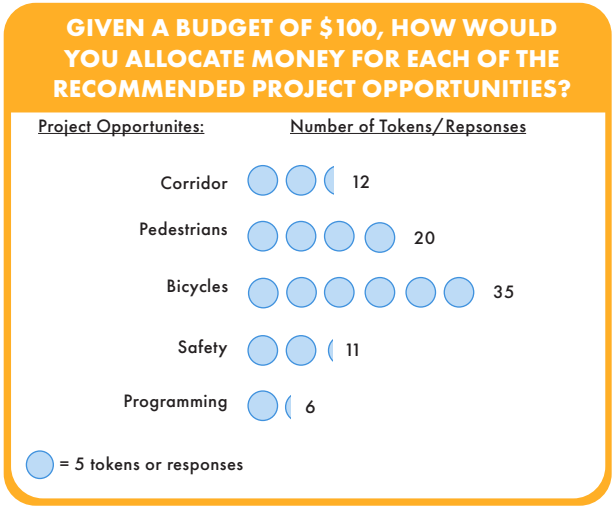
Attendees were presented with eleven engagement boards which informed them on the planning process, these boards contained information on the existing conditions of and the proposed improvements to the pedestrian and bicycle networks in the Study Area, accompanied by a mobility toolbox, and land use and design policies.

Participants were encouraged to share their response to our plans and proposals via sticky notes on the engagement boards, a prioritization exercise, and a tabletop discussion.

Project team members engaging with resident at Public Meeting #2
Source: H-GAC

Prioritization Exercise:

Each attendee was given 5 tokens, each token represents $20 to "spend" on improvements.



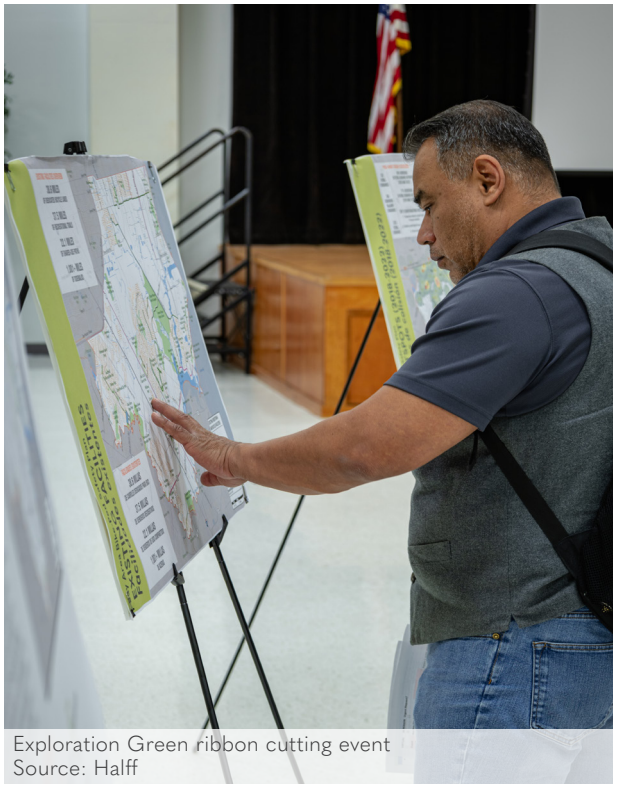
Prioritization exercise
Source: H-GAC

Task Force Meeting #4

The fourth and final Task Force meeting was held virtually on July 29, 2024. The purpose of this meeting was to present refined project and policy recommendations that accounted for feedback received during the last public workshop. This meeting gave the project team the opportunity to discuss how this plan can be put into action such that the mission of creating safe walking and biking conditions in the Bay Area could be realized.

Public Engagement Major Themes:

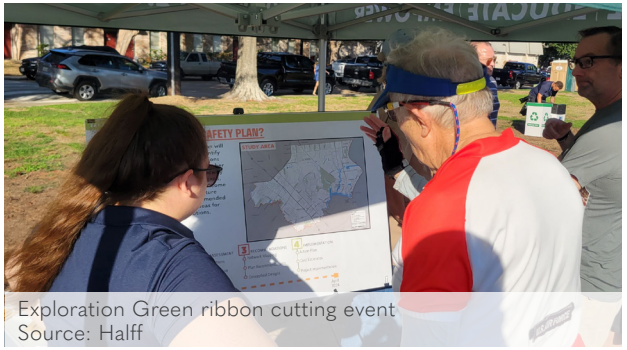
1. Existing on-street bicycle and pedestrian infrastructure is not safe or accessible for all users.
2. Existing off-street trails are a great asset to the community; improvements needed to fill gaps and connect to more destinations.
3. Debris clutters on-street bicycle lanes, causing cyclists to ride on the sidewalk or mix with vehicular traffic.
4. High-speed roadways do not foster safe travel for non-motorized road users.
5. Separated facilities, such as shared-use paths, are desired by community members to increase safety for non-motorized travel.



Exploration Green ribbon cutting event
Source: Halff

Public Meeting #2
Source: H-GAC

Commissioner Garcia providing opening remarks at Public Meeting #1
Source: H-GAC



Exploration Green ribbon cutting event
Source: Halff

Public Meeting #2
Source: Halff

4 CHAPTER FOUR
OPPORTUNITY ANALYSIS


Shared use path near La Porte High School

The Need for Safety Improvements

For this plan to become reality, focusing on improving and maintaining existing facilities, committing funding to address high-crash locations, and promoting an all ages and abilities network for implementation will be critical to improving bicycle and pedestrian safety throughout the Study Area. To develop an all ages and abilities network and enhance safety for all road users, new infrastructure and better connectivity is required. This report will summarize the technical analysis along with supporting feedback from the community that led the project team to develop potential bike and pedestrian safety recommendations.

This chapter is divided into the following categories:

- Technical Analyses
- Project Recommendations
- Program and Policy Opportunities

The intent of this chapter is to build on information received from community and task force members and provide a roadmap and toolbox for further implementation. It will take a coordinated effort from Harris County Precinct 2, member agencies, and H-GAC for successful implementation of project and policy recommendations.

While an emphasis was placed on locations with a demonstrated history of pedestrian and bicycle crashes, particularly those relative to schools within the Study Area, locations were also identified where crashes can happen such as trail crossings, intersections, or unsafe bicycle facilities. This proactive approach will identify opportunities for safety improvements to be incorporated into upcoming projects and address solutions systemwide. It will be important for Harris County Precinct 2, member agencies, and H-GAC to consider how these identified safety improvement projects and long-term bicycle network can be incorporated into ongoing and planned projects.

According to the U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA), pedestrian and bicyclist safety improvements depend on an integrated approach that involves the 4 E's: Engineering, Education, Enforcement , and Emergency Services. This same approach is also considered by the League of American Bicyclists (LAB) for determining status for a "Bicycle Friendly Community". Categories for this designation include: Equity and Accessibility, Engineering, Education, Encouragement, and Evaluation and Planning. While not commonly known, the Walk Friendly Community designation also considers similar criteria to encourage cities across the country to support safer and more comfortable environments for walking.

Feedback received from community members, task force members, and focus group participants as well as through the online community survey and interactive map indicated a need for a complete and robust network that supports all modes of transportation in the Study Area. Key findings from the community that pertained to safety improvements included the following:

Nearly **70%** of community survey respondents **disagree or strongly disagree** that they **can comfortably walk or bike to area destinations and public transit options** in the Study Area. They would like to walk or bike to parks and other community destinations.

However, **88%** of respondents feel it is **"very important" or "somewhat important"** to have **safe and accessible walking and biking** when choosing where to live or work.

Based on community feedback from public meetings and community survey, the public sees opportunities for traffic calming at trail crossings along roadways with speeding vehicles as a priority.

Space Center at Bay Area Hike and Bike Trail Crossing
Source: Halff

Interstate crossings and bridges were the least comfortable facilities in the Study Area. Walking/biking along residential streets and minor streets was ranked relatively comfortable with trails and shared-use paths being the most comfortable facility type. Crossing at non-signalized crosswalks was ranked least comfortable by respondents.

Non-signalized crosswalk at NASA Pkwy Repsdorph
Source: Halff

Major barriers to walking and bicycling in the Study Area include unsafe roadway conditions, network connectivity/gaps, and limited connectivity to destinations.

Spencer Highway sidewalk network gap
Source: Halff

Connectivity to destinations, physical barriers between bike lane and travel lane and intersection improvements were identified as improvements that would encourage more people to use bicycle facilities.

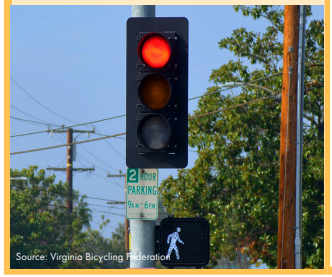
NASA Pkwy and Saturn Ln Intersection with bicycle lane without physical barrier
Source: Halff

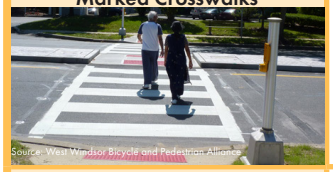
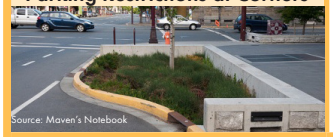
Recommendations

Mobility Toolbox

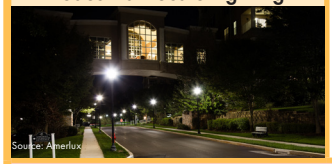
A toolbox was developed to document and summarize the countermeasures that can be considered for implementation to improve safety for pedestrians and bicyclists. The countermeasures in this toolbox are derived from local, state, and national resources, building off best practice research to provide practical ideas for implementation. Application of the countermeasures described in this toolbox can be applied at locations throughout the Study Area, either along a corridor, at an intersection, or to provide safe crossings for mid-block and trail crossing opportunities. This can not only be applied at existing locations but also should be used as a reference for future implementation and build-out of the sidewalk network and all ages and abilities bicycle network. Additional applications to be considered throughout the Study Area include the implementation of Intelligent Transportation Systems (ITS), such as pedestrian and bicycle signalization and detection at intersections to improve non-motorized crossings and reduce conflicts with vehicles, estimated time to arrive at major destinations based on walking or cycling speeds, estimated transit arrival time, and estimated travel time to crossings or intersections. The tables on the following pages identify the mobility toolbox items proposed for this plan.

Table 9: Mobility Toolbox

Treatment	Description	Effectiveness / Justification	Cost	Considerations	Evaluation Measures
Accessibility					
Ramps  Source: City of Copperas Cove	Short ramp that cuts through a sidewalk curb to provide access to the sidewalk for mobility devices. Ramps should include tactile surfaces	Required for ADA compliance, curb ramps provide an accessible route for all pedestrians and bicyclists to travel between roadways and curbed sidewalks safely.	Low – Medium: ranges from $200 to $1,500 per curb ramp.	The location of fixed objects should not limit access for pedestrians or bicyclists using sidewalks or curb ramps. Curb ramps should be designed to drain water away from curb ramps, reducing risk of pooling.	N/A
Audible Pedestrian Signals  Source: iStock	Pedestrian crossing signal that uses sound, raised arrows, and vibration to inform people with blindness or vision loss when the Walk, Pedestrian Clearance, or Don't Walk indications are on to provide information to cross the street. Includes ticking sounds and/or audible message to assist pedestrians.	Enhance safety at intersections with loud traffic noise to indicate safe crossings for pedestrians.	Low – Medium: Ranges from $8,000 to $12,000 depending on design.	Audible signals should be considered at crossings longer than 70 feet with no median divider, at complex, skewed, or irregular intersections, or at any intersection where an engineering study suggests beaconing would be helpful.	N/A
Leading Pedestrian Interval (LPI)  Source: Virginia Bicycling Federation	Low-cost adjustments to signal timing to increase pedestrian safety at signalized intersections.	Gives pedestrians a 3- to 7-second head start before vehicles in the parallel direction are given a green light. LPIs can reduce conflicts between pedestrians and left- or right-turning vehicles. FHWA states a potential 13% reduction in pedestrian-vehicle crashes at intersections with LPIs.	Low: $200 to $1200 each depending on traffic study and analyses.	MUTCD suggests LPIs should be at least 3 seconds in duration and be timed to allow pedestrians to cross at least one lane of traffic before the signal for turning traffic changes. Consider restricting Right Turns on Red in association with LPIs to better control conflicts with right-turning vehicles. Site considerations for LPIs includes crash history, pedestrian crossing volumes, and presence of vulnerable populations.	Number and rate of pedestrian involved crashes.

Treatment	Description	Effectiveness / Justification	Cost	Considerations	Evaluation Measures
Crossings					
Curb Extensions  Source: Department of Transportation	Extends the curb out from the sidewalk and into the street, typically at an intersection. This increases pedestrian visibility and decreases pedestrian exposure to vehicles on the roadway.	Creates better sight distances for pedestrians and drivers, decreases pedestrian crossing distance, avoids motor vehicles parking near crosswalks, and increases awareness of pedestrians.	Medium-High: Ranges from $2,000 to $20,000 depending on design and existing conditions.	Works best on streets with on-street parking. Should be designed to accommodate large vehicles, as appropriate. Drainage should be considered in design.	Number and severity of crashes. Speeds of vehicles in the intersection.
Crossing Islands (Pedestrian Refuge Islands)  Source: City of Chicago	Raised median in a street, at an intersection, midpoint of the block, or continuously along the street.	Protect crossing pedestrians from traffic by creating a barrier from vehicles. Also reduce crossing distance and allow pedestrians to cross traffic moving at one direction at a time. Can benefit motor vehicle safety by reducing head-on crashes. 56% reduction in pedestrian crashes with refuge islands.	Medium-High: Varies greatly, from $6,000 to $200,000. Continuous medians are more costly.	Consider landscaping and maintenance in the design. Potential opposition to loss of left-turn ability, Possible conflict with right-turning large vehicles.	Number of crashes, especially those involving pedestrians, left-turn crashes, angle crashes at driveways and head on crashes.
Marked Crosswalks  Source: West Windsor Bicycle and Pedestrian Alliance	Painted pedestrian crossings that specify locations determined as proper for crossing the street.	Marked crosswalks that are properly placed can encourage pedestrians to walk at preferred crossing locations and increase the visibility of a pedestrian crossing. High visibility crosswalks can reduce pedestrian crashes by 25%.	Low – Medium: ranges from $300 to $3,000 depending on type of marking and existing conditions.	On high volume multilane roadways, crosswalk painting should be paired with other crossing treatments. Markings must be placed in line with ramps.	Number of pedestrian crashes and conflicts with vehicles. Increase in pedestrian activity.
Parking Restrictions at Corners  Source: Maven's Notebook	Restricts how close vehicles park to a crosswalk (20-ft minimum per MUTCD) to improve sight distance for all users.	Improve pedestrian and motorist visibility, which can reduce the likelihood of pedestrian-vehicle conflicts and collisions.	Low: Costs may include street markings, signs, enforcement, and education efforts.	Accurately identify problem locations and appropriate improvements. Educate the public about the purpose of the treatment. Enforce parking restrictions.	Number of pedestrian crashes and conflicts with vehicles.
Raised Crosswalks  Source: City of Chicago	Raised crosswalks are ramped speed tables spanning the entire width of the roadway, often placed at midblock crossing locations. The crosswalk is demarcated with paint and/or special paving materials to provide advance warning.	These crosswalks act as traffic calming measures that allow pedestrians to cross at-grade with the sidewalk and provide additional accessibility benefits.	Medium: Costs range from $7,000 to $30,000 each depending on size and material type.	Raised crosswalks are typically installed on 2- or 3-lane roads with speed limits of less than 30MPH and AADT below 9,000. Drainage must be considered before installation.	Reduced conflicts/crashes between pedestrians and vehicles.
Pedestrian Gate at RR Crossings  Source: Icon West	Pedestrian gates create a physical barrier between pedestrians and train tracks. Much like crossing gates to stop vehicular traffic at railroad crossings, pedestrian gates block sidewalks when a train is approaching.	Pedestrian gates help facilitate safe pedestrian/bicycle crossings over railroad crossings and allow non-motorized traffic to be separated from vehicles.	High: Costs can vary widely depending on site conditions and existing infrastructure. Enhancing at-grade crossings to connect platforms and adding lights can vary from $50,000 to $300,000.	Installation of pedestrian gates may require complex negotiation between local agencies and railroad company. Additional engineering feasibility studies will be required to identify appropriate application.	Reduced conflicts/crashes between pedestrians/bicyclists and vehicles crossing railroad tracks.
Intersection Bike Boxes  Source: KVUE ABC	The intersection bike box, a designated area on the approach to a signalized intersection, provides cyclists a space to wait in front of stopped motor vehicles during the red signal phase.	Bike boxes help make cyclists more visible to motorists at the start of the green signal phase.	Low: $2,000 - $7,000	Implementation of bike boxes will require additional education and outreach to community members.	Reduced intersection-related conflicts/crashes involving bicyclists and vehicles.

Treatment	Description	Effectiveness / Justification	Cost	Consdierations	Evaluation Measures
Signage and Awareness					
Pedestrian Hybrid Beacon (PHB) 	Traffic control device designed to help pedestrians safely cross higher-speed roadways at midblock crossings and uncontrolled intersections.	Improve pedestrian crossing at midblock and uncontrolled intersections. 55% reduction in pedestrian crashes, 15% reduction in serious or fatal injury crashes	Medium – High: Ranges from $20K to $150K depending on design.	Effective at locations where three or more lanes will be crossed, or traffic volumes are above 9,000 AADT. If PHBs are not already familiar to a community, education should be conducted as part of implementation.	Number of pedestrian crashes and conflicts with vehicles at uncontrolled or midblock crossings.
Rectangular Rapid Flashing Beacon (RRFB) 	Pedestrian-actuated conspicuity enhancements used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled, marked crosswalks.	Improve pedestrian crossing at uncontrolled, marked intersections. RRFBs can reduce crashes up to 47% for pedestrian crashes. RRFBs can increase motorist yielding rates by up to 98%	Low – Medium: Ranges from $4K to $25K depending on design.	Effective at multilane crossings with speed limits less than 40 MPH.	Number of pedestrian crashes and conflicts with vehicles at uncontrolled crossings.
Asphalt Art 	The Asphalt Art Initiative by Bloomberg Philanthropies uses art and design to improve street safety, revitalize public spaces, and engage communities.	Asphalt art at intersections can be used in lieu of permanent structures as a "testing ground" for new traffic calming measures in areas. Art can bring drivers' attention to the intersection and slow down.	Low – Medium: Cost ranges depending on design, labor.	Placement of signs at the approach to trail crossings to alert drivers of potential conflicts.	Number of pedestrian crashes and conflicts with vehicles. Increase in pedestrian activity.
MUTCD Signage 	Signage contributes to the communication of the demarcation of potential conflict areas.	Both the FHWA and TxDOT MUTCD identify standards and requirements for signage for pedestrian and bicycle facilities.	Low: Ranges from $200 to $500 per sign.	Accurately identify problem locations and appropriate improvements. Educate the public about the purpose of the treatment. Enforce parking restrictions.	Number of pedestrian or bicyclist crashes or conflicts with vehicles at trail crossings.
Advance Warning Pavement Markings 	Pavement markings set at the approach to trail crossings to alert drivers of potential conflict areas.	Both the FHWA and TxDOT MUTCD identify standards and requirements for signage for pedestrian and bicycle facilities.	Medium: Costs range from $7,000 to $30,000 each depending on size and material type.	Placement of signs at the approach to trail crossings to alert drivers of potential conflicts.	Number of pedestrian or bicyclist related crashes at trail crossings.
Pedestrian Activated Crosswalk Systems 	In-road lights that, when activated by a pedestrian push-button, illuminate the crosswalk and alert drivers they are approaching an area with pedestrians.	In-road pedestrian crosswalk lights can be added to help pedestrians safely cross a roadway during lighted or low-light conditions.	Medium: Cost ranges depending on intersection length, vendor prices vary.	Treatments can be added to signalized or unsignalized intersections and midblock crossings. Treatments can be solar powered to reduce energy use.	Number of pedestrian related crashes during low-light conditions.

Treatment	Description	Effectiveness / Justification	Cost	Considerations	Evaluation Measures
Signage and Awareness Continued					
Neighborhood Traffic Calming  Source: U.S. Department of Transportation	Harris County Engineering has Neighborhood Traffic Calming guidelines for improving safety for all users and enhancing useability for non-motorized street users.	Slow vehicular traffic speeds on residentials streets. Can include treatments such as bulb-outs, speed humps, speed tables, and chicanes.	Low – Medium: Cost ranges depending on traffic calming measure.	Treatments can be added to residential neighborhoods experiencing high vehicular speeds.	Number of pedestrian conflicts with vehicles. Average vehicle speeds along roadway.
Pedestrian-Scale Lighting  Source: Amerlux	Pedestrian-scale lighting is designed to improve the safety and security of pedestrians, particularly at crossings and along sidewalks by illuminating paths and increasing visibility to drivers.	Pedestrian-scale lighting can reduce the number of pedestrian crahes by 81%.	Low – Medium: Ranges from $4K to $10K per light depending on design.	Lighting can be added to roadways that experience high pedestrian volumes and / or provide connections to Study Area destinations.	Number of pedestrian crashes during low light conditions.
Facility Types					
Protected Bike Lanes  Source: Denver Streets Partnership	A protected bike lane is physically separated from the adjacent motor vehicle traffic by vertical elements. These elements may include continuous raised medians, flexible pots, intermittent concrete curbing, or parking lanes.	Protected bike lanes can increase safety, comfort, and predictability for all street users - particularly on busy streets.	Low – Medium: Cost ranges depending on design and length of facility. ~$80,000 - $300,000 per mile.	According to TxDOT, raised medians, curbs, or other low-profile, hard separators on protected bike lanes should only be used in locations with speeds of 45 MPH or less. Elements such as flexible posts or crashworthy barriers are allowable for high-speed roadways.	Number of bicycle conflicts with vehicles.
Shared-Use Path  Source: Chicago Magazine	A shared-use path is a physically separated, bi-directional, wide sidewalk located adjacent and parallel to the roadway.	Shared-use paths accommodate bicycle and pedestrian travel that is separated from vehicular lanes. Shared-use paths provide a low-stress experience for a variety of users that rely on the network for transportation or recreation.	Medium – High: Costs range depending on design and length of facility. Approx. $600k per mile.	AASHTO recommends shared-use paths to be a minimum of 10 feet wide to accommodate bi-directional travel. TxDOT guidance recommends shared-use paths along roadways with traffic volumes exceeding 7,000 motor vehicles per day and speeds greater than 30 MPH.	Number of bicycle conflicts with vehicles.
Bicycle Boulevard  Source: ReGreenThePlanet.blog	Bicycle boulevards are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority.	Bicycle boulevards use signs, pavement markings, and speed/ volume management to discourage high-speed trips by motor vehicles.	Low: Cost ranges from $300 - $600 per sign/marking.	TxDOT recommends bicycle boulevards along roadways with traffic volumes less than 3,000 motor vehicles per day and speeds lower than 25 MPH.	Number of bicycle conflicts with vehicles. Reduction in vehicle speeds along roadway.
Multi-Use Trail  Source: Mason Creek South Hike & Bike Trail Google Review	Multi-use trails are separated corridors used for walking, running, cycling, or other forms of non-motorized active transportation. Multi-use trails may be placed adjacent to roads like shared-use paths, but are typically found within public ROW, drainage easements, decommissioned rail corridors, other utility corridors, or areas within parks.	Multi-use trails are attractive options for those walking or cycling for leisure or for longer trips. Multi-use trails can provide a bypass around major barriers such as freeways or railroads. Fewer conflict points (i.e., crossings) along multi-use trails allow users to travel at higher speeds and therefore experience shorter travel times.	Medium – High: Costs vary depending on design and length of facility/ Approx. $700k per mile.	Multi-use trails should include amenities such as lighting, shade structures, access to water, and bicycle repair stations and seating to ensure safe and comfortable trail use.	Number of bicycle conflicts with vehicles.

Top Crash Locations

The Federal Highway Administration (FHWA), part of the US Department of Transportation (USDOT), provides a collection of proven safety strategies that are effective in reducing roadway fatalities and serious injuries. These countermeasures are primarily intended for vehicular traffic movements; however, there are several countermeasures directly related to pedestrian and bicyclist safety. These proven safety countermeasures are intended to be used by multiple jurisdictions at the local, regional, state, and national level and are designed for roadways of various types and geographic locations. The proposed recommendations identified in the mobility toolbox as well as presented below for top crash locations, build off these countermeasures and strategies and present ways in which Harris County Precinct 2 and H-GAC can implement some countermeasures in the short-term as well as consider long-term opportunities.

Based on the information available on the FHWA Highway Safety Programs website, CMF Clearinghouse website and FHWA Office of Safety publication "Crash Modification Factors in Practice", highway safety professionals have conducted numerous studies measuring the crash reduction potential of various types of safety improvements. Many of these estimates have been developed by comparing crashes "before" implementation of a safety improvement against crashes "after" implementation. The measured change in crashes is used to develop a "crash modification factor," or CMF. Each CMF has a "star rating" indicating the quality or confidence in the results of the study producing the CMF. A higher number of stars indicate a better rating, with five stars representing the best quality of research for the CMF.

Application of CMFs requires an appreciation of their sources and limitations. The CMF Clearinghouse contains over 3,000 CMFs for a wide range of safety countermeasures under a variety of conditions. However, CMFs are still lacking for a large number of treatments, for certain crash types and severities, combination treatments and those that are innovative and experimental in nature. CMFs for some of the proposed treatments in the Bay Area Pedestrian and Bike Safety Study are not available at the time of this study. The CMF Clearinghouse provides a "Most Wanted List" for CMFs. Users can access the website and add to the list by submitting ideas for future CMF research or current needs. While the research would need to be completed, this link provides users with the opportunity to share their CMF needs.

Through analysis of historical crash data, the project team identified intersections and corridors with opportunities for pedestrian and bicycle safety improvements. Prioritized locations with high levels of pedestrian and cyclist involved crashes, and high-crash corridors adjacent to schools were identified throughout the Study Area. Based on this criteria, a list of ten priority locations, shown in Table 10 on page 61 and 62, along with recommendations and crash modification factors for each one were developed. This allows for a cost-benefit analysis to be undertaken and makes prioritizing specific projects easier. To streamline improvements, agencies should aim to incorporate these recommendations in their regularly scheduled improvement plan.

Table Glossary

HSIP – Highway Safety Improvement Program. The Texas Department of Transportation manages the Texas Highway Safety Improvement Program (HSIP) to comply with federal requirements and work to achieve the main objective of reducing traffic fatalities and serious injuries on all public roads. Projects that align with this plan have the potential for additional funding opportunities for construction and operational improvements.

Reduction Factor – percentage crash reduction that might be expected after implementing a given countermeasure. A CRF should be regarded as a generic estimate of the effectiveness of a countermeasure. The estimate is a useful guide, but it remains necessary to apply engineering judgment and to consider site-specific environmental, traffic volume, traffic mix, geometric, and operational conditions which will affect the safety impact of a countermeasure. Actual effectiveness will vary from site to site. Reduction factors only apply to specific types of crashes and only applies to pedestrian or bicyclist improvements where work code exist through HSIP.

Crash Modification Factor (CMF) - multiplicative factor that indicates the proportion of crashes that would be expected after implementing a countermeasure. While some countermeasures so not have an associated reduction factor, they may also help reduce crashes and enhance pedestrian and bicyclist safety along Study Area roadways.

Combined CMF – multiple treatments may be applied to a particular location where the combined effects of these improvements would be taken into account for the overall potential crash reduction.

Map 24: **Top Ped-Bike Crash Locations**

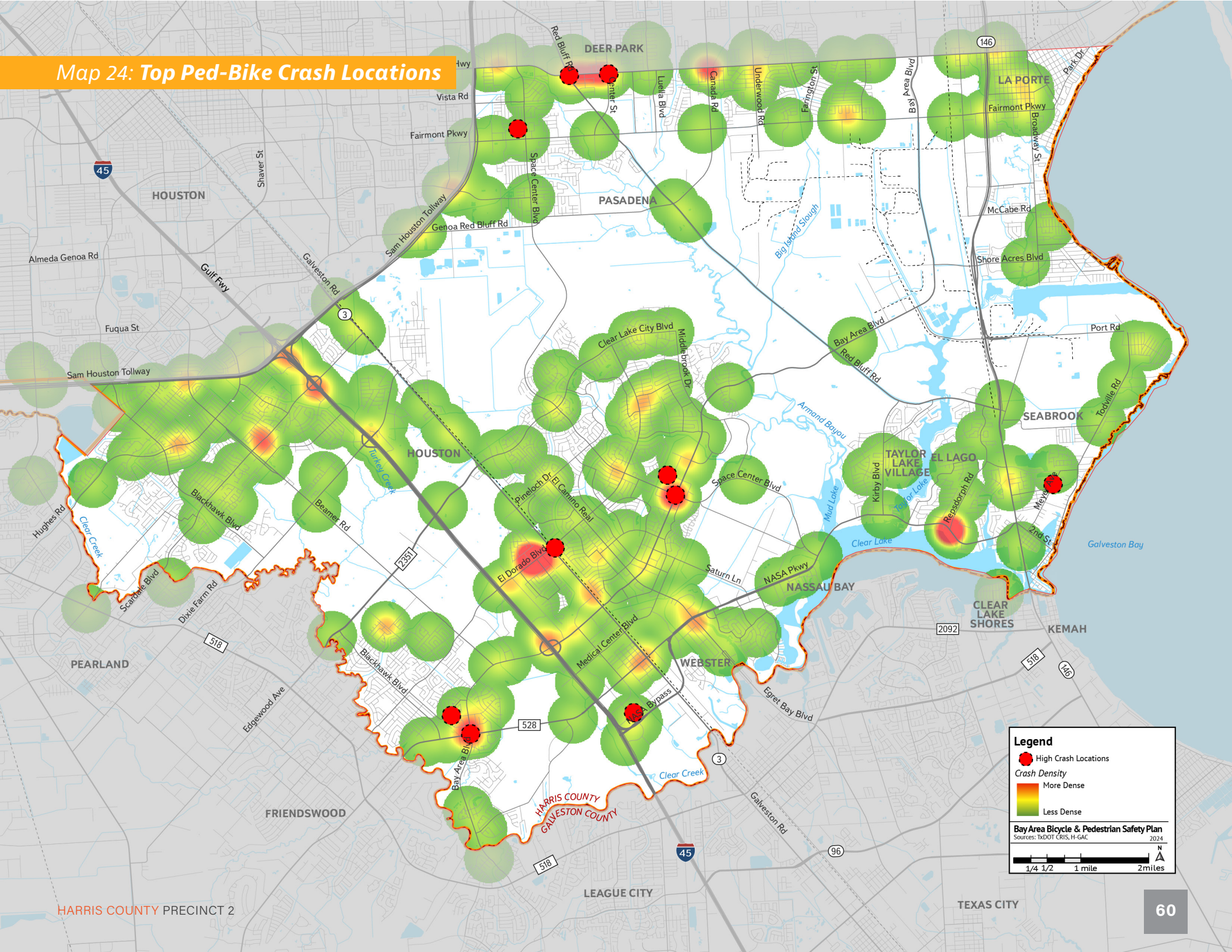


Table 10: Top Crash Location Recommendation

Location for Improvements	Location Type	Suggested Improvement	Work Code from TxDOT HSIP	Reduction Factor	CMF	Combined CMF	
El Dorado Blvd & Galveston Blvd	Intersection	Resurface pavement with friction	WC 303	30%	0.7	0.40	60%
		Reconstruct sidewalks to meet standards and pavement conditions	WC 407	65%	0.35		
		Install Pedestrian Signal (consider Audible when feasible)	WC 110	34%	0.66		
		Reconstruct ADA ramps	NA	NA			
		Improve clear zone by relocating or removing fixed objects	WC 209	50%	0.5		
		Pedestrian Refuge Islands	NA	NA			
		Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
		Leading Pedestrian Intervals	NA	NA			
Spencer Hwy & Red Bluff Rd	Intersection	Resurface pavement with friction	WC 303	30%	0.7	0.46	54%
		Reconstruct sidewalks to meet standards and pavement conditions	WC 407	65%	0.35		
		Reconstruct ADA ramps	NA	NA			
		Improve clear zone by relocating or removing fixed objects	WC 209	50%	0.5		
		Pedestrian Refuge Islands	NA	NA			
		Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
		Leading Pedestrian Intervals	NA	NA			
FM 528 & Bay Area Blvd	Intersection	Resurface pavement with friction	WC 303	30%	0.7	0.46	54%
		Reconstruct sidewalks to meet standards and pavement conditions	WC 407	65%	0.35		
		Reconstruct ADA ramps	NA	NA			
		Improve clear zone by relocating or removing fixed objects	WC 209	50%	0.5		
		Pedestrian Refuge Islands	NA	NA			
		Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
		Leading Pedestrian Intervals	NA	NA			
Spencer Hwy & Center St	Intersection	Resurface pavement with friction	WC 303	30%	0.7	0.56	44%
		Reconstruct sidewalks to meet standards and pavement conditions	WC 209	50%	0.5		
		Pedestrian Refuge Islands	NA	NA			
		Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
		Leading Pedestrian Intervals	NA	NA			
Bay Area Blvd & El Camino Real	Intersection	Resurface pavement with friction	WC 303	30%	0.7	0.44	56%
		Reconstruct sidewalks to meet standards and pavement conditions	WC 209	65%	0.35		
		Reconstruct ADA ramps	NA	NA			
		Improve clear zone by relocating or removing fixed objects	WC 209	50%	0.5		
		Check Illumination	WC 304/305	13%	0.87		
		Pedestrian Refuge Islands	NA	NA			
		Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
		Leading Pedestrian Intervals	NA	NA			

Table 10: Top Crash Location Recommendation Continued

Location for Improvements	Location Type	Suggested Improvement	Work Code from TxDOT HSIP	Reduction Factor	CMF	Combined CMF	
Bay Elementary School	Bayport Blvd	Resurface pavement with friction	WC 303	30%	0.7	0.66	34%
	Meyer Road	Check Illumination	WC 304/305	13%	0.87		
	Meyer Road	Asphalt Art	NA	NA			
	Meyer Road	Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
Clear Path Alternative School	Magnolia Avenue	Resurface pavement with friction	WC 303	30%	0.7	0.52	48%
	Nasa Bypass	Improve clear zone by relocating or removing fixed objects	WC 209	50%	0.5		
	Magnolia Avenue Kobayashi Road	Check Illumination	WC 304/305	13%	0.87		
	Magnolia Avenue	Asphalt Art	NA	NA			
	Magnolia Avenue	Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
Falcon Pass Elementary	Falcon Pass Drive	Resurface pavement with friction	WC 303	30%	0.7	0.52	48%
	Bay Area Blvd	Improve clear zone by relocating or removing fixed objects	WC 209	50%	0.5		
	Bay Area Blvd Space Center Blvd	Check Illumination	WC 304/305	13%	0.87		
	Falcon Pass Drive Moonrock Drive	Asphalt Art	NA	NA			
	Falcon Pass Drive Moonrock Drive	Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
P H Greene Elementary School	School	Resurface pavement with friction	WC 303	30%	0.7	0.66	34%
	Fife Ln	Check Illumination	WC 304/305	13%	0.87		
	Friendswood Link Road	Asphalt Art	NA	NA			
	Friendswood Link Road Fife Ln	Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		
Vista Academy of Pasadena	Fairmont Parkway	Resurface pavement with friction	WC 303	30%	0.7	0.52	48%
	Fairmont Parkway	Improve clear zone by relocating or removing fixed objects	WC 209	50%	0.5		
	Fairmont Parkway	Check Illumination	WC 304/305	13%	0.87		
	Intersection of Fairmont Parkway and Space Center Blvd	Marked Crosswalks/ Raised Crosswalks	WC 403	10%	0.9		

Bicycle Network

Consistent with the H-GAC 2045 Active Transportation Plan, H-GAC Vision Zero, Harris County Vision Zero, and Precinct 2 Parks and Trails Master Plan, the proposed bicycle vision map provides safe and efficient access to the network for users of all ages and abilities. While there were many documented trails and bicycle facilities located throughout the Study Area from previous plans, many of these facility types and locations did not provide a holistic and connected network. Public and stakeholder feedback emphasized that the existing bike network does not allow safe and easy access for people to take the trips they want to take. The mapped bicycle network focuses on roadway corridors and off-street trails that should be constructed in conjunction with pedestrian facilities. Where overlap occurs between the two and right-of-way is present, the proposed bicycle network should be built out and align with these recommendations.

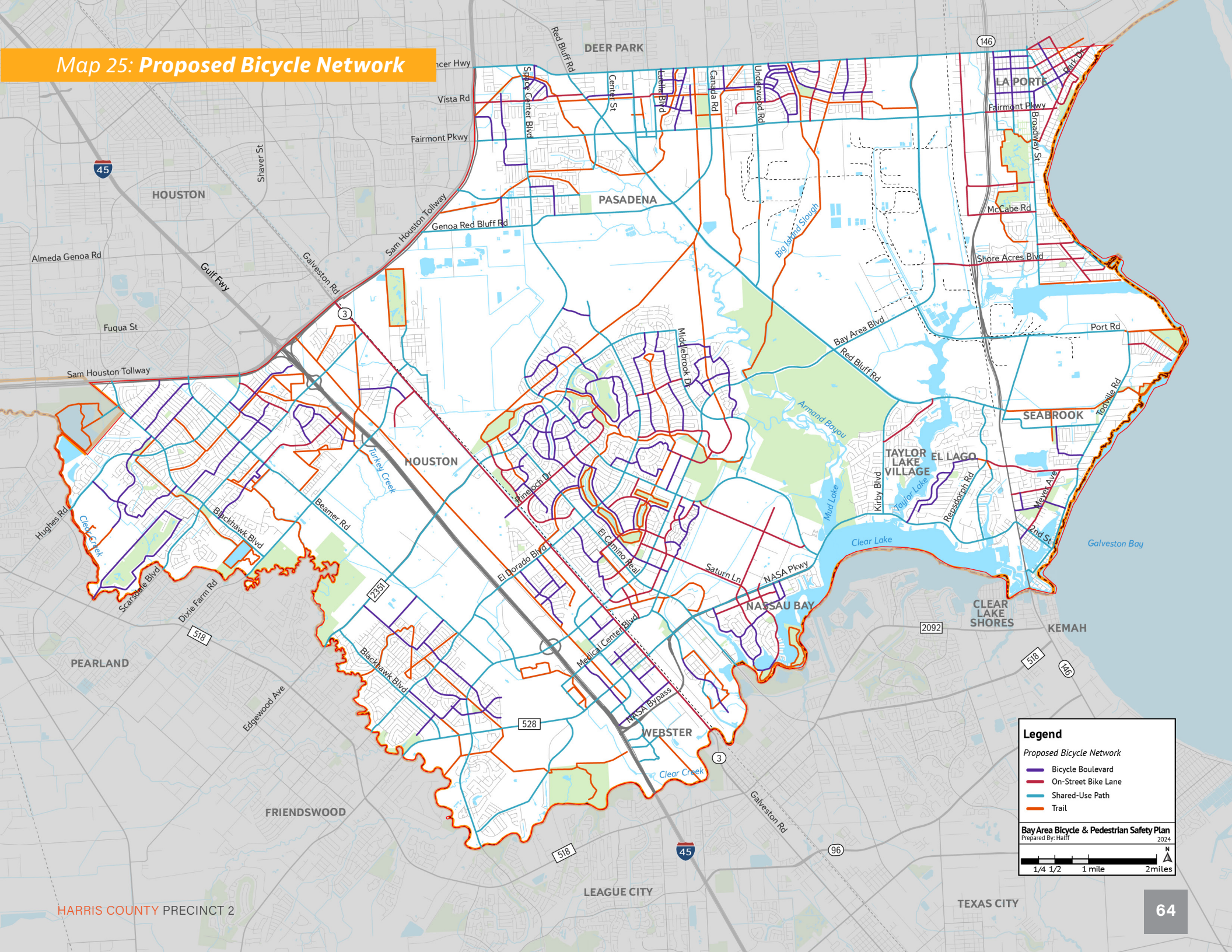
Development of a complete network takes time, but a general understanding of an overall vision helps local municipalities and Precinct 2 account for this in design of new infrastructure projects as well as implementation of enhanced facilities at intersections and crossings. The proposed bicycle network was aligned with the All Ages and Abilities Network providing the highest possible level of comfort for users along the roadways, improving safety and enhancing connectivity. The facility types identified for the Study Area align with the naming conventions associated with the H-GAC regional network system. Upon full build-out, the Study Area will have over 450 miles of safe, accessible, and high-quality bikeways, shared-use paths, and trail facilities. This will potentially improve access to local destinations and reduce vehicle emissions providing a better quality of life for residents within the Study Area. Full network build-out should also incorporate policy recommendations referenced on page 69.

Bay Area Blvd at IH 45 - Cyclist Crossing IH 45 Frontage Road
Source: Halff

Figure 6 Proposed Improvements to El Camino - Gemini Intersection

El Camino Real at Bay Area Blvd - Cyclist Crossing Bay Area Blvd.
Source: Halff

Map 25: **Proposed Bicycle Network**



Legend

Proposed Bicycle Network

- Bicycle Boulevard
- On-Street Bike Lane
- Shared-Use Path
- Trail

Bay Area Bicycle & Pedestrian Safety Plan
Prepared By: Halff
2024

N

1/4 1/2 1 mile 2miles

Sidewalk Gap Projects

As identified in the existing conditions section as well as expressed throughout public engagement, gaps in the existing sidewalk network and condition of infrastructure play a key role in limiting safe and accessible commute opportunities for people walking and bicycling. As identified in Map 3 – Sidewalk Coverage Analysis, many major thoroughfares throughout the Study Area lack sidewalks along both sides of the roadway. To better understand areas of greatest need for pedestrian infrastructure, the team compiled an assessment evaluation for potential sidewalk gap projects. This analysis looks at roadways in the Study Area that had no sidewalk on both sides or only one sidewalk along the side of the roadway.

Criteria used to define potential roadway segments included the following:

- Access to Parks (½ mile)
- Access to Schools (½ mile)
- Major Activity Centers (adjacent roadways)
- Existing Pedestrian and Bicyclist Activity (Replica and Strava data)
- Transit Stop Access
- Vulnerable Population
- Health Analysis

Map 26, *Sidewalk Gap Projects* represent the recommended sidewalk gap location projects throughout the Study Area. While it is understood that sidewalk accessibility is crucial along all roadways within the Study Area, these criteria allow certain locations to be prioritized, to maximize safety and accessibility to key destinations.

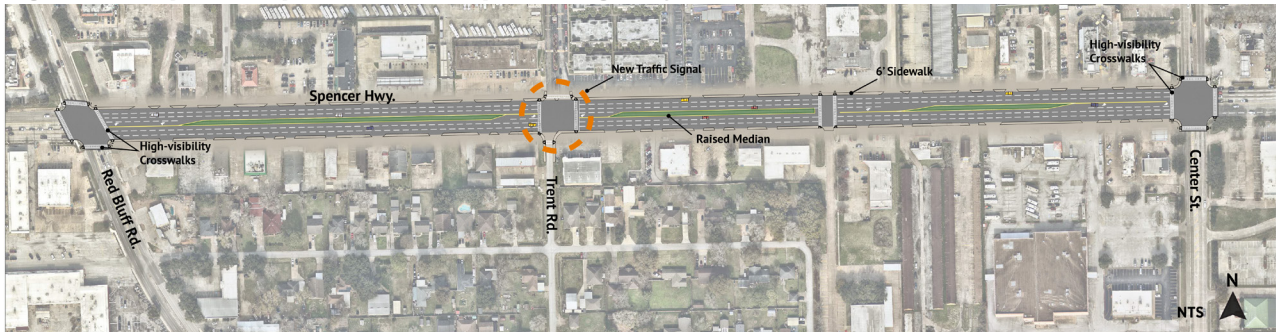
*Precinct 2 will be launching the "Re-imagine Spencer Hwy" Corridor Study in the months following the completion of this plan. It will be an opportunity for the community to develop the vision for a safer Spencer Highway.

Figure 7, Proposed Improvements to Friendswood Link (Small Scale)

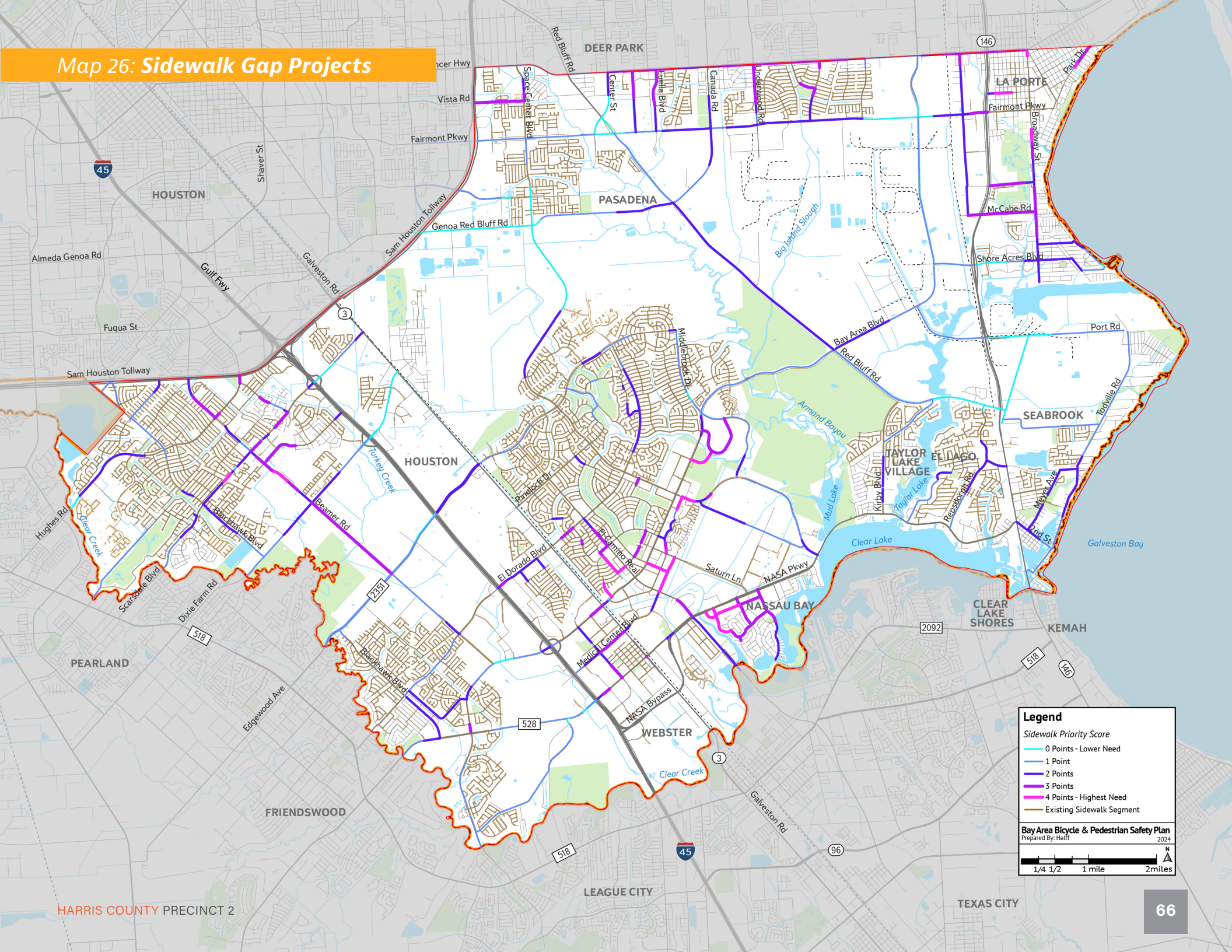
Figure 8, Proposed Improvements to Friendswood Link (Small Scale)

Figure 9, Proposed Improvements to NASA Rd.

Figure 10, Proposed Improvements to Spencer Highway*



Map 26: **Sidewalk Gap Projects**



Legend

Sidewalk Priority Score

- 0 Points - Lower Need
- 1 Point
- 2 Points
- 3 Points
- 4 Points - Highest Need
- Existing Sidewalk Segment

Bay Area Bicycle & Pedestrian Safety Plan
Prepared By: Halff 2024

N
1/4 1/2 1 mile 2miles

Intersection and Trail Crossings

Utilizing Table 9, *Mobility Toolbox*, this same approach was taken for potential recommendations for intersections and trail crossings throughout the Study Area. The same criteria used for the sidewalk gap projects was also utilized to identify potential intersection locations that could benefit from pedestrian infrastructure improvements. Map 27 represents these intersection locations throughout the Study Area. Similar locations identified in the priority map have also been identified as the top crash locations for recommended improvements based on historical pedestrian and bicycle crash data and potential improvements.

It will be important to consider these improvements in relation to other ongoing projects in the Study Area. Some upcoming or ongoing Harris County Precinct 2 projects include:

- Corridor Study: Beamer Road from Hughes Road to Bay Area Boulevard
- Corridor Study: Bay Area Boulevard from Middlebrook Drive to Fairmont Parkway
- Corridor Study: Spencer Highway from Beltway 8 to Canada Road
- Street and Traffic: Blackhawk Boulevard from Beltway 8 to Scarsdale Boulevard
- Trail Connection: Exploration Green (see Figure 11, below)
- Trail Improvements: Fairmont Parkway from Center Street to Sylvan Beach Park

Additional programmed projects from H-GAC and TxDOT should also incorporate bicycle and pedestrian safety improvements reflecting the mobility toolbox presented on the previous pages.

Figure 11, Proposed Improvements to Space Center Blvd. Crossing

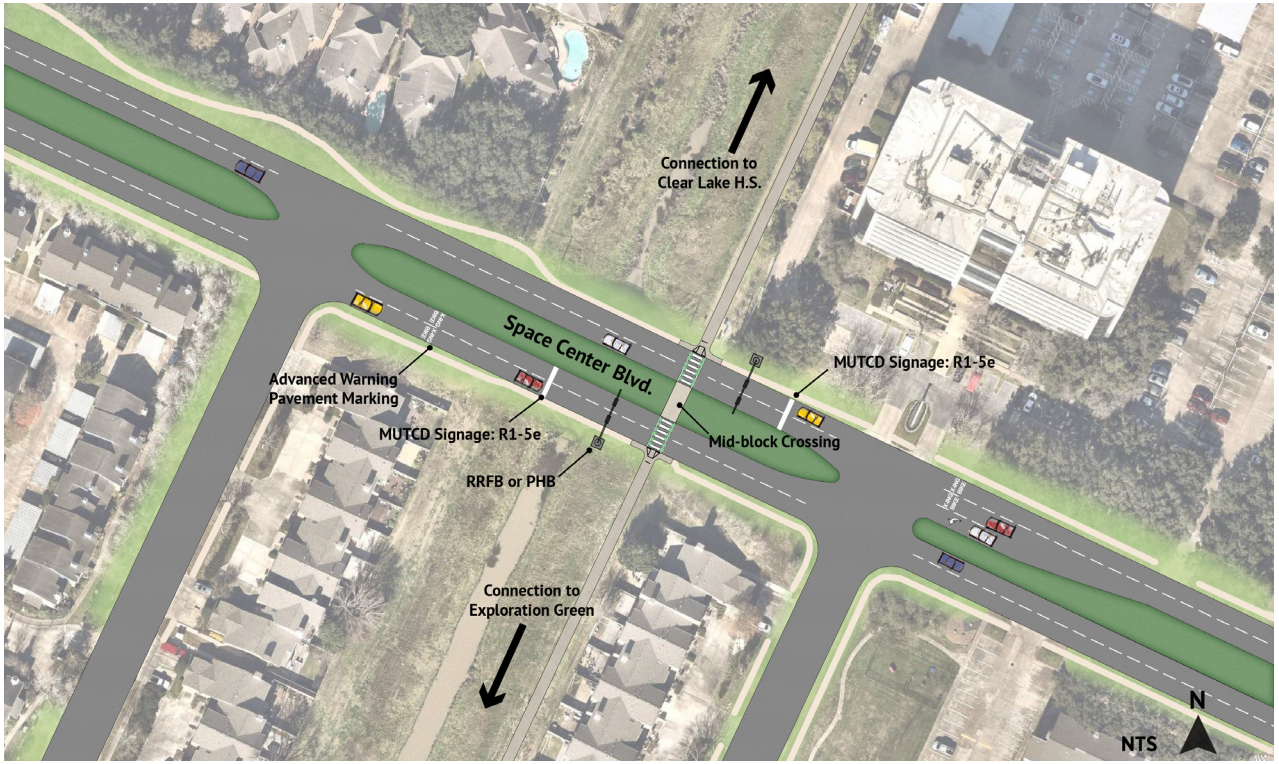
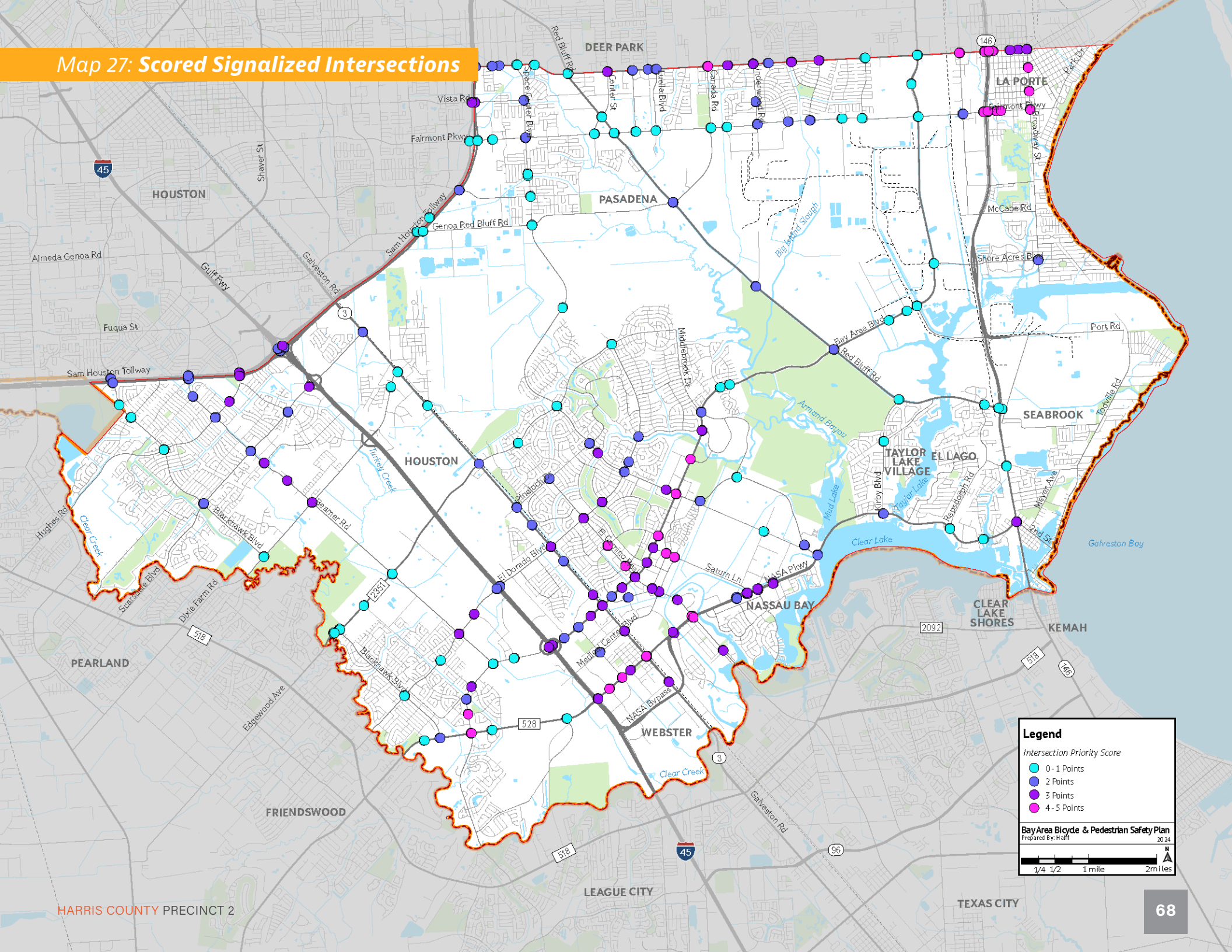


Figure 12, Proposed Improvements to Space Center Blvd. near Broadlawn Dr.

NASA Pkwy & Saturn Ln Intersection
Source: Halff

NASA Pkwy & Saturn Ln Intersection
Source: Halff

Map 27: **Scored Signalized Intersections**



Program and Policy Opportunities

Land Use and Development

The ability to construct, improve, and maintain bicycle and pedestrian infrastructure throughout the Study Area is largely dependent upon regulatory tools across various municipalities and county-wide related to land development processes. As documented in the regulatory review, there are various definitions as to how pedestrian infrastructure is implemented as development occurs as well as along major roadways across jurisdictions. Proposed development should take into account sidewalk connectivity and the opportunity to build out the proposed bicycle network developed as part of this planning effort.

In addition to the potential for land use and development to support build out of the network, making sure pedestrian and bicyclist infrastructure meets ADA standards and best practices will be critical to safe and accessible infrastructure. Particularly when sidewalks traverse across the properties of businesses with extended driveways, the typical case has been to merge the sidewalk with the driveway, with little to no delineation between the two. Properly designed driveways, as they cross sidewalks, can enhance pedestrian safety by providing a consistent surface and reminding drivers that they are crossing a sidewalk.

The following principles should be applied to driveway design:

- The sidewalk continues across the driveway at the same elevation – providing a level, continuous sidewalk not only brings the sidewalk up to the standards of ADA compliance, but also changes driver behavior.
- The driveway apron does not go through the sidewalk.
- In general, sidewalks and driveways should be easily distinguishable, either by using a different paving material, or clear marking, and remain free of outdoor vehicle or material storage.

Sidewalk - driveway merger which implements ADA best practices
Source: Baleno Concrete

Trail-Oriented Development

The proposed bicycle and trail network presented on Page 64 identifies multiple trail connectivity opportunities that pose an opportunity for connectivity to the built environment. Similar to transit-oriented development, trail-oriented development (TrOD) aims to create a built environment that integrates adjacent trails with development. This connectivity opportunity promotes linking people to local businesses, community spaces, public services, and neighborhood by way of trails and trail support infrastructure. It will take the County and multiple jurisdictions to work together with property owners and businesses to implement infrastructure and building typology to support this type of development.

Example of Trail-Oriented Development
Source: H-GAC

Design Manual

Designing, engineering, operating, and maintaining pedestrian and bicycle infrastructure are critical to the safety of all road users. Incorporating a wide range of design solutions and technologies provide a safer, inviting, and more accessible roadway for residents to reach community destinations. While the County has implemented some pedestrian and bicycle infrastructure design best practice design guidance, as well as guidelines for neighborhood traffic calming, it will be important that this information is disseminated to local municipalities. In coordination with local municipalities, the County should update regulatory language that supports increased facility widths that establish appropriate setbacks and account for obstructions to create a more accessible and comfortable user environment.

Maintenance and Operations

Participants in public engagement repeatedly noted the importance of maintaining existing infrastructure, to ensure active transportation users could safely use these facilities. Maintaining existing infrastructure will improve community confidence that future infrastructure investments will be easily accessible and make usability predictable. The County should continue to and expand its work with agencies like TxDOT and other municipalities to coordinate a maintenance schedule for pedestrian and bicyclist infrastructure. This should include clearing of facilities of debris and other obstructions that may create accessibility issues for users. Protocols for clearing facilities should be specific to each type of infrastructure such as intersection, sidewalk, bicycle lane, and shared-use path or trail.

Depending on facility, maintenance may not be required as often and may also be incorporated into existing roadway maintenance programs. There is also an opportunity to purchase and/or share maintenance equipment between Precinct 2 and municipalities in the Study Area. This would help reduce upfront costs as well as ongoing service needs of the equipment. Maintenance can also be accomplished through adopt-a-sidewalk/bike lane/intersection/drain/esplanade program which our volunteer-based initiatives that can not only serve as a cleanup program but enhance stewardship and promote alternative forms of transportation.

Street sweeper upkeeping sidewalk
Source: Axios Houston

Signage and pavement markings will also need to be considered as part of the maintenance program as this helps enhance comfort and usability of pedestrian and bicyclist infrastructure. Adequate inspection will contribute to the legibility of the network and help inform annual budgetary needs for County and local municipalities. As indicated in recommendations, additional pavement markings should be implemented at intersections and trail crossings along with bicycle facilities to create a safer network. Signage and pavement markings should align with the regulations set forth by the Texas Manual on Uniform Traffic Control Devices.

Section of sidewalk along Space Center Blvd
Source: Halff

End of Trip Facilities

The availability of end of trip facilities can influence an individual's decision to commute by walking or bicycling. Facilities such as bicycle parking, locker rooms, showers, or bicycle repair stations can support individuals who utilize walking and bicycling as their form of transportation or for leisure/recreational activities. Similar to vehicular parking, bicycle parking provides the convenience and comfort of utilizing this mode of transportation.

The County should work with local municipalities to encourage bicycle parking at existing developments and look for ways to incorporate end of trip facilities in new and proposed development. These facilities could be directly correlated to TrOD opportunities throughout the Study Area. Bicycle parking should be visible from and close to the building entrance it serves – no more than 50 feet from the door. When installing bike racks on the sidewalk, the pedestrian through zone must be maintained. Racks should be placed in a location that maintains a clear line of travel for all sidewalk users.

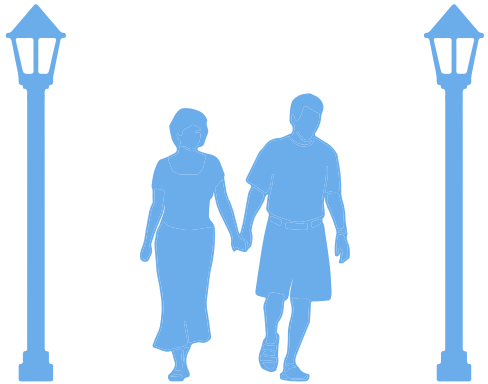
End of Trip Facilities with bike racks and lockers
Source: Central Park Tower Perth

End of Trip Bike Lockers
Source: San Jose Public Library

Lighting and Wayfinding

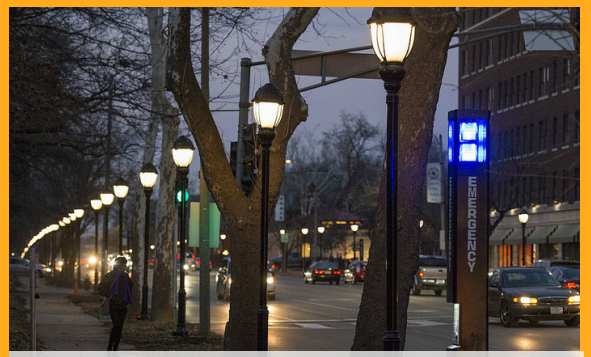
As expressed throughout public engagement and identified through various walk-bike audits, wayfinding and lighting plays a critical role in user experience and safety along pedestrian and bicycle infrastructure. The County and many jurisdictions may have design guidance related to roadway and vehicular wayfinding and lighting but an emphasis may need to be placed on the pedestrian realm to enhance user comfort and safety. Illuminated facilities at intersections should be prioritized to increase visibility of pedestrians and bicyclists and alert all transportation users to reduce conflict points. Pedestrian scale lighting should also be considered along roadways and at key junctures such as mid-block crosswalks and along trail facilities.

Wayfinding along key corridors not only creates legibility of the network but also provides a transportation network that is easily navigable to community destinations. Wayfinding should incorporate not only local destinations but also major activity centers and employment areas. The County should work with municipalities to build out a wayfinding program that supports pedestrian and bicyclist infrastructure and provides adequate signage types and placement at key locations. Locations to consider include transit facilities, public buildings, major retail and healthcare destinations, parks, and trailheads.



Car Scale Lighting Vs Pedestrian Scale Lighting

Car scale lighting at a Spencer Highway intersection
Source: Halff



Pedestrian scale lighting
Source: Joe Angeles / WUSTL Photos

Car Scale Wayfinding Vs Pedestrian Scale Wayfinding

Car scale wayfinding signage along Spencer Highway
Source: Halff

Pedestrian scale wayfinding signage
Source: ACS Inc

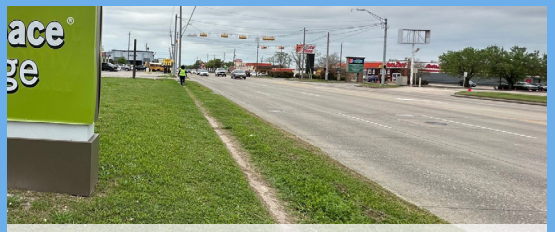
Pedestrian scale wayfinding signage in Convention District, Irving, TX
Source: H-GAC

Complete Streets

Complete Streets is an approach to planning, designing, and building streets that enables safe access for all users, including pedestrians, cyclists, motorists, and transit riders of all ages and abilities. A Complete Streets policy would provide clear direction for planning, design, and implementation of roadways that are accessible and safe for all road users of all ages and abilities. While providing Complete Streets is a process and approach to street design, there is no singular design prescription for Complete Streets.

A Complete Street may include sidewalks, bike lanes or sidepaths, dedicated bus lanes, comfortable and accessible bus stops, frequent and safe crosswalks, curb extensions, and narrower travel lanes. Well-designed Complete Streets reduce crashes, while having little or no impact on travel time.

'Incomplete' Streets in the Bay Area



Marie Street: only serves vehicles
Source: Halff

Section of Spencer Highway: only serves vehicles
Source: Halff

Complete Streets can improve mobility by:

- **Reducing additional cars on the road:** Complete Streets make it feasible for people to take alternative modes of transportation such as public transit, walking, or cycling rather than adding their cars to congested roads.
- **Encouraging people to try new modes:** To see a real change in congestion, other modes of transportation must be safe and attractive. For example, when sidewalks are maintained and connected, people will be more willing to walk regularly for shorter trips to school, work, or other destinations.
- **Doing more with less:** As infrastructure costs increase, opportunities to right-size roadways make themselves prevalent by performing road diets or lane reconfigurations.

Illustration of a complete street
Source: Stantec

Complete Street on a city scale:

City-scale complete street
Source: MRSC

Complete Street on a neighborhood scale:

Neighborhood-scale complete street
Source: City of Austin, Texas

Education and Awareness

Education programs provide opportunities for not only people walking and bicycling to enhance their skills and understand practical laws but also motorists and other transportation users to increase their knowledge of the rules of the road. Educational programs can be done through general public information settings, skill-building workshops, and student led activities.

Safe Routes to School

The primary purpose of Safe Routes to School (SRTS) programs and planning is to make it safer and easier for students to walk and bike to school. SRTS programs are typically pursued by cities and school districts, with initial funding often resulting from state or federal grants. SRTS implementation often sees benefits for both infrastructure and programming, including access to unique after school programs for students that would not have a method of traveling to and from school. It is noteworthy that the CDC has recognized SRTS as a program that is cost-effective and shows significant population health impacts within five years. The County should work with area school districts and campuses to establish a SRTS program. Identified infrastructure projects like traffic calming and sidewalk gap implementation projects may help in accomplishing safer routes to schools for area residents.

Students participating in Safe Routes to School program
Source: National Center for Safe Routes to School

Other key benefits of Safe Routes Partnership programs include:

- Cost savings for families and school districts due to lower transportation and transit costs, respectively
- Improved traffic safety and reduced numbers of severe and fatal crashes
- Reduced emissions and improved air quality due to reduced vehicle miles traveled
- Safety from crime from more activity on the streets
- Community connectedness
- Better academic performance

Bicycle Friendly Communities

The League of American Bicyclists (LAB) sets the criteria and establishes the designation of Bronze, Silver, Gold, or Platinum Bicycle Friendly Communities (BFCs) for cities throughout the United States. The criteria used to judge and award the BFC status relies on how the community's performance on policies, programs, and implementation in five broad areas: engineering, education, encouragement, evaluation, and equity. These areas, and the specifics within each, have been shown to make communities safer and more comfortable for bicyclists of all ages and abilities. The County should work with local municipalities to establish infrastructure and policies that support this designation.

Walk Friendly Communities

Similar to BFCs, Walk Friendly Communities (WFC) is a parallel recognition program that was developed to encourage cities across the country to support safer and more comfortable environments for people walking. The WFC program is supported and operated by the University of North Carolina's Highway Safety Research Center and is supported by the Pedestrian and Bicycle Information Center (PBIC), a national clearinghouse on walking, biking, and rolling funded by the US Department of Transportation. The County should work with local municipalities in implementing pedestrian infrastructure and policies that support this designation.

Walk Friendly Communities: City of Austin's "Walk Texas!" Campaign

The City of Austin is the only Walk Friendly Community in Texas, designated Silver-level for its targeted enforcement of safe speeds and yielding, ongoing pedestrian data monitoring, and comprehensive program and policy strategies. The city's Pedestrian Plan is a pillar of the Austin Strategic Mobility Plan, and six additional overlapping programs ensure that pedestrian mobility and safety are protected focus areas for the city. Finally, the city has implemented a community-driven program called "Walk Texas!" that encourages people to walk as part of a healthier and more environmentally-friendly lifestyle.

Similar to a SRTS program, Precinct 2 and local jurisdictions in the Study Area should encourage the use of active transportation to get to community events. Information should be provided to community residents and alternative travel modes should be promoted through event outreach efforts. It is important that Precinct 2 and local jurisdictions work with area law enforcement to enhance safety measures along key routes and at intersections where event is occurring. End of trip facilities can also be incorporated such as a bike valet and additional safe and secure bike parking locations.

Safety and Skills Training

Publicly accessible courses to teach traffic laws, rules of the road, and skills necessary to be safe while bicycling can be taught by the County and by partnering with other local organizations. H-GAC offers several bicycle safety and training classes that can be promoted through Precinct 2 and local jurisdictions in the Study Area. A better understanding of the applicable laws related to walking and bicycling needs to be understood by all members of the community.

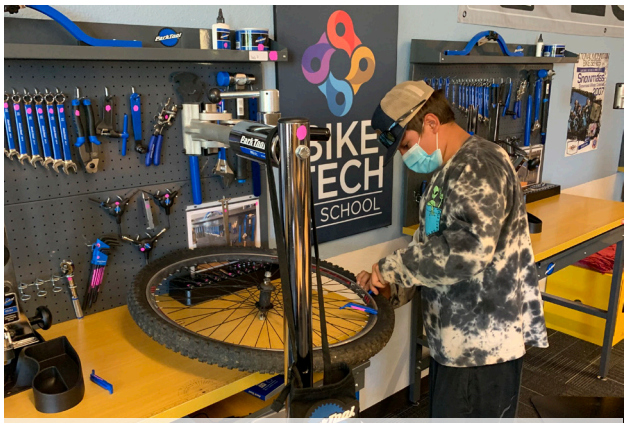
This effort can be coordinated with area advocacy groups, law enforcement, and other organizations to create a coordinated campaign to distribute information amongst all road users. TxDOT and H-GAC currently have ongoing efforts like public service announcements and media billboards to promote safe walking and bicycling along area roadways. The County should look to target educational and outreach materials to the target audience and work with local municipalities to encourage safe use of all users of the roadway.

H-GAC Bicycle Friendly Communities Event
Source: Bike Texas

Case Study: Project Bike Tech

Project Bike Tech (PBT) is a nonprofit organization based in Frisco, Colorado that provides comprehensive, hands-on bicycle education for youth. PBT programs offer technical training in bicycle mechanics, which prepares the youth for job opportunities within the bicycle industry. Additionally, students are introduced to the bicycle as an alternative source of transportation, an element of healthy living, and as a vehicle for connecting with the outdoors. From bicycle safety and basic roadside repair to bicycle culture and career opportunities, PBT encourages communities to explore the benefits of adopting a cycling lifestyle.

PBT offers an accredited two-year high school curriculum that results in certification of bicycle technicians for the outdoor cycling industry. PBT also provides a great introduction to the principles of fabrication, marketing, mechanical engineering, and other STEM topics while teaching valuable business and life skills.



Student learning at Project Bike Tech course
Source:ProjectBikeTech.org

Demonstration Projects

To raise awareness for walking and cycling as convenient and comfortable modes of transportation to and from school, quick build projects can get cycling and walking infrastructure built in months, rather than years. Quick build demonstration projects can help promote SRTS and provide low-cost temporary installations that can pilot potential long-term solutions to improve walking and cycling, vehicle travel, and public spaces.

Demonstration projects such as painted bulb-outs and crosswalks allow the community to see how traffic calming devices would work in their neighborhood or near their school before a more permanent application is installed, allowing new types of infrastructure to be better understood, supported, and achieved throughout the community. One location where a demonstration project could occur is along Falcon Pass Blvd. between Space Center Blvd. and Krueger Way. As a four-lane roadway, potential demonstration projects could include curb extensions to reduce crossing distances while providing for safe pick up and drop off opportunities.

Organizations such as the American Association of Retired Persons (AARP) and Better Block provide materials for communities to create pop-up infrastructure demonstration in their own cities. AARP's Pop-Up Placemaking Tool Kit provides placemaking "recipes" for demonstrating and implementing positive change in public spaces.

Team Better Block Project in Des Moines
Source: Better Block

5 CHAPTER FIVE IMPLEMENTATION


Clear Lake

Implementation & Funding Roadmap

This Plan sets an ambitious vision for an integrated bicycle and pedestrian network that provides safe and accessible connectivity opportunities for area residents. This chapter establishes a basic framework for implementation and discusses different funding mechanisms that can be leveraged to implementation many of the projects and programs identified in Chapter 3, *Opportunity Analysis*.

The successful implementation of the plan recommendations will depend on coordination efforts among multiple jurisdictions. While the local sponsor of this plan is Harris County Precinct 2, member agencies such as La Porte, Seabrook, Friendswood, and Pearland could also serve as implementing partners.

It will be important to consider each project category in relation to improving safety for all road users. The project categories include sidewalks, bicycle and trail facilities, intersections, and trail crossings. Projects are quantified not only by their order-of-magnitude costs but also the potential benefit/cost ratio.

The following tables represent each project category and include the following information:

- **Project Type:** one of four categories developed by project team.
- **Description:** project recommendation based on type of project.
- **Length:** estimate length in miles for project.
- **Timeframe:** short (1-2 years), medium (2-5 years), and long-term (5-10 years).
- **Lead:** agency responsible for lead implementation/construction of project. Assumption based on jurisdictional boundaries.
- **Partner:** entity that could partner with lead agency to implement project. This is an assumption based on jurisdictional boundaries.
- **Project Cost:** order-of-magnitude cost developed based on most recent TxDOT bid tabs along with professional engineering judgement from similar projects.
- **Benefit/Cost Ratio:** related to the USDOT BCA guide, this ratio is calculated using the cost associated with the project as well as the assumed service life of infrastructure and expected walking/biking trips per the H-GAC ACE Tool. The BCR is a high-level estimate with the higher score representing the greater return on investment.
- **Combined CMF:** Like the benefit/cost ratio, the combined CMF represents the crash modification factor for the applied recommendations at the intersection/crossing location. This data is related to the total crash reduction if project was implemented.

More information related to the methodology / approach for calculating the benefit / cost ratio can be found in Appendix E.

Sidewalk Projects

Project ID	Segment	From	To	Description	Length (Mi)	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
SW_1	Sageglen Dr.	Hughes Rd.	Scarsdale Blvd.	Construct 6' sidewalks	0.84	Medium	Harris County	Houston	$700,670.04	4.5
SW_2	Gemini St.	Saturn Ln.	Space Center Blvd.	Construct 6' sidewalks	0.93	Medium	Houston	Harris County	$769,427.80	4.2
SW_3	W. G St.	S. 9th St.	San Jacinto St.	Construct 6' sidewalks	0.90	Medium	La Porte	Harris County	$745,537.96	3.0
SW_4	Friendswood Link Rd.	El Dorado Blvd.	Bay Area Blvd.	Construct 6' sidewalks	1.13	Medium	Harris County	Friendswood	$940,534.00	2.9
SW_5	Diana Ln.	Bay Area Blvd.	Hercules Ave.	Construct 6' sidewalks	0.34	Short	Houston	Harris County	$279,396.60	13.8
SW_6	Hall Rd.	S. Sam Houston Pkwy. E.	Southbluff Blvd.	Construct 6' sidewalks	0.50	Short	Harris County	TBD	$418,809.63	0.0
SW_7	Feather Craft Ln.	Gemini St.	Medical Center Blvd.	Construct 6' sidewalks	0.35	Short	Houston	Harris County	$289,686.67	0.0
SW_8	Falcon Pass Dr.	Space Center Blvd.	Moon Rock Dr.	Construct 6' sidewalks	0.25	Short	Houston	Harris County	$207,666.80	4.0
SW_9	Farrington St.	Fairmont Pkwy.	Collingswood Rd.	Construct 6' sidewalks	0.49	Medium	Pasadena	Harris County	$406,167.00	5.6
SW_10	Hall Rd.	Beamer Rd.	Blackhawk Blvd.	Construct 6' sidewalks	0.84	Medium	Harris County	TBD	$699,540.14	5.2
SW_11	E. Meyer Rd.	Repsdorph Rd.	Todville Rd.	Construct 6' sidewalks	1.38	Medium	Seabrook	Harris County	$1,144,248.13	1.4
SW_12	Beamer Rd.	FM 2351	BW 8	Construct 12' shared use path	4.27	Medium	Harris County	TBD	$8,378,649.48	6.0
SW_13	Broadway St./SH 501	Shady Ln.	E. Main. St.	Construct 12' shared use path	3.48	Medium	La Porte	Harris County	$6,833,750.31	2.3
SW_14	Spencer Hwy.	BW 8	Broadway St.	Construct 12' shared use path	8.25	Medium	Harris County	TxDOT	$16,191,327.20	4.8
SW_15	Space Center Blvd.	Spencer Hwy.	NASA Pkwy.	Construct 12' shared use path	10.76	Medium	Harris County	TBD	$21,112,641.78	2.4
SW_16	Glenwest Dr.	Baybrook Vlg.	El Dorado Blvd.	Construct 12' shared use path	1.13	Medium	Harris County	Houston	$2,215,433.82	33.3
SW_17	N. Kobayashi Rd.	Medical Center Blvd.	S. Texas Ave.	Construct 6' sidewalks	0.79	Medium	Webster	Harris County	$658,532.54	4.8
SW_18	S. Kobayashi Rd.	S. Texas Ave.	Gulf Fwy.	Construct 12' shared use path	0.84	Medium	Webster	Harris County	$1,649,724.66	9.1
SW_19	E. Medical Center Blvd./ Hercules Ave.	N. Sarah Deel Rd.	Saturn Ln.	Construct 12' shared use path	0.86	Medium	Houston	Webster, Harris County	$1,688,829.73	22.9
SW_20	Space Park Dr.	Nassau Bay Dr.	Upper Bay Rd.	Construct 6' sidewalks	0.72	Medium	Nassau Bay	Harris County	$593,881.32	4.8
SW_21	Ramada Dr.	Sea Liner Dr.	Reseda Dr.	Construct 6' sidewalks	0.77	Medium	Houston	Harris County	$638,761.86	7.6
SW_22	Hughes Rd.	BW 8	PCT Boundary	Construct 12' shared use path	3.50	Medium	Harris County	Pearland	$6,860,616.86	6.8
SW_23	Bay Shore Dr.	Cedar St.	Oak Grove Ave.	Construct 6' sidewalks	1.30	Medium	Harris County	La Porte	$1,081,605.94	1.6

On-street Bicycle Projects

Project ID	Segment	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
B_1	Kirkville Dr	BW 8	Blackhawk Blvd	0.72	Bike Boulevard	M-L	Harris County	TBD	$11,055.43	35
B_2	Kirkfair Drive	Beamer Rd	Blackhawk Blvd	0.99	Bike Boulevard	M-L	Harris County	TBD	$15,228.33	60
B_3	Hall Rd	Beamer Rd	Blackhawk Blvd	0.84	Bike Boulevard	M-L	Harris County	TBD	$12,964.66	164
B_4	Riverstone Ranch Rd	Blackhawk Blvd	Highland Meadows Dr	1.71	Bike Boulevard	M-L	Harris County	TBD	$26,265.46	59
B_5	Riverstone Falls Dr	Hughes Rd	Dry Willow Ln	0.63	Bike Boulevard	M-L	Harris County	TBD	$9,766.13	42
B_6	Meadow Wind Dr / Hughes Ranch Rd	Riverstone Falls Dr	Blackhawk Blvd	1.12	Bike Boulevard	M-L	Harris County	TBD	$17,230.20	37
B_7	Sageglen Dr	Hughes Rd	Scarsdale Blvd	0.85	On-Street Bike Lane	M-L	Harris County	TBD	$451,206.29	93
B_8	Sagedowne Ln	Sagedowne Ln	IH 45	1.07	Bike Boulevard	M-L	Houston	Harris County	$16,468.68	60
B_9	Sagecreek Dr	Hughes Rd	Scarsdale Blvd	0.77	Bike Boulevard	M-L	Harris County	TBD	$11,787.99	66
B_10	Olivewood Dr	Beamer Rd	Sageglen Dr	0.70	Bike Boulevard	M-L	Harris County	TBD	$10,735.73	101
B_11	Sagewood / Sageglow Dr	Beamer Rd	Blackhawk Blvd	1.22	Bike Boulevard	M-L	Harris County	TBD	$18,746.54	52
B_12	Astoria Blvd	Blackhawk Blvd	Beamer Rd	1.20	Bike Boulevard	M-L	Harris County	TBD	$18,544.90	51
B_13	Astoria Blvd	Beamer Rd	IH 45	1.46	On-Street Bike Lane	M-L	Houston	Harris County	$772,125.04	19
B_14	Ryewater Dr	Fairbury Dr	Turkey Creek	0.19	Bike Boulevard	M-L	Houston	Harris County	$2,849.53	92
B_15	Fairbury Dr	Gotham Dr	Ryewater Dr	0.59	Bike Boulevard	M-L	Houston	Harris County	$9,025.17	60
B_16	Teaneck Dr / Flushing Meadows Dr	Astoria	Gotham Dr	1.26	Bike Boulevard	M-L	Houston	Harris County	$19,382.35	43
B_17	Tall Ships Ln	Beamer Rd	Hope Village Rd	0.60	Bike Boulevard	M-L	Harris County	TBD	$9,167.10	69
B_18	Rex Rd	Beamer Rd	Hope Village Rd	0.63	Bike Boulevard	M-L	Harris County	TBD	$9,657.43	23
B_19	Hope Village Rd	Edgewood Ave	Bisontine St	1.03	Bike Boulevard	M-L	Harris County	TBD	$15,852.10	49
B_20	Signal Hill Dr	El Dorado Blvd	Friendswood Link Rd	0.65	Bike Boulevard	M-L	Harris County	TBD	$10,044.78	84
B_21	Laura Leigh Dr	Forest Bend Park	Friendswood Link Rd	0.42	Bike Boulevard	M-L	Friendswood	Harris County	$6,485.62	123
B_22	Pilgrims Point Dr	Tall Ships Ln	Heritage Colony Dr	1.65	Bike Boulevard	M-L	Harris County	TBD	$25,388.77	79
B_23	Fife Ln	Sailors Moon Dr	Heritage Colony Dr	0.88	Bike Boulevard	M-L	Harris County	TBD	$13,557.25	63
B_24	Tristar Dr	SH 3	Horsepen Bayou	0.65	On-Street Bike Lane	M-L	Houston	Harris County	$344,959.77	0
B_25	Kensington Pl	Tristar Dr	Barrow Downs Way	0.76	Bike Boulevard	M-L	Houston	Harris County	$11,620.22	0
B_26	Upper Bay Rd	3rd St	Park Rd	1.24	On-Street Bike Lane	M-L	Harris County	TBD	$654,393.85	25
B_27	Point Lookout Dr	San Sebastian Ln	2nd St	0.59	On-Street Bike Lane	M-L	Harris County	TBD	$314,368.39	118
B_28	Second St	Saturn Ln	NASA Campus	1.26	On-Street Bike Lane	M-L	Houston	Harris County	$666,085.50	0
B_29	Space Park Dr	Nassau Bay Dr	Houston Methodist Dr	0.96	On-Street Bike Lane	M-L	Harris County	TBD	$510,612.34	10
B_30	Houston Methodist Dr	NASA Pkwy	Space Park Dr	0.26	Bike Boulevard	M-L	Harris County	TBD	$4,039.07	0

On-street Bicycle Projects, Continued

Project ID	Segment	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
B_31	Sun Ct	NASA Pkwy	Space Park Dr	0.23	Bike Boulevard	M-L	Harris County	TBD	$3,507.10	0
B_32	Space Park Dr	Sun Ct	Upper Bay Rd	0.35	Bike Boulevard	M-L	Harris County	TBD	$5,389.31	0
B_33	San Sebastian Ln / Cape Bahamas Dr	Nassau Bay Dr	Upper Bay Rd	0.74	Bike Boulevard	M-L	Harris County	TBD	$11,362.27	0
B_34	Nassau Bay Dr	NASA Pkwy	Cape Bahamas Dr	0.52	Bike Boulevard	M-L	Harris County	TBD	$7,960.10	113
B_35	Point Lookout Dr	San Sebastian Ln	Park Rd	0.68	Bike Boulevard	M-L	Harris County	TBD	$10,535.47	37
B_36	Barbuda Ln	Cap Bahamas Dr	Point Lookout Dr	0.42	Bike Boulevard	M-L	Harris County	TBD	$6,437.06	0
B_37	Park Rd	Upper Bay Rd	Point Lookout Dr	0.34	Bike Boulevard	M-L	Harris County	TBD	$5,203.91	0
B_38	Water St		Rita Blanca Dr	1.11	Bike Boulevard	M-L	Webster	Harris County	$17,029.38	4
B_39	Magnolia Ave	IH 45	SH 3	0.98	Bike Boulevard	M-L	Webster	Harris County	$15,066.10	0
B_40	Walnut St	Linda Ln	Magnolia Ave	0.87	Bike Boulevard	M-L	Webster	Harris County	$13,386.78	67
B_41	Pennsylvania Ave	Walnut St	SH 3	0.31	Bike Boulevard	M-L	Webster	Harris County	$4,841.84	106
B_42	Travis St	Texas Ave	SH 3	0.48	Bike Boulevard	M-L	Webster	Harris County	$7,383.10	0
B_43	Kobayashi Rd	Jasmine	Texas Ave	0.79	Bike Boulevard	M-L	Webster	Harris County	$12,216.32	79
B_44	Live Oak St	Bya Area Blvd	Orchard St	0.25	Bike Boulevard	M-L	Webster	Harris County	$3,845.29	0
B_45	Orchard St	Texas Ave	SH 3	0.48	Bike Boulevard	M-L	Webster	Harris County	$7,369.27	0
B_46	SH 3	BW 8	Study Area Boundary	8.51	On-Street Bike Lane	L	TxDOT	Harris County	$4,508,728.72	10
B_47	Pipers View Dr	El Dorado Blvd	Wedgerock Dr	1.02	Bike Boulevard	M-L	Houston	Harris County	$15,705.26	134
B_48	Eastcape Dr	El Dorado Blvd	El Toro Ln	0.56	Bike Boulevard	M-L	Houston	Harris County	$8,622.87	140
B_49	El Toro Ln	Cul de sac	Cul de sac	0.47	Bike Boulevard	M-L	Houston	Harris County	$7,283.64	0
B_50	Ironbark Dr	Eastcape Dr		0.37	Bike Boulevard	M-L	Houston	Harris County	$5,739.40	0
B_51	Pineloch Dr		SH 3	0.23	Bike Boulevard	M-L	Houston	Harris County	$3,529.76	162
B_52	Pineloch Dr	SH 3	Bay Oaks Blvd	2.20	On-Street Bike Lane	M-L	Houston	Harris County	$1,163,207.38	35
B_53	Broadlawn Dr	Gemini St	Space Center Blvd	0.43	On-Street Bike Lane	M-L	Houston	Harris County	$228,640.16	38
B_54	Feathercraft Ln	Bay Area Blvd	Medical Center Blvd	0.52	On-Street Bike Lane	M-L	Houston	Harris County	$278,029.95	0
B_55	El Camino Real	Clear Lake City Blvd		0.21	Bike Boulevard	M-L	Houston	Harris County	$3,160.86	151
B_56	Diana Ln	Hercules		1.86	Bike Boulevard	M-L	Houston	Harris County	$28,682.95	0
B_57	Diana Ln		Penn Hills	0.36	Bike Boulevard	M-L	Houston	Harris County	$5,542.36	0
B_58	Holy Trail Dr	Gemini	Ash Arbor Way	0.27	Bike Boulevard	M-L	Houston	Harris County	$4,191.25	0
B_59	Ash Arbor Way	Hercules	Holy Trail Dr	0.16	Bike Boulevard	M-L	Houston	Harris County	$2,531.04	261
B_60	College Green Dr	Holy Trail Dr	Broadlawn Dr	0.76	Bike Boulevard	M-L	Houston	Harris County	$11,671.75	0
B_61	Ivy Grove Dr	Gemini	College Green Dr	0.53	Bike Boulevard	M-L	Houston	Harris County	$8,167.85	0

On-street Bicycle Projects, Continued

Project ID	Segment	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
B_62	Thunder Bay	El Dorado Blvd	Shell Lake Dr	0.67	Bike Boulevard	M-L	Houston	Harris County	$10,283.13	93
B_63	Shell Lake Dr	Voyager Dr	Sealiner	0.34	Bike Boulevard	M-L	Houston	Harris County	$5,257.27	229
B_64	Reseda Dr	Sealiner	Gemini	1.11	On-Street Bike Lane	M-L	Houston	Harris County	$586,008.04	71
B_65	Seawolf	Bay Area Blvd	Voyager Dr	0.35	Bike Boulevard	M-L	Houston	Harris County	$5,349.19	215
B_66	Voyager Dr	Shell Lake Dr	Seawolf	0.05	Bike Boulevard	M-L	Houston	Harris County	$789.13	1506
B_67	Ramada / Neptune Ln	Seawolf	Torry Pines	2.12	On-Street Bike Lane	M-L	Houston	Harris County	$1,123,764.63	20
B_68	Torry Pines	Penn Hills	Reseda Dr	1.12	Bike Boulevard	M-L	Houston	Harris County	$17,233.08	0
B_69	Fairwind Rd	Neptune	Reseda Dr	0.47	Bike Boulevard	M-L	Houston	Harris County	$7,159.19	69
B_70	Penn Hills	Pineloch Dr	Tory Pines	0.69	Bike Boulevard	M-L	Houston	Harris County	$10,608.57	69
B_71	Seakale Ln	Bay Area Blvd	Ramada	0.28	Bike Boulevard	M-L	Houston	Harris County	$4,345.05	0
B_72	Oak Harbor / Pebbleshire	Manor Hill Dr	El Camino Real	1.12	On-Street Bike Lane	M-L	Houston	Harris County	$591,051.29	29
B_73	Manor Hill Dr	Redwood Bend Trl	Kelbrook Dr	0.58	Bike Boulevard	M-L	Houston	Harris County	$8,871.24	65
B_74	Woodhorn Dr	Pebbleshire Dr	Diana Ln	0.73	Bike Boulevard	M-L	Houston	Harris County	$11,232.83	67
B_75	Crescent Landing Dr	Sylvan Rodriguez Park		0.65	On-Street Bike Lane	M-L	Houston	Harris County	$343,883.97	10
B_76	Crescent Landing Dr	Laurel Shadows Ct		0.15	Bike Boulevard	M-L	Houston	Harris County	$2,376.43	0
B_77	Village Evergreen Trail	Pineloch Dr	Crescent Landing Dr	0.59	On-Street Bike Lane	M-L	Houston	Harris County	$314,105.64	0
B_78	Redwood Bend Trail	El Camino Real	Village Evergreen Trl	0.74	Bike Boulevard	M-L	Houston	Harris County	$11,387.70	0
B_79	Diamond Brook Dr / Mabry Mill Rd	El Camino Real	Sun Harbor Dr	1.50	Bike Boulevard	M-L	Houston	Harris County	$23,009.90	0
B_80	Whitlock Dr	Diamond Brook Dr	Oak Chase Dr	0.48	Bike Boulevard	M-L	Houston	Harris County	$7,323.18	86
B_81	Sun Harbor Dr	Whitlock Dr	Trowbridge Dr	1.04	Bike Boulevard	M-L	Houston	Harris County	$16,042.01	51
B_82	New Cedars Dr	Space Center Blvd	Oak Chase Dr	0.36	Bike Boulevard	M-L	Houston	Harris County	$5,596.59	152
B_83	Oak Chase Dr	Space Center Blvd	Sun Harbor Dr	0.77	Bike Boulevard	M-L	Houston	Harris County	$11,822.41	73
B_84	Lofty Mountain Trl / Island Oak St	Clear Lake City Blvd	Pineloch Dr	0.80	Bike Boulevard	M-L	Houston	Harris County	$12,352.34	0
B_85	Greenwood Oaks Ln	Space Center Blvd	Pineloch Dr	0.35	Bike Boulevard	M-L	Houston	Harris County	$5,440.32	0
B_86	Bay Oaks Blvd / Acorn Wood Way	Clear Lake City Blvd	Oak Links Ave	1.66	Bike Boulevard	M-L	Houston	Harris County	$25,611.58	19
B_87	Oak Links Ave	Bay Oaks Blvd	Parkwood Way	1.25	Bike Boulevard	M-L	Houston	Harris County	$19,199.17	0
B_88	Almond Creek Dr	Vilage Dale Ave	Oak Links Ave	1.07	Bike Boulevard	M-L	Houston	Harris County	$16,521.02	22
B_89	Village Dale Ave / Leafy Glen Dr	Space Center Blvd	Space Center Blvd	1.15	Bike Boulevard	M-L	Houston	Harris County	$17,719.09	24
B_90	Sunrise Lake Dr	Space Center Blvd	El Dorado Blvd	0.42	Bike Boulevard	M-L	Houston	Harris County	$6,438.63	35
B_91	Brookgreen Dr	El Dorado Oaks Dr	Hickory Knoll	0.55	Bike Boulevard	M-L	Houston	Harris County	$8,518.24	77
B_92	Royalfield Dr	Cedar Ridge Trail	Hickory Knoll Dr	0.48	Bike Boulevard	M-L	Houston	Harris County	$7,369.14	76
B_93	Running Spring Dr	Hickory Knoll Dr	Brook Forest Dr	0.58	Bike Boulevard	M-L	Houston	Harris County	$9,001.86	58
B_94	Plum Hollow Dr	Hickory Knoll Dr	Brook Forest Dr	0.76	Bike Boulevard	M-L	Houston	Harris County	$11,745.71	48

On-street Bicycle Projects, Continued

Project ID	Segment	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
B_95	Hickory Knoll	El Dorado Blvd	Middlebrook Dr	0.73	On-Street Bike Lane	M-L	Houston	Harris County	$387,064.62	71
B_96	Brook Forest / Bayou Blvd	El Dorado Blvd	Middlebrook Dr	2.09	On-Street Bike Lane	M-L	Houston	Harris County	$1,105,915.66	8
B_97	Park Shadows Trl	Middlebrook Dr	Mighty Redwood Dr	1.01	Bike Boulevard	M-L	Pasadena	Harris County	$15,514.71	25
B_98	Walnut Pond Dr	Middlebrook Dr	Middle Forest Dr	0.48	Bike Boulevard	M-L	Pasadena	Harris County	$7,430.28	48
B_99	Roaring Rapids Dr	Ridgewood Canyon Dr	Park Shadows Trl	0.46	Bike Boulevard	M-L	Pasadena	Harris County	$7,009.11	0
B_100	Middle Forest Dr	Walnut Pond Dr	Mighty Redwood Dr	0.24	Bike Boulevard	M-L	Pasadena	Harris County	$3,768.68	0
B_101	Raven River Dr	Village Corner Dr	Middlebrook Dr	0.46	Bike Boulevard	M-L	Pasadena	Harris County	$7,063.46	0
B_102	Ridgewood Canyon Dr	Bay Area Blvd	Raven River Dr	0.34	Bike Boulevard	M-L	Pasadena	Harris County	$5,163.06	0
B_103	Falcon Pass	Space Center Blvd	University Dr	0.56	Bike Boulevard	M-L	Houston	Harris County	$8,610.49	220
B_104	Bay Forest Dr	Orchard Falls Dr	Lake Lodge Dr	0.33	Bike Boulevard	M-L	Houston	Harris County	$5,107.51	0
B_105	Krueger Way / University Dr	Bayou Blvd		0.70	On-Street Bike Lane	M-L	Houston	Harris County	$373,046.89	25
B_106	Old Kirby Rd	Kirby Rd	Red Bluff Rd	0.99	On-Street Bike Lane	M-L	Harris County	TBD	$525,344.74	10
B_107	Repsdorph Rd / E Meyer Ave	Lakeside Blvd	Toddville Rd	1.38	On-Street Bike Lane	M-L	Harris County	TBD	$731,343.80	32
B_108	Lakeshore Dr	NASA Pkwy	White Cap	1.30	Bike Boulevard	M-L	Harris County	TBD	$20,081.69	0
B_109	White Cap	Lakeshore Dr	Loch Lake Dr	0.36	Bike Boulevard	M-L	Harris County	TBD	$5,581.65	73
B_110	Meyer Ave	2nd St	SH 146	0.17	Bike Boulevard	M-L	Harris County	TBD	$2,605.27	0
B_111	N Meyer Ave	2nd St	E Meyer Ave	1.02	On-Street Bike Lane	M-L	Harris County	TBD	$539,306.59	22
B_112	El Mar Ln	SH 146	N Meyer Ave	0.60	On-Street Bike Lane	M-L	Seabrook	Harris County	$318,700.38	50
B_113	Delabrook	SH 146	Meyer Ave	0.41	Bike Boulevard	M-L	Seabrook	Harris County	$6,365.90	119
B_114	Bahama Dr	El Mar Ln	Delabrook	0.25	Bike Boulevard	M-L	Seabrook	Harris County	$3,852.43	0
B_115	Park Dr	Mystic Village Ln	Red Bluff Rd	0.40	Bike Boulevard	M-L	Harris County	TBD	$6,154.60	0
B_116	Mystic Village Ln	Toddville Rd	Park Dr	0.36	Bike Boulevard	M-L	Seabrook	Harris County	$5,576.22	50
B_117	El Jardin Dr	Toddville Rd		0.70	On-Street Bike Lane	M-L	Seabrook	Harris County	$372,657.97	0
B_118	Shoreacres Blvd	Bay Area Blvd	Shore Acres Cir	2.39	On-Street Bike Lane	M-L	Harris County	TBD	$1,266,076.65	0
B_119	Sunrise Dr	Fairfield Ave		0.74	On-Street Bike Lane	M-L	Harris County	TBD	$389,385.97	0
B_120	Fairfield Ave	Old Hwy 146	Miramar Dr	0.55	On-Street Bike Lane	M-L	Harris County	TBD	$290,944.73	8
B_121	Baywood Ave	Sunrise Dr	Miramar Dr	0.37	On-Street Bike Lane	M-L	Harris County	TBD	$194,318.56	0
B_122	Bayshore Dr	San Jacinto	Seabreeze Ave	0.58	On-Street Bike Lane	M-L	La Porte	Harris County	$307,806.83	0
B_123	Main St	Broadway St	Ohio Ave	0.39	On-Street Bike Lane	M-L	La Porte	Harris County	$203,997.04	62
B_124	Ohio Ave	Main St		0.24	Bike Boulevard	M-L	La Porte	Harris County	$3,619.89	0
B_125	Kansas St	Park Dr	Main St	0.75	Bike Boulevard	M-L	La Porte	Harris County	$11,467.23	0
B_126	G St	Texas St	Ohio Ave	0.61	Bike Boulevard	M-L	La Porte	Harris County	$9,373.03	0

On-street Bicycle Projects, Continued

Project ID	Segment	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
B_127	Texas St	G St	Fairmont Pkwy	0.27	Bike Boulevard	M-L	La Porte	Harris County	$4,130.64	0
B_128	C St	Broadway St	Ohio Ave	0.50	On-Street Bike Lane	M-L	La Porte	Harris County	$266,088.99	0
B_129	G St	Texas St	8th St	0.56	Bike Boulevard	M-L	La Porte	Harris County	$8,661.88	0
B_130	C St	8th St	Broadway St	0.51	Bike Boulevard	M-L	La Porte	Harris County	$7,774.34	0
B_131	A St	8th St	Broadway St	0.50	Bike Boulevard	M-L	La Porte	Harris County	$7,751.99	0
B_132	8th St	Spencer Hwy	Fairmont Pkwy	0.89	Bike Boulevard	M-L	Harris County	TBD	$13,714.42	0
B_133	4th St	Spencer Hwy	Fairmont Pkwy	0.89	Bike Boulevard	M-L	La Porte	Harris County	$13,735.34	0
B_134	Wharton Wheems Blvd	16th St	Old Hwy 146	1.00	On-Street Bike Lane	M-L	La Porte	Harris County	$530,247.99	7
B_135	16th St	Spencer Hwy	McCabe Rd	2.41	On-Street Bike Lane	M-L	Harris County	TBD	$1,276,681.77	0
B_136	Driftwood	Spencer Hwy	Fairmont Pkwy	0.91	On-Street Bike Lane	M-L	Harris County	TBD	$480,742.50	16
B_137	Farrington St	Spencer Hwy	Fairmont Pkwy	0.91	On-Street Bike Lane	M-L	Harris County	TBD	$481,084.58	27
B_138	Rustic Gate Rd	Caniff Rd	Roseberry Dr	1.03	On-Street Bike Lane	M-L	La Porte	Harris County	$544,561.64	29
B_139	Vista Rd	BW 8	Red Bluff Rd	1.61	On-Street Bike Lane	M-L	Pasadena	Harris County	$851,496.31	16
B_140	Valleybrook Dr	Spencer Hwy		1.44	Bike Boulevard	M-L	La Porte	Harris County	$22,189.40	9
B_141	Fleetwood Dr	Spencer Hwy	Mesquite Dr	0.61	Bike Boulevard	M-L	La Porte	Harris County	$9,438.53	63
B_142	Catlett Ln	Carlow Ln	Farrington St	0.79	Bike Boulevard	M-L	La Porte	Harris County	$12,159.77	0
B_143	Roseberry Dr	Myrtle Creek Dr	Willmont Rd	1.14	Bike Boulevard	M-L	La Porte	Harris County	$17,529.88	0
B_144	Willmont Rd	Cedarmont Dr	Fairmont Pkwy	0.68	Bike Boulevard	M-L	La Porte	Harris County	$10,502.70	17
B_145	Cedarmont Dr	Rocky Hollow Rd	Rosberry Dr	0.74	Bike Boulevard	M-L	La Porte	Harris County	$11,324.48	0
B_146	Somerton Dr	Spencer Hwy	Venture Ln	0.63	Bike Boulevard	M-L	La Porte	Harris County	$9,633.76	58
B_147	Brookwood Dr	Farimont Pkwy		0.51	Bike Boulevard	M-L	La Porte	Harris County	$7,876.28	31
B_148	Venture Ln	Luella blvd	Gladwyne Ln	0.55	Bike Boulevard	M-L	La Porte	Harris County	$8,435.18	0
B_149	Gladwyne Ln	Ashwyne Ln	Orchard Ln	0.43	Bike Boulevard	M-L	La Porte	Harris County	$6,560.14	19
B_150	Bandridge Rd	Scotch Moss Ln	Somerton Dr	0.33	Bike Boulevard	M-L	La Porte	Harris County	$5,059.30	0
B_151	Fernrock Dr	Spencer Hwy	Oakhaven Rd	0.37	Bike Boulevard	M-L	La Porte	Harris County	$5,745.68	97
B_152	Ashton Ln	Oakhaven Rd	Venture Ln	0.18	Bike Boulevard	M-L	La Porte	Harris County	$2,796.66	0
B_153	Carlow Ln	Canada St	Underwood Rd	0.68	Bike Boulevard	M-L	La Porte	Harris County	$10,491.59	0
B_154	Clarkville St	Spencer Hwy		0.36	Bike Boulevard	M-L	La Porte	Harris County	$5,608.12	0
B_155	Stonemont Rd	Underwood Rd	Parkmont Dr	0.30	Bike Boulevard	M-L	La Porte	Harris County	$4,674.79	178
B_156	Myrtle Creek Dr	Spencer Hwy	Cedarmont Dr	0.12	Bike Boulevard	M-L	La Porte	Harris County	$1,777.38	506
B_157	Carlow Ln	Cedarmont Dr	Parkmont Dr	0.18	Bike Boulevard	M-L	La Porte	Harris County	$2,846.23	0
B_158	Parkmont Dr	Carlow Ln	Willmont Rd	0.17	Bike Boulevard	M-L	La Porte	Harris County	$2,544.37	0
B_159	Schochler Dr / Oakhaven Rd	Cunningham Dr	Venture Ln	0.44	On-Street Bike Lane	M-L	Pasadena	Harris County	$232,673.74	31
B_160	Knob Hill Ave	Red Bluff Rd		0.69	Bike Boulevard	M-L	Pasadena	Harris County	$10,620.70	0

On-street Bicycle Projects, Continued

Project ID	Segment	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
B_161	Trebor St	Spencer Hwy	Space Center Blvd	0.49	Bike Boulevard	M-L	Harris County	TBD	$7,576.26	108
B_162	Crestford Ln	Space Center Blvd	Olson Ln	0.53	Bike Boulevard	M-L	Harris County	TBD	$8,189.58	0
B_163	Crestgrove Dr	Crestford Ln	Olson Ln	0.30	Bike Boulevard	M-L	Pasadena	Harris County	$4,582.59	0
B_164	Country Rd	Bliss Meadows Park	France Ln	1.09	Bike Boulevard	M-L	Pasadena	Harris County	$16,718.82	51
B_165	Fairway Plaza Dr	BW 8	Fairmont Pkwy	0.55	Bike Boulevard	M-L	Pasadena	Harris County	$8,457.48	0
B_166	France Ln	Nations Dr	Space Center Blvd	0.32	Bike Boulevard	M-L	Pasadena	Harris County	$4,935.71	154
B_167	St Andrews Dr	Space Center Blvd	Baywood Dr	0.35	Bike Boulevard	M-L	Pasadena	Harris County	$5,311.10	108
B_168	Anthony Ln	Crenshaw Rd	Genoa Red Bluff Rd	0.44	Bike Boulevard	M-L	Pasadena	Harris County	$6,739.41	44
B_169	Baywood Dr	St Andrews Dr	Genoa Red Bluff Rd	0.43	Bike Boulevard	M-L	Pasadena	Harris County	$6,665.14	0
B_170	Woodland Dr	Cedar Ln	Lake Bluff Dr	0.85	Bike Boulevard	M-L	Harris County	TBD	$13,022.44	0
B_171	Gunwale	Neptune Ln	Space Center Blvd	0.30	On-Street Bike Lane	M-L	Houston	Harris County	$158,561.60	0
B_172	Parkwood Way	El Dorado Blvd		0.43	Bike Boulevard	M-L	Houston	Harris County	$6,637.87	78
B_173	Lake Lodge Dr	Bay Forest Dr	Moonrock Dr	0.56	Bike Boulevard	M-L	Houston	Harris County	$8,591.18	0
B_174	Scenic View Dr	Bay Forest Dr	Greenwood Pines Dr	0.58	Bike Boulevard	M-L	Houston	Harris County	$9,000.63	60
B_175	Hammer St	Meyer Ave	Toddville Rd	0.33	Bike Boulevard	M-L	Harris County	TBD	$5,049.79	0
B_176	Green Tee Dr	Country Club Dr	Golfcrest Dr	1.83	Bike Boulevard	M-L	Green Tee HOA	Harris County	$28,170.99	13
B_177	Sealiner	Reseda Dr	Shell Lake Dr	0.13	On-Street Bike Lane	M-L	Houston	Harris County	$68,143.59	176
B_178	Seabreeze Ave	Bayshore Dr		0.42	Bike Boulevard	M-L	La Porte	Harris County	$6,395.71	0
B_179	Park Center Dr	Clear Lake City Blvd	El Dorado Oaks Dr	0.25	Bike Boulevard	M-L	Houston	Harris County	$3,875.29	50
B_180	El Dorado Oaks Dr	Park Center Dr	Brookgreen Dr	0.25	Bike Boulevard	M-L	Houston	Harris County	$3,785.18	0
B_181	Chapel Park Way	Clear Lake City Blvd	Cedar Ridge Trl	0.29	Bike Boulevard	M-L	Houston	Harris County	$4,539.31	0
B_182	Cedar Ridge Trl	Chapel Park Way	Royalfield Dr	0.13	Bike Boulevard	M-L	Houston	Harris County	$1,947.75	0
B_183	Orchard Falls Dr	Space Center Blvd	Bay Forest Dr	0.15	Bike Boulevard	M-L	Houston	Harris County	$2,346.26	81
B_184	Scotch Moss Ln	Spencer Jwy	Oakhaven Rd	0.37	Bike Boulevard	M-L	La Porte	Harris County	$5,662.96	128
B_185	Oakhaven Rd	Scotch Moss Ln	Fernrock Dr	0.15	Bike Boulevard	M-L	La Porte	Harris County	$2,333.66	0
B_186	Greewood Pines Dr	Scenic View Dr	Krueger Way	0.22	Bike Boulevard	M-L	Houston	Harris County	$3,324.30	0
B_187	Country Club Dr	Golfcrest Dr		1.70	Bike Boulevard	M-L	Pearland	Harris County	$26,185.26	11
B_188	Golfcrest Dr	Country Club Dr	Green Tee Dr	0.28	Bike Boulevard	M-L	Pearland	Harris County	$4,271.68	0
B_189	Gemini St	Space Center Blvd	Bay Area Blvd	0.69	On-Street Bike Lane	M-L	Harris County	TBD	$367,423.34	0

Off-street Trail Projects

Project ID	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
Tr_1	Harris County Line	Highland Meadows Dr.	0.51	Trail	M -L	Pearland	Harris County	$290,112.84	25
Tr_2	Summer Indigo Trl.	Clearwater Grove Ln.	0.37	Trail	M -L	Pearland	Harris County	$206,885.16	35
Tr_3	Franco Lee Park	Country Club Dr.	2.65	Trail	M -L	Pearland	Harris County	$1,498,284.14	8
Tr_4	Blackhawk Blvd.	Dixie Farm Rd.	4.02	Trail	M -L	Houston	Harris County	$2,271,447.15	8
Tr_5	Hall Rd.	Sagedowne Ln.	0.68	Trail	M -L	Houston	Harris County	$384,754.65	56
Tr_6	Sageglen Dr.	Scarsdale Blvd.	1.71	Trail	M -L	Houston	Harris County	$963,824.83	17
Tr_7	Scarsdale Blvd.	Harris County Line	1.83	Trail	M -L	Harris County	Friendswood	$1,035,389.51	7
Tr_8	Clear Brook Oak St.	Beamer Rd.	0.50	Trail	M -L	Harris County	TBD	$283,583.59	67
Tr_9	Christy Glen Ct.	Beamer Rd.	0.59	Trail	M -L	Harris County	TBD	$333,050.00	61
Tr_10	Beamer Rd.	Turkey Creek	2.44	Trail	M -L	Houston	Harris County	$1,379,234.40	7
Tr_11	Harris County Line	Beamer Rd.	3.15	Trail	M -L	Harris County	Friendswood	$1,780,569.00	9
Tr_12	Bisontine St.	Harris County Line	2.81	Trail	M -L	Friendswood	Harris County	$1,591,059.93	13
Tr_13	Heritage Park	Bay Area Blvd.	0.69	Trail	M -L	Friendswood	Harris County	$388,277.56	44
Tr_14	Baybrook Vlg.	NASA Pkwy.	2.11	Trail	M -L	Harris County	Webster	$1,190,283.81	12
Tr_15	Genesis Blvd.	Genesis Blvd.	0.52	Trail	M -L	Webster	Harris County	$292,966.11	38
Tr_16	Challenger Seven Memorial Park	Autumn Creek Dr.	2.18	Trail	M -L	League City	Friendswood, Harris County	$1,234,949.91	2
Tr_17	Challenger Seven Memorial Park	Cemetery Rd.	0.84	Trail	M -L	League City	Webster, Harris County	$477,074.61	3
Tr_18	Avon Brook Ln.	Turkey Creek	2.49	Trail	M -L	Houston	Harris County	$1,409,042.63	5
Tr_19	S. Texas Ave.	BW 8	7.29	Trail	M -L	Houston	Harris County	$4,118,681.96	3
Tr_20	Golf Course	Golf Course	2.18	Trail	M -L	Houston	Harris County	$1,232,388.24	2
Tr_21	Saturn Ln.	2nd St.	0.06	Trail	M -L	Houston	Harris County	$34,992.11	537
Tr_22	Pearson Park	Upper Bay Rd.	0.16	Trail	M -L	Nassau Bay	Harris County	$89,123.98	55
Tr_23	Upper Bay Rd.	Nassau Bay Peninsula Wildlife Park	2.36	Trail	M -L	Nassau Bay	Harris County	$1,335,787.48	4
Tr_24	SH 3	El Camino Real	2.07	Trail	M -L	Houston	Webster, Harris County	$1,169,793.12	20
Tr_25	El Camino Real	N. Sarah Deel St.	0.25	Trail	M -L	Houston	Webster, Harris County	$140,932.32	151
Tr_26	Edgewater Park	Water St.	1.83	Trail	M -L	Webster	Harris County	$1,033,747.49	3
Tr_28	Harris County Line	Fairway Dr.	0.91	Trail	M -L	Webster	Harris County	$514,799.46	1
Tr_29	Elder Glen Dr.	Exploration Green Trail	2.45	Trail	M -L	Houston	Harris County	$1,384,887.00	18
Tr_30	Diana Ln.	Diana Ln.	0.04	Trail	M -L	Pasadena	Harris County	$20,646.17	734
Tr_31	Cow Bayou	Reseda Dr.	0.94	Trail	M -L	Houston	Webster, Harris County	$532,564.43	55
Tr_32	Redwood Bend Trl	Sylvan Rodriguez Park	2.30	Trail	M -L	Houston	Harris County	$1,301,400.59	4

Off-street Trail Projects, Continued

Project ID	From	To	Length (Mi)	Description	Timeframe	Potential Lead	Potential Partner	Project Cost	BCR
Tr_33	Sylvan Rodriguez Park	Armand Bayou Nature Center	4.12	Trail	M -L	Houston	Harris County	$2,329,477.61	6
Tr_34	Red Bluff Rd.	Middlebrook Dr.	2.85	Trail	M -L	Pasadena	Harris County	$1,608,440.89	3
Tr_35	Whitecap Dr	Repsdorph Rd	0.14	Trail	M -L	Seabrook	Harris County	$81,367.55	164
Tr_36	Old Hwy 146	Pine Gully Park	2.73	Trail	M -L	Seabrook	Harris County	$1,544,391.58	2
Tr_37	Red Bluff Rd	Friendship Park	0.46	Trail	M -L	Seabrook	Harris County	$261,787.78	17
Tr_38	Port Rd	El Jardin Beach Park	1.74	Trail	M -L	Pasadena	Harris County	$984,191.83	3
Tr_39	Old Hwy 146	Bay Colony Dr	1.21	Trail	M -L	Pasadena	Harris County	$681,437.04	9
Tr_40	Little Cedar Bayou Park	Taylor Bayou Park	2.52	Trail	M -L	La Porte	Harris County	$1,424,413.59	84
Tr_41	Ohio Street Park	E. D St.	0.11	Trail	M -L	La Porte	Harris County	$62,256.66	24420
Tr_42	E. C St.	S. Blackwell St.	0.44	Trail	M -L	La Porte	Harris County	$246,491.41	3044
Tr_44	Red Bluff Rd.	Spencer Hwy.	2.45	Trail	M -L	La Porte	Harris County, Pasadena	$1,385,143.80	62
Tr_45	Fairmont Park	Bay Area Blvd.	1.80	Trail	M -L	La Porte	Harris County	$1,017,717.65	752
Tr_46	Spencer Hwy	Big Island Slough	1.43	Trail	M -L	La Porte	Harris County	$810,034.87	1094
Tr_47	Spencer Hwy	Bay Area Blvd	5.23	Trail	M -L	La Porte	Pasadena, Harris County	$2,955,988.70	24
Tr_48	Underwood Rd	Red Bluff Rd	3.17	Trail	M -L	Pasadena	Harris County, La Porte	$1,794,613.29	40
Tr_49	Spencer Hwy.	Spenwick Park	0.42	Trail	M -L	La Porte	Harris County	$237,668.26	5840
Tr_50	Spencer Hwy	Red Bluff Rd	1.82	Trail	M -L	La Porte	Pasadena, Harris County	$1,031,017.65	443
Tr_51	Luella Blvd.	Canada Rd.	0.82	Trail	M -L	La Porte	Harris County	$463,934.59	2052
Tr_52	Cunningham Dr.	Armand Bayou	1.11	Trail	M -L	Pasadena	Harris County	$628,869.32	1362
Tr_53	Space Center Blvd.	Center St.	0.98	Trail	M -L	Pasadena	Harris County	$553,665.90	2172
Tr_54	BW 8	Holly Bay Court Park	2.30	Trail	M -L	Pasadena	Harris County	$1,300,434.01	697
Tr_55	Repsdorph Rd	Vermillion Rd	0.15	Trail	M -L	Seabrook	Harris County	$82,605.94	12099
Tr_57	Sylvan Rodriguez Park	Red Bluff Rd.	3.77	Trail	M -L	Pasadena	Houston, Harris County	$2,130,329.06	403
Tr_58	Little Cedar Bayou Park	Little Cedar Bayou Nature Trail	0.57	Trail	M -L	La Porte	Harris County	$321,483.23	2710
Tr_59	Exploration Green	Horsepen Bayou	0.77	Trail	M -L	Pasadena	Harris County	$434,403.36	2377
Tr_60	Exploration Green	Space Center Blvd.	0.15	Trail	M -L	Houston	Harris County	$87,214.35	18596

Intersection Projects

Project ID	Location for Improvements	Suggested Improvement	Timeframe	Potential Lead	Potential Partner	Project Cost	Combined CMF
IP_1	El Dorado Blvd & Galveston Blvd	Resurface pavement with friction Reconstruct sidewalks to meet standards and pavement conditions Install Pedestrian Signal (consider Audible when feasible) Reconstruct ADA ramps Improve clear zone by relocating or removing fixed objects Pedestrian Refuge Islands Marked Crosswalks/ Raised Crosswalks Leading Pedestrian Intervals	Short	TxDOT	Houston, Harris County Pct. 2	$5,400,002.19	60%
IP_2	Spencer Hwy & Red Bluff Rd	Resurface pavement with friction Reconstruct sidewalks to meet standards and pavement conditions Reconstruct ADA ramps Improve clear zone by relocating or removing fixed objects Pedestrian Refuge Islands Marked Crosswalks/ Raised Crosswalks Leading Pedestrian Intervals	Short	Harris County Pct. 2	Pasadena	$5,477,890.10	54%
IP_3	FM 528 & Bay Area Blvd	Resurface pavement with friction Reconstruct sidewalks to meet standards and pavement conditions Reconstruct ADA ramps Improve clear zone by relocating or removing fixed objects Pedestrian Refuge Islands Marked Crosswalks/ Raised Crosswalks Leading Pedestrian Intervals	Short	Harris County Pct. 2	TxDOT / Friendswood	$5,863,746.35	54%
IP_4	Spencer Hwy & Center St	Resurface pavement with friction Reconstruct sidewalks to meet standards and pavement conditions Pedestrian Refuge Islands Marked Crosswalks/ Raised Crosswalks Leading Pedestrian Intervals	Short	Harris County Pct. 2	Pasadena	$5,538,368.34	44%
IP_5	Bay Area Blvd & El Camino Real	Resurface pavement with friction Reconstruct sidewalks to meet standards and pavement conditions Reconstruct ADA ramps Improve clear zone by relocating or removing fixed objects Check Illumination Pedestrian Refuge Islands Marked Crosswalks/ Raised Crosswalks Leading Pedestrian Intervals	Short	Houston	Harris County Pct. 2	$5,722,151.35	56%

School Crossing Projects

Project ID	School Name	Crossing Locations	Suggested Improvement	Timeframe	Potential Lead	Potential Partner	Project Cost	CMF
SC_1	Bay Elementary School	Bayport Blvd	Resurface pavement with friction	Short	Seabrook	Clear Creek ISD, Harris County Pct. 2	$12,451,686.36	34%
		Meyer Road	Check Illumination					
		Meyer Road	Asphalt Art					
		Meyer Road	Marked Crosswalks/ Raised Crosswalks					
SC_2	Clear Path Alternative School	Magnolia Avenue	Resurface pavement with friction	Short	Webster	Clear Creek ISD, Harris County Pct. 2	$12,363,690.00	48%
		Nasa Bypass	Improve clear zone by relocating or removing fixed objects					
		Magnolia Avenue Kobayashi Road	Check Illumination					
		Magnolia Avenue	Asphalt Art					
		Magnolia Avenue	Marked Crosswalks/ Raised Crosswalks					
SC_3	Falcon Pass Elementary	Falcon Pass Drive	Resurface pavement with friction	Short	Houston	Clear Creek ISD, Harris County Pct. 2	$12,220,086.67	48%
		Bay Area Blvd	Improve clear zone by relocating or removing fixed objects					
		Bay Area Blvd Space Center Blvd	Check Illumination					
		Falcon Pass Drive Moonrock Drive	Asphalt Art					
		Falcon Pass Drive Moonrock Drive	Marked Crosswalks/ Raised Crosswalks					
SC_4	P H Greene Elementary School	School	Resurface pavement with friction	Short	Harris County Pct. 2	Clear Creek ISD	$16,425,311.67	34%
		Fife Ln	Check Illumination					
		Friendswood Link Road	Asphalt Art					
		Friendswood Link Road Fife Ln	Marked Crosswalks/ Raised Crosswalks					
SC_5	Vista Academy of Pasadena	Fairmont Parkway	Resurface pavement with friction	Short	Harris County Pct. 2	Pasadena	$17,207,036.00	48%
		Fairmont Parkway	Improve clear zone by relocating or removing fixed objects					
		Fairmont Parkway	Check Illumination					
		Intersection of Fairmont Parkway and Space Center Blvd	Marked Crosswalks/ Raised Crosswalks					

Trail Crossing Projects

Project ID	Segment	Status	Short-term Improvements	Long-term Improvements	Timeframe	Potential Lead	Potential Partner	Project Cost
TC_01	Sageaspen Ln.	Existing	Add crosswalk striping	-	S - M	Harris County	TBD	$5,150.00
TC_02	Hughes Ranch Rd.	Existing	Restripe crosswalk, add advanced warning signage and pavement markings	-	S - M	Harris County	TBD	$6,050.00
TC_03	Scarsdale Blvd.	Existing	Restripe crosswalks, add advance warning signage and pavement markings	-	S - M	Harris County	TBD	$6,050.00
TC_04	Crescent Landing Dr.	Existing	Add crosswalk striping	-	S - M	Houston	Harris County	$5,150.00
TC_05	Crescent Landing Dr.	Existing	Add crosswalk striping	-	S - M	Houston	Harris County	$5,150.00
TC_06	Reseda Dr.	Existing	Restripe crosswalk	-	S - M	Houston	Harris County	$5,150.00
TC_07	El Dorado Blvd.	Existing	Restripe crosswalks, add advanced warning signage and pavement markings, lighting enhancements	In-road pedestrian-activated lights	S - M	Houston	Harris County	$10,382.00
TC_08	Reseda Dr.	Existing	Restripe crosswalk, add advanced warning signage and pavement markings, lighting	Raised crosswalk/ speedtable	S - M	Houston	Harris County	$10,382.00
TC_09	Reseda Dr.	Existing	Restripe crosswalk, add advanced warning signage and pavement markings, lighting	-	S - M	Houston	Harris County	$10,382.00
TC_10	Reseda Dr.	Existing	Restripe crosswalk, add advanced warning signage and pavement markings, lighting	-	S - M	Houston	Harris County	$10,382.00
TC_11	Neptune Ln.	Existing	Restripe crosswalk, add advanced warning signage and pavement markings, lighting	-	S - M	Houston	Harris County	$10,382.00
TC_12	Neptune Ln.	Existing	Restripe crosswalk, add advanced warning signage and pavement markings, lighting	-	S - M	Houston	Harris County	$10,382.00
TC_13	Space Center Blvd.	Proposed	Mid-block crossing w/ refuge, pavement markings and advance warning signage, lighting enhancements	Installation of PHB/HAWK signal	S - M	Harris County	TBD	$56,736.00
TC_14	Oregon St.	Existing	Advance warning signage and pavement markings, lighting	-	S - M	La Porte	Harris County	$10,382.00
TC_15	Hickory Knoll Dr.	Existing	Restripe crosswalk, advance warning signage	-	S - M	Houston	Harris County	$6,050.00
TC_16	Hickory Knoll Dr.	Existing	Restripe crosswalk, advance warning signage	-	S - M	Houston	Harris County	$6,050.00
TC_17	Bay Area Blvd.	Proposed	Add high-visibility crosswalk markings, audible pedestrian signal	-	M - L	Harris County	TBD	$8,150.00
TC_18	Fife Ln.	Proposed	Add high-visibility mid-block crossing, add advanced warning signage and markings	-	M - L	Harris County	TBD	$6,050.00
TC_19	Bay Area Blvd.	Proposed	Add high visibility mid-block crossing, advance warning signage, lighting	Installation of PHB/HAWK signal	M - L	Friendswood	Harris County	$48,882.00
TC_20	El Dorado Blvd.	Proposed	Add high-visibility mid-block crossing, advanced warning signage and markings, lighting	Installation of PHB/HAWK signal	M - L	Harris County	TBD	$48,882.00

Trail Crossing Projects, Continued

Project ID	Segment	Status	Short-term Improvements	Long-term Improvements	Timeframe	Potential Lead	Potential Partner	Project Cost
TC_21	Pilgrims Point Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting	-	M - L	Harris County	TBD	$10,382.00
TC_22	Manowar Ln.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting	-	M - L	Harris County	TBD	$10,382.00
TC_23	Frigate Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, neighborhood traffic calming (speed table, raised crosswalk)	-	M - L	Harris County	TBD	$15,382.00
TC_24	Quiet Canyon Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, neighborhood traffic calming (speed table, raised crosswalk)	-	M - L	Harris County	TBD	$15,382.00
TC_25	Hope Village Rd.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, neighborhood traffic calming (speed table, raised crosswalk)	-	M - L	Harris County	TBD	$15,382.00
TC_26	Blackhawk Blvd.	Proposed	Restripe crosswalks, add advanced warning signage and markings	-	M - L	Friendswood	Harris County	$6,050.00
TC_27	Nyack Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting	-	M - L	Houston	Harris County	$10,382.00
TC_28	Grapewood Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, neighborhood traffic calming (speed humps)	-	M - L	Harris County	TBD	$15,382.00
TC_29	Space Center Blvd.	Proposed	Mid-block crossing w/ refuge, pavement markings and advance warning signage, lighting enhancements	Installation of PHB/HAWK signal	M - L	Houston	Harris County	$95,133.00
TC_30	Penn Hills Ln.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting	-	M - L	Houston	Harris County	$10,382.00
TC_31	El Camino Real Blvd.	Proposed	Add high-visibility crosswalk markings, pedestrian refuge, add advanced warning signage and markings, lighting	-	M - L	Houston	Harris County	$61,783.00
TC_32	Pebbleshire Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting, neighborhood traffic calming (speed humps)		M - L	Houston	Harris County	$15,382.00
TC_33	El Dorado Blvd.	Proposed	Mid-block crossing w/ refuge, advance warning signage, lighting	Installation of PHB/HAWK signal	M - L	Houston	Harris County	$95,133.00

Trail Crossing Projects, Continued

Project ID	Segment	Status	Short-term Improvements	Long-term Improvements	Timeframe	Potential Lead	Potential Partner	Project Cost
TC_34	Feather Craft Ln.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting	-	M - L	Webster	Harris County	$10,382.00
TC_35	Gemini St.	Proposed	Mid-block crossing w/ lighting, add advanced warning signage and markings	Installation of PHB/HAWK signal	M - L	Harris County	TBD	$95,133.00
TC_36	Todville Rd.	Existing	Restripe crosswalk, add advanced warning signage and markings, lighting	-	S - M	Harris County	TBD	$10,382.00
TC_37	Medical Center Blvd.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting,	Installation of PHB/HAWK signal	M - L	Harris County	TBD	$48,432.00
TC_38	Kinrose Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, neighborhood traffic calming (speed humps)	-	M - L	Pasadena	Harris County	$15,382.00
TC_39	Farrington St.	Proposed	Mid-block crossing w/ refuge, advance warning signage and markings, lighting	-	M - L	Harris County		$61,783.00
TC_40	Old Hickory Dr.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage, lighting	-	M - L	La Porte	Harris County	$10,382.00
TC_41	Holly Bay Ct.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage, lighting	-	M - L	Pasadena	Harris County	$10,382.00
TC_42	Space Center Blvd.	Proposed	Mid-block crossing w/ lighting, add advanced warning signage and markings	Installation of PHB/HAWK signal	M - L	Houston	Harris County	$95,133.00
TC_43	Village Dale Ave.	Proposed	Add high-visibility crosswalk markings, add advanced warning signage and markings, lighting, neighborhood traffic calming (speed humps)	-	M - L	Houston	Harris County	$15,382.00

Funding Opportunities

The following funding programs represent the most reliable resources for implementing bicycle and pedestrian projects. For project applicability, please reference Appendix F, *Funding Opportunities.*

Federal Transportation Grants

- **Active Transportation Infrastructure Investment Program (ATIIP):** FHWA will award competitive grants to help communities plan, design, and construct safe and connected active transportation networks such as sidewalks, bikeways, and trails that connect destinations such as schools, workplaces, residences, businesses, recreation areas, and medical facilities within a community or metropolitan region. ATIIP also provides an opportunity for eligible organizations to enhance their overall transportation network by integrating active transportation facilities with transit services, where available, to improve access to public transportation.
- **Advanced Transportation Technologies and Innovative Mobility Deployment:** The Advanced Transportation Technologies and Innovative Mobility Deployment program, also known as ATTAIN, supports the implementation and operation of mobility-focused transportation technologies. The program, provides funding to deploy, install, and operate advanced transportation technologies to improve safety, mobility, efficiency, system performance, intermodal connectivity, and infrastructure return on investment.
- **Rivers, Trails, and Conservation Assistance:** The National Park System's RTCA program offers local groups staff assistance and consultations (no monetary award) for locally-led conservation projects. Projects may include developing trails and greenways or protecting rivers and open space. Regional RTCA offices provide application information and assistance.
- **Reconnecting Communities and Neighborhoods (RCN) Program:** The RCN combines two discretionary grant programs (Reconnecting Communities Pilot and Neighborhood Access and Equity) into one. Together, this combined program is known as the RCN Program. While they remain separate programs for the purposes of award, the programs share many common characteristics including prioritizing disadvantaged communities, improve access to daily needs, foster equitable development, and reconnecting communities by removing, retrofitting, or mitigating highways or other transportation facilities that create barriers for the community.
- **Safe Streets for All (SS4A):** The program supports the development of a comprehensive safety action plan (Action Plan) that identifies the most significant roadway safety concerns in a community and the implementation of projects and strategies to address roadway safety issues. Action Plans are the foundation of the SS4A grant program. SS4A requires an eligible Action Plan be in place before applying to implement projects and strategies.
- **BUILD Grants:** The Better Utilizing Investments to Leverage Development, or BUILD, Transportation Discretionary Grand program provides a unique opportunity for the DOT to invest in road, transit, and port projects that promise to achieve national objectives. Congress has dedicated nearly $7.9 billion for eleven rounds of National Infrastructure Investments to fund projects that have a significant local or regional impact.
- **FTA Enhanced Mobility for Seniors and Individuals with Disabilities (5310):** This program provides formula funding to states for the purpose of assisting private nonprofit groups in meeting the transportation needs of older adults and people with disabilities when the transportation service provided is unavailable, insufficient, or inappropriate to meeting these needs.

State Resources

- **Recreational Trails Grant:** TPWD administers the National Recreational Trails Fund in Texas under the approval of the Federal Highway Administration (FHWA). This federally funded program receives its funding from a portion of federal gas taxes paid on fuel used in non-highway recreational vehicles. The grants can be up to 80% of project cost with a maximum of $300,000 for non-motorized trail grants and up to $600,000 for motorized trail grants. Funds can be used for the construction of new recreational trails, to improve existing trails, to develop trailheads or trailside facilities, and to acquire trail corridors.
- **Transportation Alternatives Set-Aside Program:** TxDOT administers Transportation Alternatives (TA) funds for locally sponsored bicycle and pedestrian infrastructure projects in communities less than 200,000. In large, urbanized areas with populations over 200,000, TA funds are distributed directly to Metropolitan Planning Organizations (MPO) to administer according to their needs. MPOs and TxDOT are responsible for selecting projects independent of one another. The TA program provides funding for construction of a variety of alternative transportation projects, including ADA/pedestrian infrastructure, on- and off-street bikeways, shared use paths, infrastructure for non-driver access to public transportation, and access for non-motorized roadway users, including safe routes to schools.
- **State Infrastructure Bank (SIB):** State Infrastructure Banks help accelerate needed mobility improvements through a variety of financial assistance options made to local entities through state transportation departments. In Texas, SIB financial assistance can be granted to any public or private entity authorized to construct, maintain, or finance an eligible transportation project.
- **Congestion Mitigation and Air Quality (CMAQ):** The Congestion Mitigation and Air Quality improvement program provides funds to states for transportation projects designed to reduce traffic congestion and improve air quality, particularly in areas of the county that do not attain national air quality standards.

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BAY AREA
BICYCLE AND PEDESTRIAN
SAFETY PLAN

ADRIAN GARCIA
COMMISSIONER

REVIVE 2 THRIVE
Community Revitalization Initiative

Houston-Galveston Area Council