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## MEMORANDUM

**DATE:** April 26, 2023  
**TO:** Maggie Bergeron, Victoria MPO  
**CC:** Julie Fulgham, City of Victoria  
**FROM:** Ellen Soll, Alliance Transportation Group  
**RE:** Existing Conditions and Analysis

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The ATG project team coordinated with the City of Victoria staff to conduct an Existing Conditions analysis of the active transportation and roadway system within the City of Victoria Extraterritorial Jurisdiction (ETJ) boundaries. This analysis serves to support the Victoria Active Transportation Master Plan (ATMP) and to identify current infrastructure and areas for improvement. This memo aims to review, and analysis exiting conditions regarding the active transportation infrastructure and identify opportunities and constrains to improve cycling and walking throughout the City of Victoria.

The research and analysis represented in this memorandum was conducted as the major deliverable associated with **Task 3 Existing Conditions and Analysis**. The ATG team appreciates your review and looks forward to any client feedback and questions.

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## 1. Review of Existing Plans

In support of the Victoria Active Transportation Master Plan, ATMP, six existing plans were reviewed to identify prior planning efforts that identified:

- Goals related to active transportation
- Public comments, concerns or responses relevant to the ATMP
- Or adopted policies or projects related to Active Transportation

The plans reviewed included the 2045 Metropolitan Transportation Plan, Paseo de Victoria, Comprehensive Plan- 2035, Thoroughfare Master Plan, the Victoria Parks and Recreation Master Plan, and Downtown Master Plan.

### 1.1. The 2045 MTP

The Victoria Metropolitan Planning Organization (MPO) 2045 MTP was prepared in April 2020, in coordination with the TxDOT, transit operators, stakeholders, and the public to create a vision for the future of the community. The planning area for the Victoria MPO 2045 MTP encompasses all of Victoria County, Texas (Figure 1.1).

#### Goals

The plan identified 13 goals and objectives of which two emphasize on encouraging active transportation, including:

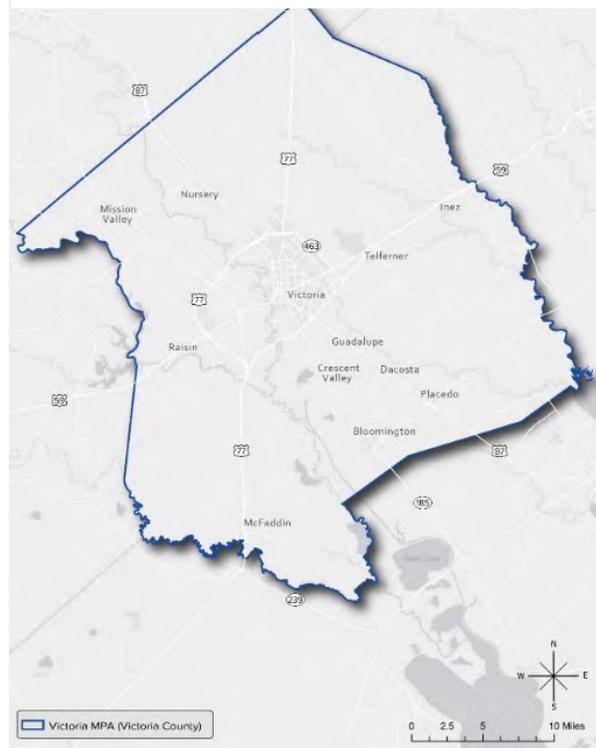
- Encourage Cycling
- Encourage Walking

#### Public Involvement

Active transportation is among eight concerns brought up during interview with stakeholders. To improve biking and walking, they suggested:

- A need for more sidewalks, bike lanes, and hiking trails throughout the region along with ADA improvements.
- Road user awareness needs to increase to change the stigma associated with biking on Victoria roadways and increase the number of cyclists on the road (educational workshops).
- Bicycle and pedestrian improvements would help improve connectivity regionally, decrease congestion, and improve quality of life for future generations.

Figure 1-1. Victoria County, TX



### ***Related Policies***

The plan recommended the expansion of the bicycle network and improvements to hiking facilities using strategies such as:

- Supply a connected system of trails and bike lanes for pedestrians and bicyclists in order to provide recreational opportunities and viable alternate modes of transportation, therefore enhancing the quality of life of all residents;
- Create and utilize a public participation process to involve members of the community in developing the trails;
- Maintain and promote a safe and secure environment along the hike and bike trails;
- Develop a functional and aesthetically pleasing trail system by considering the following amenities: rest areas, maps and signage, directional signage, exercise stations, interpretive installations, lighting, and art installations; and
- Actively encourage the community to utilize the developed trail system by promoting the positive health, social, and environmental benefits of the trail system.

The plan recommends expanding the pedestrian infrastructure network and increasing connectivity using the following strategies:

- Creating priority pedestrian corridors along major roadways in the urban areas to improve regional mobility and create connections. This also includes creating linked corridors that further increase connections within the expanded network by creating links to priority corridors from major destinations and neighborhoods;
- Installing pedestrian crossings/crosswalks in appropriate locations that tie into existing or proposed sidewalks throughout the urban areas of the region; and
- Ensuring that new pedestrian infrastructure and amenities are compliant with the Americans with Disabilities Act of 1990 [1].

### **1.2. Paseo de Victoria**

The Paseo de Victoria is a hike and bike plan, prepared by City of Victoria Parks and Recreation and Development Services staff that outlines the need for hike and bike trails to improve pedestrian circulation and mentions the many natural and man-made drainage ways throughout Victoria and how they can serve as the base for a trail.

### ***Goals***

The following goal is one among five goals of the plan that were considered throughout the development of the plan and will continue to be considered throughout the implementation process of the hike and bike trail system.

- Supply a connected system of trails and bike lanes for pedestrians and bicyclists in order to provide recreational opportunities and viable alternate modes of transportation, therefore enhancing the quality of life of all residents [2].

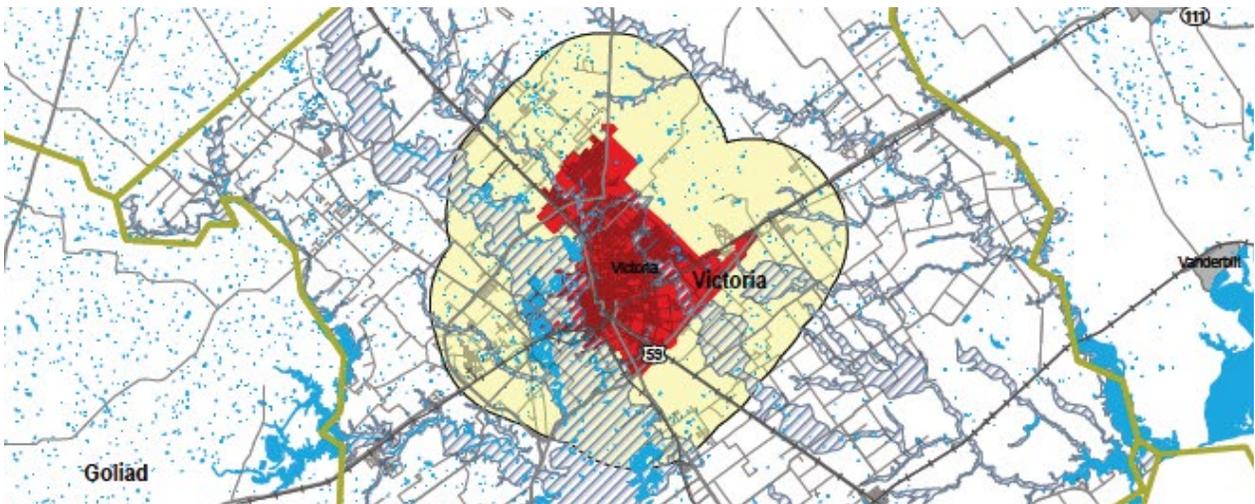
### 1.3. Comprehensive Plan 2035

The Victoria Comprehensive Plan, adopted in April 2016, is intended to guide future development, redevelopment, and community enhancement efforts over the next 20 years through 2035. The study area is Victoria City limits which is shown in red on the map below (Figure 1-2).

#### *Existing Facilities*

In recent years, the City of Victoria has adopted regulations requiring new development to construct sidewalks along roadways. However, regulations are made with building permits which prolong the competition of sidewalks. Victoria currently has no on-street bike lanes, which has been attributed to a lack of funding support relative to other transportation improvements [3].

**Figure 1-2. Study Area: Victoria City**



#### *Key issues in Mobility*

Five key issues and considerations related to Mobility were identified through the comprehensive planning process, of which one is associated with active transportation.

- Greater emphasis on safe and convenient bicycle/pedestrian circulation to both routine and high-profile destinations in the city.
- First and foremost, the city must be more assertive in prioritizing bicycle/ pedestrian circulation and safety in general and as part of its own capital projects planning. This will require close coordination among key City departments (e.g., Development Services, Public Works, Parks and Recreation) plus greater synergy among the planning, projects, and philosophies of multiple agencies (City, Victoria MPO, Texas Department of Transportation, etc.).
- Part of this is recognition of mobility relative to recreational needs, and of opportunities to leverage resources and make joint improvements that suit both purposes (e.g., Safe Routes to Schools projects that also tie into local trail segments and fill sidewalk system gaps).

- The areas near the University of Houston-Victoria and Victoria College campuses are categorized as priority areas for active transportation in Victoria.
- When attendees at a public workshop for this Comprehensive Plan were asked to identify locations on a city map “you consider unsafe when driving, walking or biking,” dots were placed in numerous locations across the community. However, the greatest concentration was along Navarro Street near Loop 463 and the Victoria Mall stretching from Guy Grant Road on the south to Broadmoor Street (Wal-Mart and Sam’s Club vicinity) on the north.

### **Goals**

One goal among four goals for mobility focus area is about development of bike and pedestrian routes:

- Alternative transportation options for Victoria residents include public transportation, hike/bike networks, and improved pedestrian circulation.

### **Strategic action priorities**

- Part of the equation for this will involve ongoing public education and police awareness of the respective rights and best practices for motorists, cyclists, and pedestrians to follow when sharing roadways.
- Review and update the Paseo de Victoria Pedestrian and Bicycle Master Plan, the City’s Parks Master Plan, and other plans and studies that lay the groundwork for phased construction of an interconnected and safe bicycle/ pedestrian system for both recreational and alternative transportation needs.
- Prepare a city-wide Sidewalk Capital Improvements Plan that builds on earlier sidewalk inventories and mapping efforts.
- Dedicate funding to fill gaps in the existing sidewalk system.
- Continue to explore opportunities to incorporate bicycle and pedestrian components and amenities into new and redesigned roadways, where available right-of-way allows and where safe outcomes can be assured.
- Consider formalizing a “Complete Streets” policy and design approach for new and reconstructed roadway corridors, where appropriate. Under this philosophy and method, which is being implemented in jurisdictions nationwide, more effective corridor design and operation is considered from the start rather than as an afterthought “where available right-of-way allows.”
- A Complete Street provides for the mobility and safety of all users of the transportation system and not just automobile traffic. As described by the National Complete Streets Coalition ([www.smartgrowthamerica.org/complete-streets](http://www.smartgrowthamerica.org/complete-streets)), elements of Complete Streets can include: sidewalks/trails, bike lanes, raised crosswalks, wide shoulders, refuge medians, audible pedestrian signals, sidewalk bulb-outs, pedestrian amenities, special bus lanes, bus pullouts, shade and shelter, and trees and landscaping.
- Consider funding support for bicycle rental/sharing facilities in conducive locations (e.g., higher education campuses, downtown, Riverside Park, etc.), looking to successful programs elsewhere for lessons learned.

- Gradually work toward annual Transportation Improvement Program (TIP) allocations for bicycle/pedestrian projects within the Victoria MPO area.
- Identify other potential funding sources and seek funding for bicycle/pedestrian facilities.

**Public concerns and priorities**

The Comprehensive Plan update process occurred concurrently with the latest five-year update of the Metropolitan Transportation Plan (MTP), which is overseen by the Victoria MPO. Input for the 2040 MTP update was obtained from two groups: (1) the general public, and (2) particular transportation stakeholders (e.g., major employers, local institutions, public agencies, and transportation providers). Both groups were most concerned about existing pavement quality and traffic signal timing. The general public was also concerned about sidewalks/trails, traffic congestion, and traffic safety, while transportation stakeholders rated railroad crossings, sidewalks/ trails, and bus operations as their next highest concerns [4].

**1.4. Thoroughfare Master Plan (TMP)**

A Thoroughfare Master Plan (TMP) establishes a community’s transportation policy direction and provides a long-term vision of the major street network necessary to meet future mobility needs. The Victoria City TMP was adopted in June 2021 [5]. The Victoria TMP focuses on roadways within the existing city limits and the City’s extraterritorial jurisdiction (Figure 1-3).

**Goals**

Six goals describing the intended long-term outcomes of the TMP implementation were ordered based on rankings by the community. One goal is associated with promoting active transportation which was ranked sixth:

- Increase multimodal options

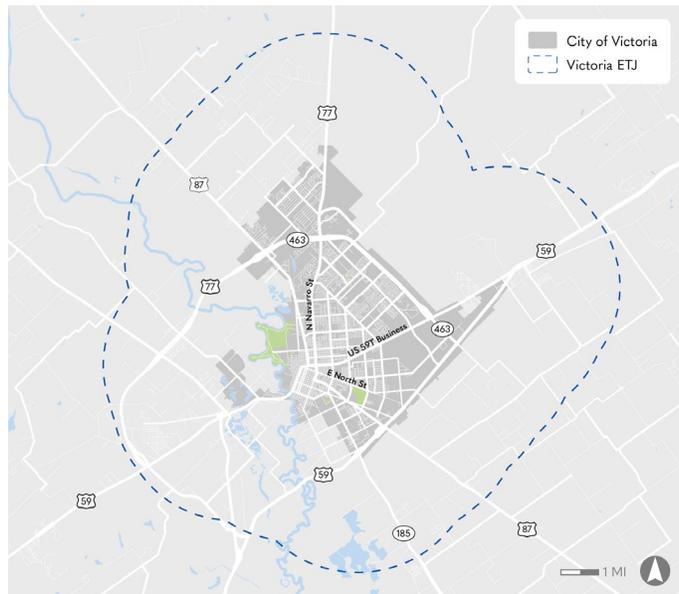
**Public Involvement**

Public participation took place through technical committee meetings, survey, stakeholder meetings, public open house, and project website. A survey asked participants to consider factors that influence where they travel and how they get to their destinations. The responses show that “bike and pedestrian facilities” is ranked 5 out of 8 on factors that influence their travel decisions.

**Related Policies**

- Policies and infrastructure that promote non-motorized modes of transportation.
- Bicycle & pedestrian facilities support transportation choice, accessibility, and safety for all roadway users. Bicycle Environmental Quality Index (BEQI) and Pedestrian Environmental Quality Index (PEQI) analysis findings were developed to understand general conditions throughout the study area [6].

**Figure 1-3. City of Victoria ETJ**



### 1.5. City of Victoria Parks and Recreation Master Plan

The Victoria Parks and Recreation Master Plan was adopted in November 2021. The plan established an updated vision for how the City’s system of parks, recreation facilities and recreational programs will meet the long-term needs of Victoria’s current and future residents [7]. As illustrated by the map below, the Plan incorporates the entire municipal limits of the City of Victoria, as well as the extraterritorial jurisdiction of the city (Figure 1-4).

**Figure 1-4. Parks and Recreation Master Plan Study Area**



#### Goals

The plan listed four goals, each one is elaborated upon with its objectives and required actions. One goal includes active transportation development:

##### Goal #1: Parks system growth and accessibility

- Objective 1.1. Ensure An Equitable Distribution Of Accessible Park Spaces And Recreational Facilities That Support Community Interests.
  - Action 1.1.4. Active Transportation Plan. Prepare an active transportation plan to link the City’s planned network of multi-use trails to a city-wide network of bicycle and pedestrian facilities.

The Paseo de Victoria Plan and this Plan do not include a true “community-wide” network of interconnected active transportation routes due to their sole focus on multi-use trails. Neither plan includes an evaluation of roadway and user characteristics that would define the appropriate active transportation facilities along Victoria’s most widely traveled corridors. An active transportation plan would identify a true city-wide network of context-appropriate bicycle and pedestrian facilities.

#### Public Involvement

The plan is provided through various forms of engagement activities such as stakeholder interviews and public outreach to help identify community preferences. Stakeholder outreach includes city council interviews and focus group meetings. Public outreach consists of online survey, town hall meetings, and city hall public information booth [8] [9].

Sample responses from the initial public survey and open houses show that “walking, hiking, and biking trails” are the top used recreational facility in the last two years for 60% of respondents who indicated themselves as users. In addition, “acquisition and development of walking and biking trails” is the second highest priority for recreational program preferences according to the community survey results.

### 1.6. City of Victoria Downtown Master Plan

The City of Victoria Downtown Plan was adopted in October 2021. The study area includes two parts: a core area and the overall study area boundary. The Downtown core was identified in order to concentrate efforts and make the biggest impact in Downtown Victoria. The Downtown core and overall study area boundaries are illustrated in the map below (Figure 1-5).

#### Goals

According to the Master Plan, only one goal amongst nine is directly associated with promoting active transportation in downtown.

- **Downtown will be a safe, walkable destination for all users.**

**Public Involvement**

Through several participation opportunities the Victoria community indicated their priorities and vision for Downtown. Connectivity and safety were among a series of recurring themes.

- Connectivity and safety

Community members expressed wanting to be able to safely walk and bike to key destinations downtown. This could be achieved through improvements to the pedestrian environment such as lighting, sidewalks, crosswalks, and other infrastructure items. Slowing vehicular traffic in the Downtown core could also improve the safety for people walking. Finally, wayfinding signage could help people better navigate Downtown [10].

**Related Policies**

Survey respondents rated the importance of these walking environment issues. Highlights from comments are:

- More trees and landscaping
- Add public restrooms
- Paint murals along the streets
- Benches and areas to stop and rest
- Add street lighting for pedestrians to feel safe
- Highlight the history of all cultures in Victoria [11]

**Figure 1-5. Downtown Study Area**



**Table 1-1. Summary of Victoria City Plans**

Name of Plan	Year of Adoption	Active Transportation Goals	Public Participation	Active Transportation Policy Recommendations
The 2045 MTP	Apr. 2020	✓	✓	✓
Paseo de Victoria	-	✓	✗	✓
The City of Victoria’s Comprehensive Plan- Plan 2035	Apr. 2016	✓	✓	✓

The City of Victoria’s Thoroughfare Master Plan (TMP)	June 2021	✓	✓	✓
The Victoria Parks and Recreation Master Plan	Sept. 2021	✓	✓	✓
City of Victoria Downtown Master Plan	Oct. 2021	✓	✓	✓

## 2. Existing Condition Overview

### Introduction

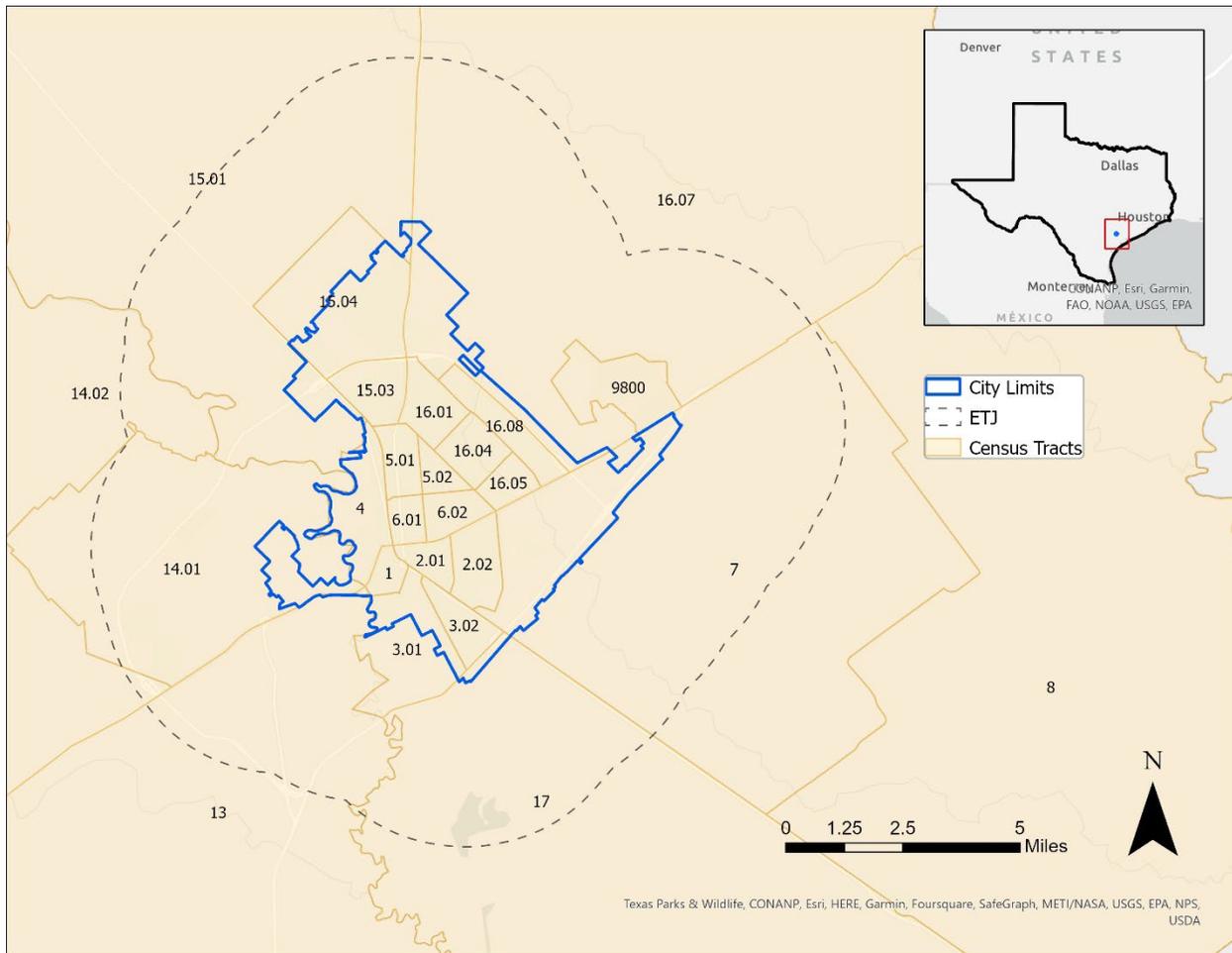
The ATG project team coordinated with the City of Victoria staff to conduct an Existing Conditions analysis of the active transportation and roadway system within the City of Victoria Extraterritorial Jurisdiction (ETJ) boundaries. This analysis serves to support the Victoria Active Transportation Master Plan (ATMP) and to identify current infrastructure and areas for improvement. The project team utilized GIS data previously developed from the Victoria Thoroughfare Master Plan, current data, and shapefiles from the City of Victoria, TxDOT roadway data, and demographic data from the U.S. Census Bureau (2021 5 Year ACS). This analysis will serve to inform active transportation system and infrastructure analysis for the City of Victoria and ETJ areas.

### City Profile and Demographics

The City of Victoria is located in southern Texas, southeast of San Antonio and southwest of Houston. The city is located in Victoria County, which is also the boundary for the Victoria Metropolitan Planning Organization (VMPO). The ETJ is also included in the study area for this analysis. In order to assess the active transportation needs of the City of Victoria, it is important to have an overview of employment and population within the region to better understand potential impacts of active transportation system improvements and how users will use and interact with it.

Figure 2-1 displays the city limits and ETJ limits of the City of Victoria and its location within the State of Texas.

**Figure 2-1. City of Victoria Boundaries**



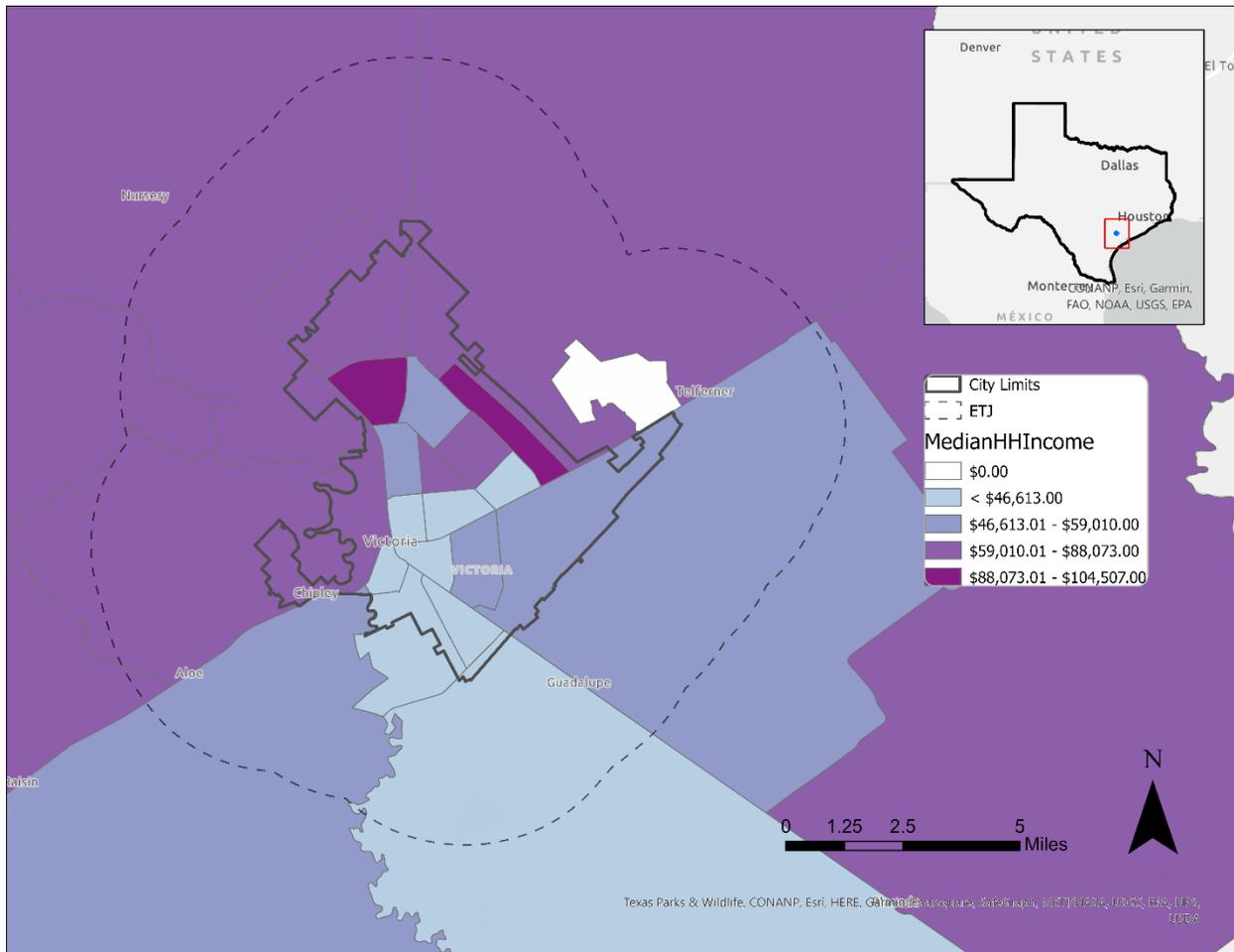
**Population**

The City of Victoria comprises the central urbanized area within the county and MPO and has an estimated population of 65,634 as of the 2021 5-Year American Community Survey (ACS). Figure 2-2 displays existing population density as of the 2021 ACS for the City of Victoria. Census Tract 5.02 within city limits contains the greatest population density at 10.64 people per acre. The central portion of the City of Victoria contains higher population concentrations compared to the ETJ area outside of city limits.





Figure 2-4. Median Household Income



*\*City of Victoria Median Household Income is \$59,010 as of the 2021 5 Year ACS.*

**Table 2-1. Median Household Income in City of Victoria by Census Tract**

Census Tract	2021 Median HH Income (\$USD)	
	City of Victoria Median Household Income (2021) = \$59,010	
Census Tract 1	\$	45,074.00
Census Tract 2.01	\$	35,023.00
Census Tract 2.02	\$	51,181.00
Census Tract 3.01	\$	24,962.00
Census Tract 3.02	\$	33,685.00
Census Tract 4	\$	64,286.00
Census Tract 5.01	\$	50,023.00
Census Tract 5.02	\$	61,632.00
Census Tract 6.01	\$	43,004.00
Census Tract 6.02	\$	32,088.00
Census Tract 7	\$	58,811.00
Census Tract 8	\$	69,879.00
Census Tract 13	\$	54,769.00
Census Tract 14.01	\$	78,526.00
Census Tract 14.02	\$	88,073.00
Census Tract 15.01	\$	85,917.00
Census Tract 15.03	\$	99,744.00
Census Tract 15.04	\$	82,199.00
Census Tract 16.01	\$	58,571.00
Census Tract 16.04	\$	63,298.00
Census Tract 16.05	\$	46,613.00
Census Tract 16.07	\$	79,773.00
Census Tract 16.08	\$	104,507.00
Census Tract 17	\$	38,189.00
Census Tract 9800	\$	-
<b>City of Victoria</b>	<b>\$</b>	<b>59,010.00</b>

Households without vehicular access rely on public transit services and active transportation infrastructure to commute, travel, and access facilities and other needs. Greater attention and resources are needed to ensure that zero-car households are able to access employment and services without the need for a personal vehicle. **Census Tract 2.02 has the greatest share of zero-car households with 280 households or 6.96% of the total tract population.** Other notable census tracts with relatively higher shares of zero-car households include Census Tracts 2.02 (4.17%), 3.01 (3.75%), 3.02 (3.74%), and 16.04 (3.78%). Table 2.2 displays households without vehicle access by census tract.

**Table 2-2. Households without Vehicle Access by Census Tract**

Census Tract	Households without Vehicular Access	Share of Households without Vehicular Access
Census Tract 1	42	2.19%
Census Tract 2.01	98	3.72%
Census Tract 2.02	233	4.17%
Census Tract 3.01	79	3.75%
Census Tract 3.02	65	3.74%
Census Tract 4	29	2.03%
Census Tract 5.01	49	1.13%
Census Tract 5.02	153	3.16%
Census Tract 6.01	57	2.30%
Census Tract 6.02	280	6.96%
Census Tract 7	54	1.63%
Census Tract 8	14	0.57%
Census Tract 13	41	1.42%
Census Tract 14.01	16	0.41%
Census Tract 14.02	118	2.43%
Census Tract 15.01	62	1.49%
Census Tract 15.03	47	1.74%
Census Tract 15.04	57	0.67%
Census Tract 16.01	96	1.90%
Census Tract 16.04	262	3.78%
Census Tract 16.05	80	2.66%
Census Tract 16.07	11	0.33%
Census Tract 16.08	56	0.96%
Census Tract 17	99	3.11%
Census Tract 9800	-	-
<b>City of Victoria and ETJ</b>	<b>2,098</b>	<b>2.30%</b>

In addition to access and availability, residents with limited mobility also require adequate active transportation infrastructure in order to travel safely and efficiently. Sidewalk conditions and connectivity are important factors for these residents, as they may not be able to drive or may want to walk for transportation and exercise. Tables 2-3 and 2-4 display the share of residents over 65 and residents with disability by census tract, respectively. Census Tracts 14.02, 15.01, 15.03, 16.07 and 17 have populations that are over 20% over the age of 65. Nearly 1/3 of the population of Census Tract 3.02 has a disability.

**Table 2-3. Share of Residents over 65 by Census Tract**

Census Tract	Residents over 65	Share of Residents over Age 65
Census Tract 1	230	12.00%
Census Tract 2.01	416	15.78%
Census Tract 2.02	809	14.47%
Census Tract 3.01	376	17.87%
Census Tract 3.02	218	12.53%
Census Tract 4	231	16.14%
Census Tract 5.01	439	10.10%
Census Tract 5.02	465	9.61%
Census Tract 6.01	308	12.43%
Census Tract 6.02	511	12.70%
Census Tract 7	600	18.12%
Census Tract 8	388	15.93%
Census Tract 13	432	14.92%
Census Tract 14.01	579	14.78%
<b>Census Tract 14.02</b>	<b>1,036</b>	<b>21.37%</b>
<b>Census Tract 15.01</b>	<b>942</b>	<b>22.57%</b>
<b>Census Tract 15.03</b>	<b>675</b>	<b>24.94%</b>
Census Tract 15.04	1471	17.26%
Census Tract 16.01	919	18.23%
Census Tract 16.04	768	11.09%
Census Tract 16.05	568	18.88%
<b>Census Tract 16.07</b>	<b>684</b>	<b>20.22%</b>
Census Tract 16.08	806	13.87%
<b>Census Tract 17</b>	<b>728</b>	<b>22.85%</b>
Census Tract 9800	0	0%
<b>City of Victoria and ETJ</b>	<b>14,599</b>	<b>15.99%</b>

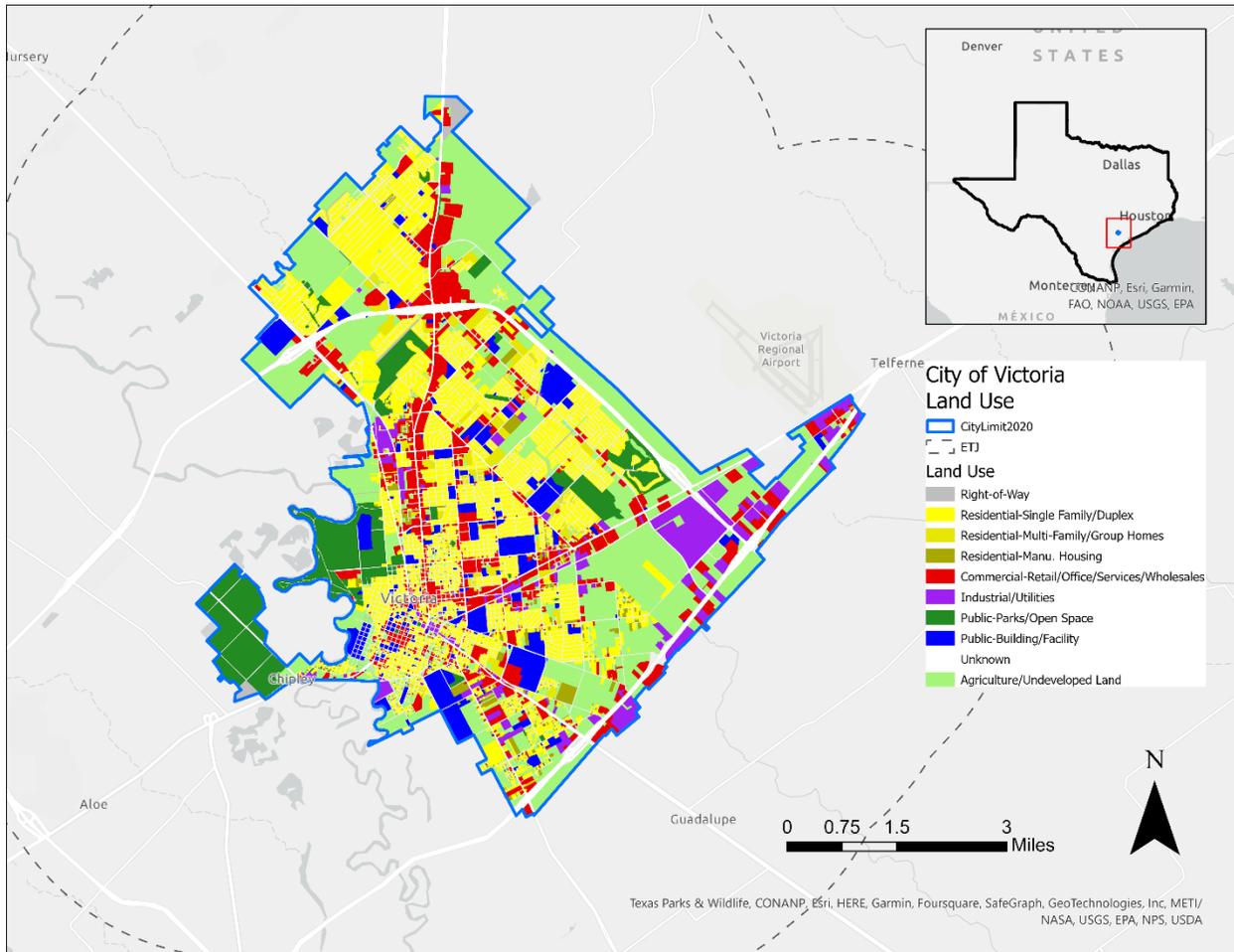
**Table 2-4. Share of Residents with Disability**

Census Tract	Population with Disability	Share of Population with Disability
Census Tract 1	207	10.80%
Census Tract 2.01	340	12.89%
Census Tract 2.02	1070	19.14%
Census Tract 3.01	365	17.35%
<b>Census Tract 3.02</b>	<b>520</b>	<b>29.89%</b>
Census Tract 4	225	15.72%
Census Tract 5.01	660	15.18%
Census Tract 5.02	856	17.68%
Census Tract 6.01	327	13.20%
Census Tract 6.02	641	15.93%
Census Tract 7	386	11.65%
Census Tract 8	265	10.88%
Census Tract 13	401	13.85%
Census Tract 14.01	456	11.64%
Census Tract 14.02	618	12.74%
Census Tract 15.01	793	19.00%
Census Tract 15.03	375	13.86%
Census Tract 15.04	915	10.73%
Census Tract 16.01	848	16.82%
Census Tract 16.04	1060	15.30%
Census Tract 16.05	716	23.80%
Census Tract 16.07	404	11.95%
Census Tract 16.08	517	8.90%
Census Tract 17	674	21.16%
Census Tract 9800	0	0%
<b>City of Victoria and ETJ</b>	<b>13639</b>	<b>14.94%</b>

## Land Use

The City of Victoria's Existing Land Use Map is displayed in Figure 2-5 below. The majority of land use in the City of Victoria consists of residential-single family and duplex housing, followed by agriculture and undeveloped land. Commercial uses are concentrated along US-59 T and US Bus. 77.

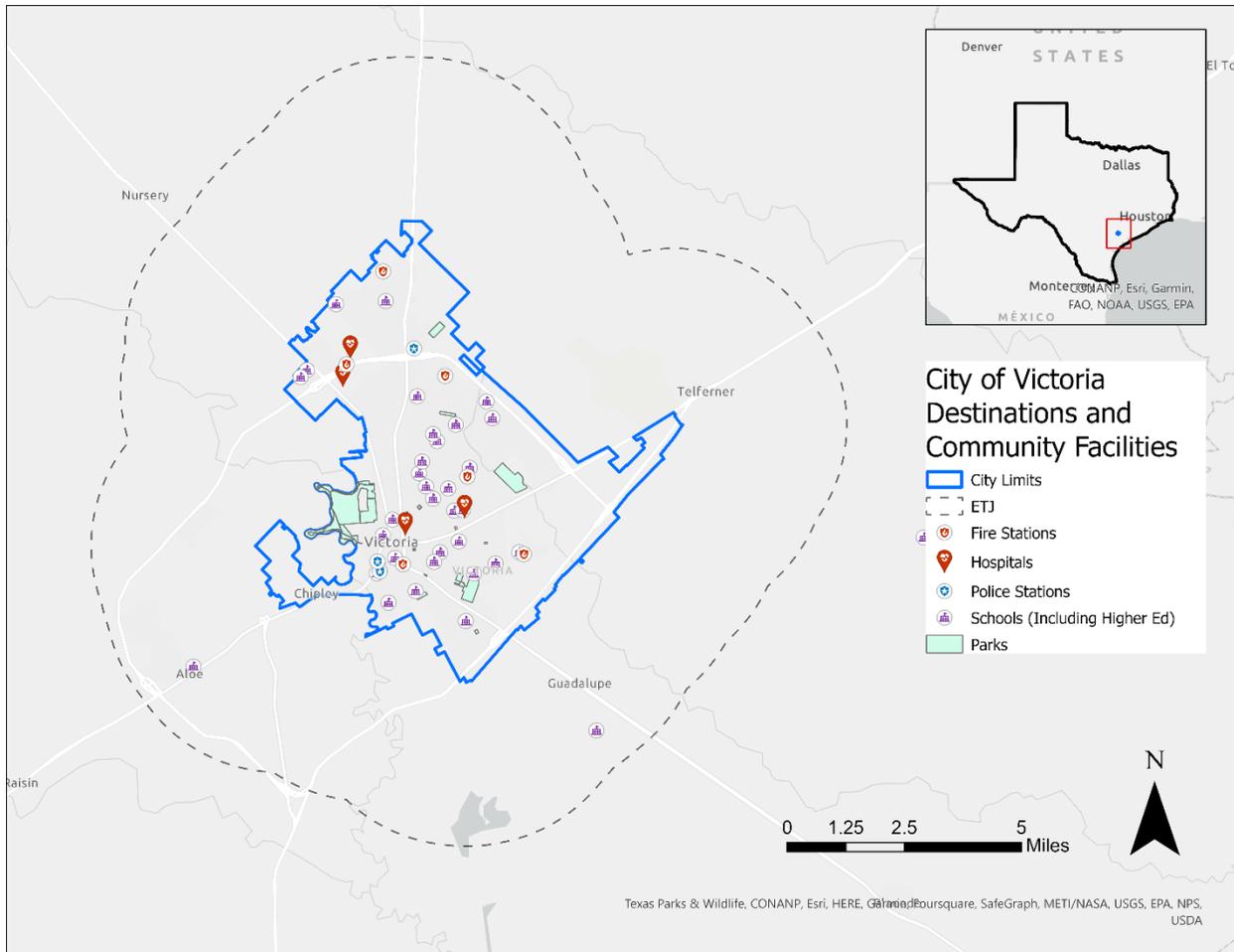
**Figure 2-5. City of Victoria Land Use Map**



The City of Victoria has several key destinations which act as generators for travel in the community. The geographic relationship between these destinations and the transportation system in the community has a meaningful impact on the travel choices people make.

Community facilities, such as libraries, parks, and community centers, are located throughout the City of Victoria. Schools and churches are scattered throughout the Victoria MPA. Figure 2-6 displays community facilities by type.

**Figure 2-6. Community Facilities by Type in the City of Victoria**



## Existing Transportation System

### Public Transportation

The City of Victoria currently has a public bus system that provides the public with transit routes throughout the city. Victoria Transit operates four fixed route bus lines from 7:00 am to 6:00 pm, Monday through Friday. Fixed route service operates on a predetermined route, and transit users must board at designated bus stops along the route. Routes Red, Blue, Green, and Gold are fixed route services in the City of Victoria. Victoria Transit also offers paratransit services that are not reflected in the figure below. Figure 2-7 displays service coverage by route.

Figure 2-7. City of Victoria Transit Coverage by Route

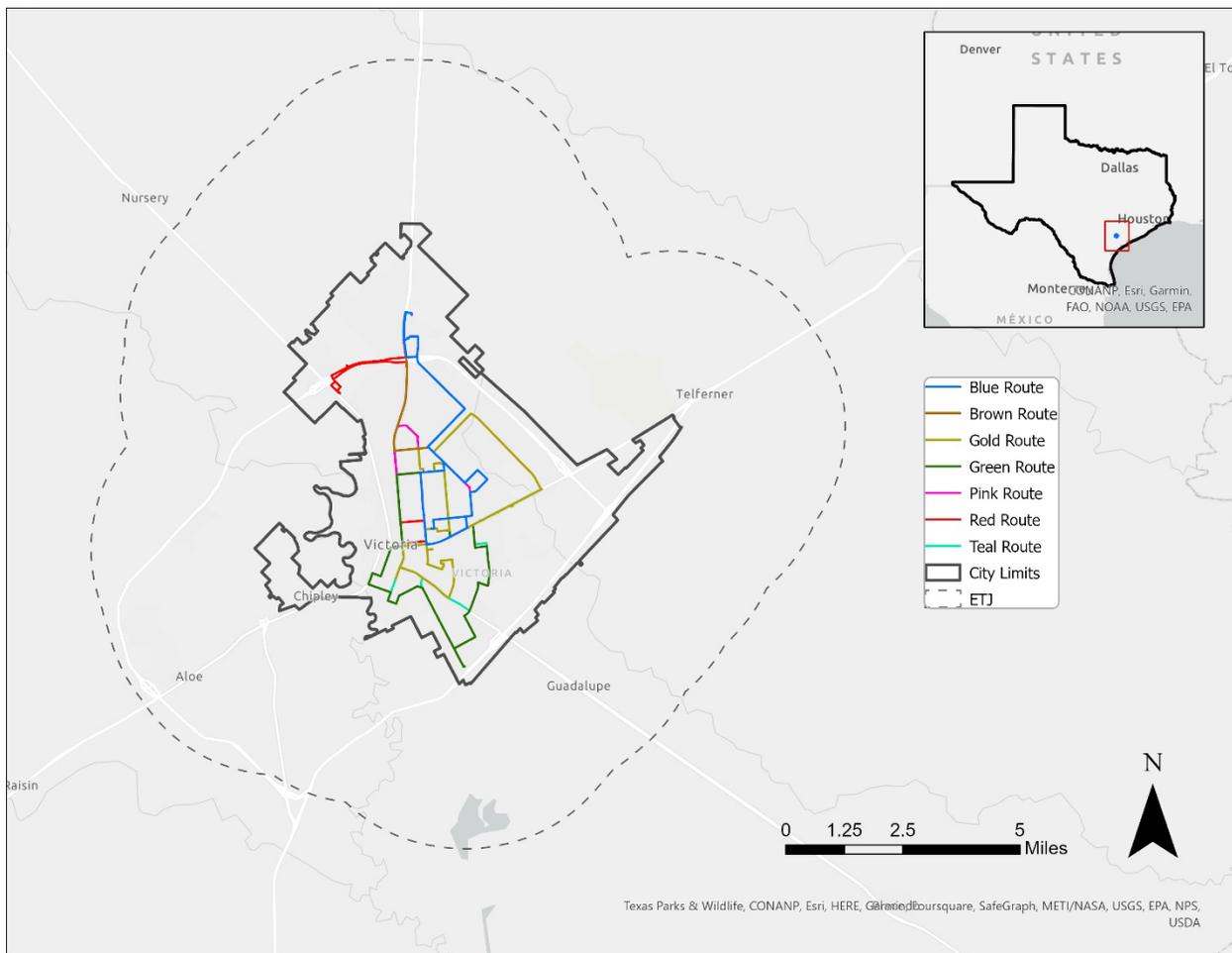


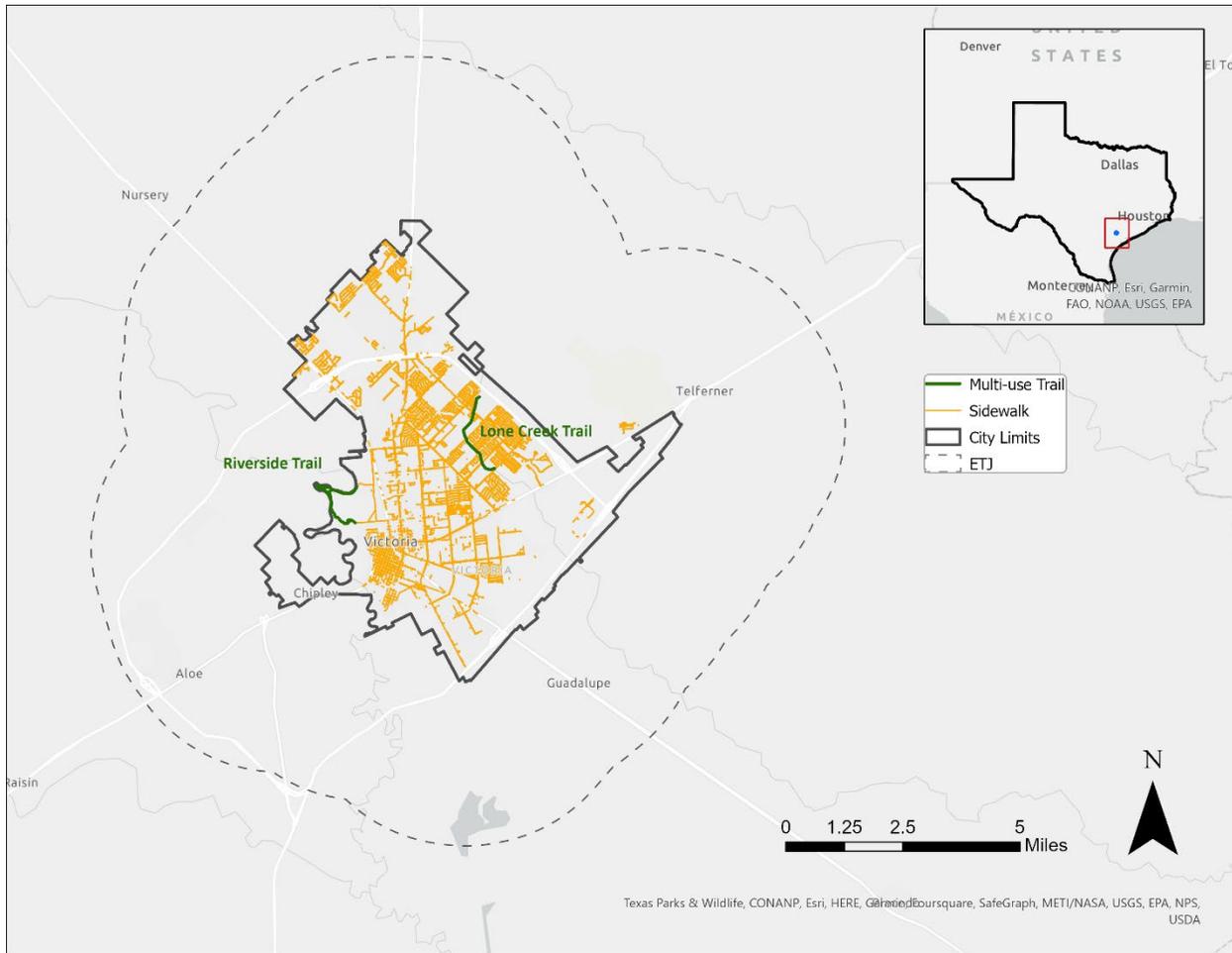
Figure 2-8 displays major roadways within the City of Victoria and the ETJ. Safe roadway networks are necessary for active transportation infrastructure and use by the community. These roadways represent major corridors that people use to get around the city, freight movement, and access to services, facilities, and recreation.



**Table 2-5. Existing Active Transportation Facilities Length in Miles**

Facility Type	Length in Miles
Multi-use Trail	2.7
Greenway Trail	3.0
Nature Trail	1.6
<b>Total Off-Street</b>	<b>7.3</b>

**Figure 2.9. Active Transportation Infrastructure (Sidewalks and Trails) in Victoria ETJ**



### 3. Crash Analysis

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The City of Victoria/Victoria MPO seeks to implement an Active Transportation Master Plan for the City and region. Crash analyses are crucial to expose areas of high crash rates for active transportation modes in order to address safety concerns. This initial crash analysis of roadways and intersections highlights areas of concern for pedestrians and bicyclists based on TxDOT CRIS data. With the growing use of active transportation modes throughout the country, and as pedestrians and cyclists continue to use the region's roads for travel and commuting, it will be vital for the City of Victoria to update its active transportation infrastructure.

Walking and cycling are necessary to the overall use of the multimodal transportation system and can have significant impacts on local and regional transportation goals. Identifying crash trends and areas of concern will allow the City to better organize its efforts to improve roadway safety and increase the use of active transportation in the city and the region.

#### Methodology

Using 2018 through 2022 crash data from the TxDOT Crash Records Information System (CRIS), ATG identified crash rates at intersections and roadways for all modes, pedestrians, and bicyclists<sup>1</sup> in ArcGIS Pro. Boundary data for the City of Victoria, Victoria MPO, and Victoria County were obtained from the City of Victoria geodatabase provided. TxDOT roadways and network were obtained from the TxDOT website and database. Additional data regarding streets and projects were obtained from the Victoria Master Thoroughfare Plan (MTP), which was previously completed by ATG.

Locational data (Latitude and Longitude) were used to map out the location of each crash and all modes, pedestrian, and bicyclist involved crashes were mapped separately to highlight roadway segments and intersections of concern. Boundaries were used to select and export crash points within the City of Victoria Extraterritorial Jurisdiction (ETJ) and City Limits. Hot Spot maps were also produced using the Heat Map symbology in ArcGIS Pro to illustrate roadways of concern for the City of Victoria. These hotspot corridors and intersections represent the high injury network where proposed improvements can have the greatest impact on improved safety outcomes in the future.

#### Crash Analysis

There were 4,755 crashes involving all modes of transportation from 2018 through 2022 within the City of Victoria ETJ. 137 crashes had injury statuses that were unknown. 211 crashes within the City ETJ for all modes were either suspected serious injuries or fatal, accounting for 4.61% of all crashes. Compared to crashes for all modes, pedestrians and bicyclists were far more likely to be seriously or fatally injured in the event of a crash in this 5-year timespan.

There were 9 fatal crashes and 19 serious injury crashes involving pedestrians and bicyclists from 2018 through 2022. 33.73% of all crashes involving pedestrians and/or bicyclists resulted in a serious or fatal injury (28 of 83 crashes). No cyclists were fatally injured in a crash from 2018 to 2022 in the City of Victoria, according to the TxDOT CRIS database.

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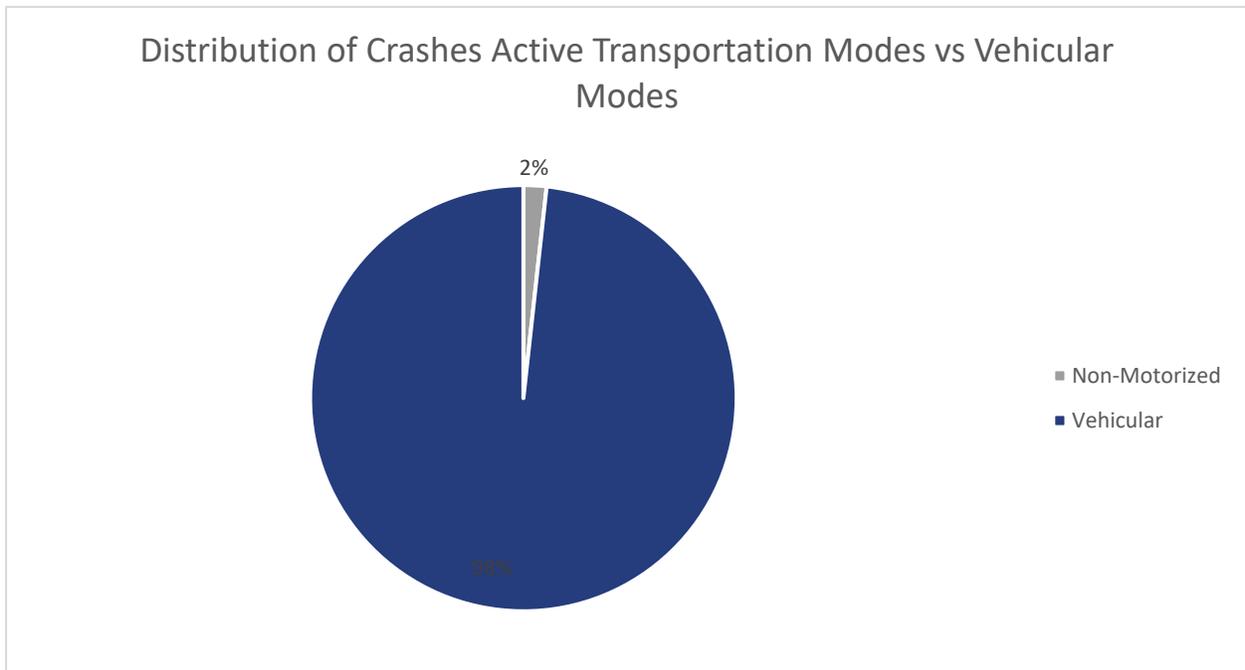
<sup>1</sup> Bicyclists are called "pedacyclists" in TxDOT CRIS dataset.

Table 3-1 displays crashes in the City of Victoria ETJ split by Pedestrians, Bicyclists and All Modes for the 5-year span 2018 – 2022. Figures 3-2 and 3-3 display the Distribution of Crash Severity by Non-Motorized Modes and All Modes respectively.

**Table 3-1. City of Victoria and ETJ Crashes by Mode from 2018 - 2022 (5 Year) by Crash Severity**

Mode	Unknown	No Injury	Possible Injury	Suspected Minor Injury	Suspected Serious Injury	Fatal Crashes	Share Serious or Fatal Crashes
Pedestrians and Bicyclists <sup>2</sup>	0	10	15	30	19	9	33.73%
All Modes	181	3012	712	639	168	43	4.61%

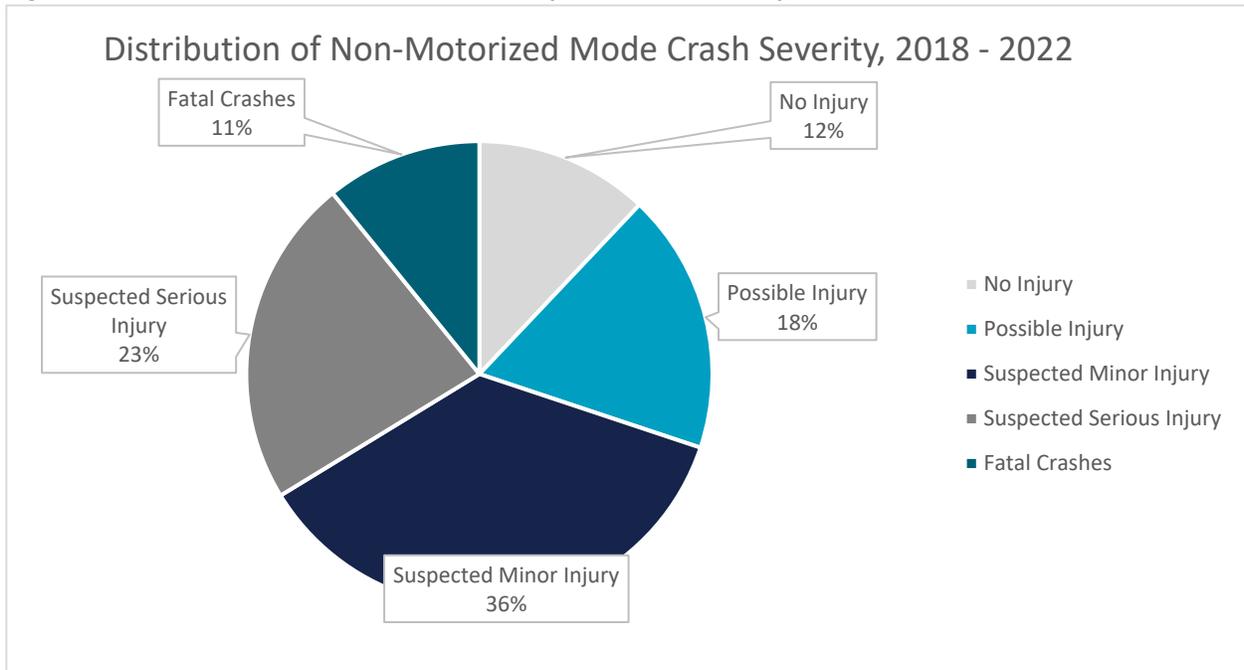
**Figure 3-1. Distribution of Crashes by Mode, 2018 – 2022**



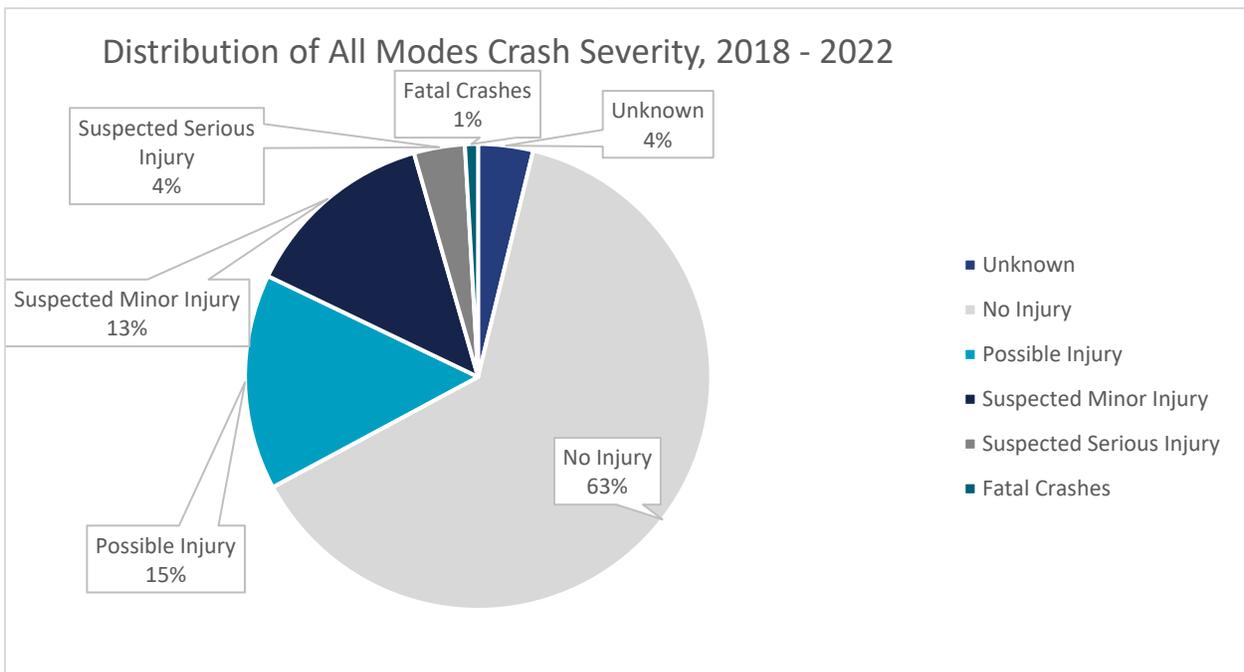
In addition to increased chances of serious or fatal injuries for active transportation users in Victoria, users using non-motorized forms of transportation are overall more likely to be injured when compared to overall distribution of crash severity for all modes from 2018 – 2022. 63% of all crashes for all modes did not result in injury. However, nearly 64% of pedestrians and cyclists were injured in a crash in the same time span.

<sup>2</sup> Bicyclists are called “pedacyclists” in TxDOT CRIS dataset

**Figure 3-2. Distribution of Pedestrian and Bicyclist Crash Severity, 2018 - 2022**



**Figure 3-3. Distribution of All Modes Crash Severity, 2018 – 2022**



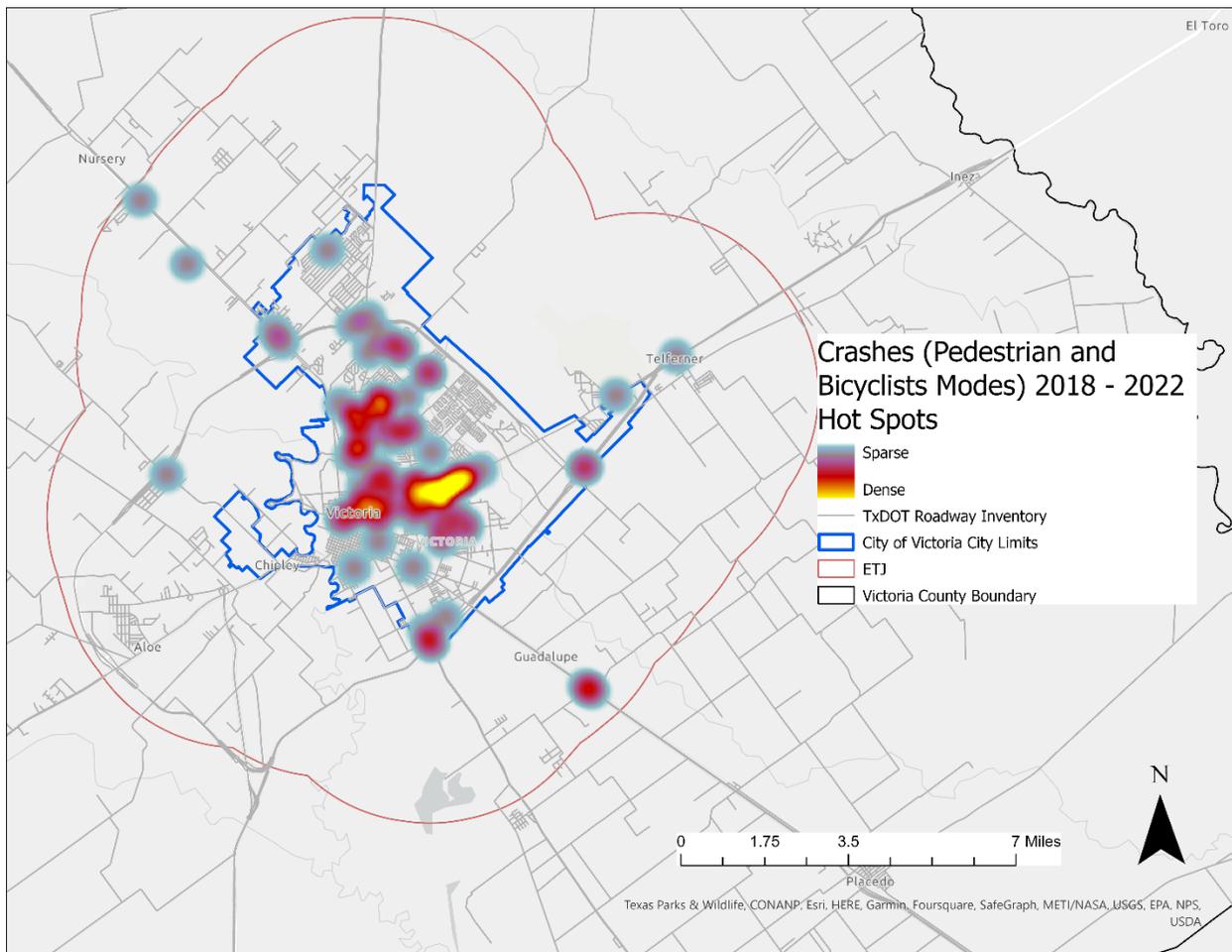
***Distribution of Crashes***

Figures 3-4 and 3-5 display crash hot spots for non-motorized modes and All Modes in the 2018 – 2022 5-year span respectively.

The distribution of crashes for pedestrians and cyclists is shown in Figure 3-4. Crashes for all modes in the City of Victoria and surrounding ETJ from 2018 – 2022 were concentrated along major corridors, such as US 59 and US 77 (Figure 3-5). While crashes for all modes seem to be distributed along these major corridors through the City of Victoria, crashes involving bicyclists and pedestrians are concentrated along certain roadways and intersections.

From 2018 through 2022, roadways of concern for non-motorized road users include Business US 77 and Business US 59. In addition, several other segments, such as N Moody St, West Stayton Ave, North John Stockbauer Dr, and Sam Houston Dr, are areas of concern for pedestrians and cyclists (Figure 3-4).

**Figure 3-4. Crash Hot Spots for Non-Motorized Modes in City of Victoria ETJ Boundaries 2018 – 2022**



**Figure 3-5. Crash Hot Spots for All Modes in City of Victoria ETJ Boundaries 2018 -2022**

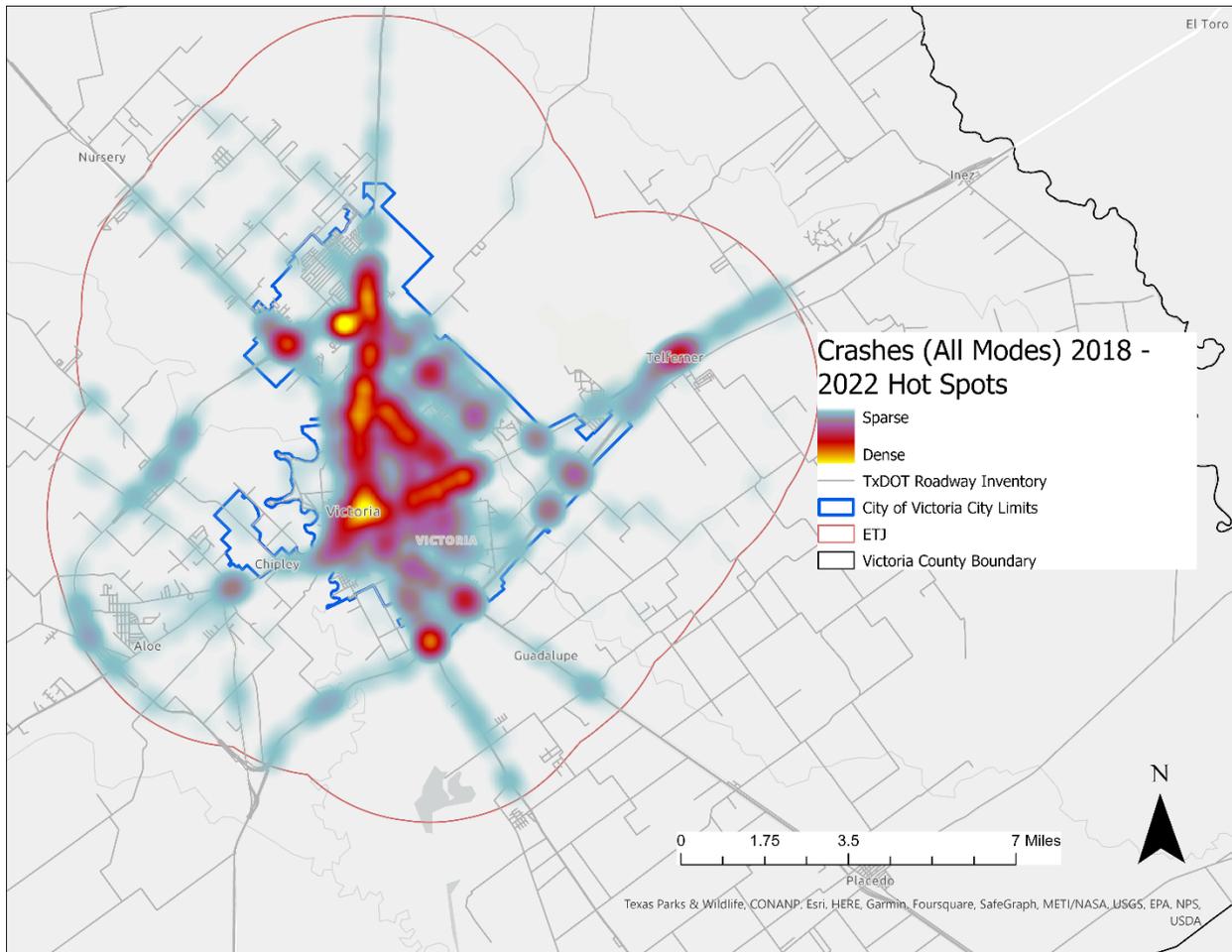


Table 3-2 displays top intersections and segments of concern for crashes for all modes from 2018 through 2022. Tables 3-3 and 3-4 display intersections and roadway segments of concern for crashes for pedestrians and cyclists in the same time span, respectively. While crashes for all modes are concentrated along major corridors such as Business US 77 and Business US 59, pedestrians and cyclists also encounter greater crash risks along certain urban arterials, such as N John Stockbauer Dr, N Ben Jordan St, and Sam Houston Dr.

Pedestrian involved crashes appear to be a greater concern along roadway segments, rather than intersections, with 29 crashes occurring along segments of concern. There were only five intersections within the City of Victoria ETJ that contained a pedestrian involved crash (6 crashes total). Bicyclist crashes are also rare compared to pedestrian and all mode crashes, with only 15 intersection crashes and 12 roadway segment crashes from 2018 – 2022.

Most crashes for pedestrians occurred in dark conditions, whether lighted or unlighted and were non-intersection related. Bicyclist crashes appear to occur during daylight conditions and were intersection and/or driveway related. Weather did not appear to play a significant factor for either pedestrians or cyclists involved crashes (most incidents occurred in dry and clear conditions according to the TxDOT CRIS data from 2018 – 2022).

**Table 3-2. Top 10 Intersections and Roadway Segments based on Crashes within the City of Victoria ETJ (All Modes)**

<b>Top 10 Intersections by Total Crashes from 2018 - 2022</b>				
<b>Ranking</b>	<b>Roadway</b>	<b>Intersecting Roadway</b>	<b>Total Crashes</b>	<b>Share of All Crashes</b>
1	US 77	TX-463-Loop E	56	1.4%
2	US 59	SH 185	42	1.1%
3	US 77	N Delmar Dr	35	0.9%
4	US 59	Sam Houston Dr	35	0.9%
5	US 77	Whispering Creek Dr	35	0.9%
6	US 77	Glasgow St	30	0.8%
7	US 59	N Ben Jordan St	29	0.7%
8	US 77	Sam Houston Dr	29	0.7%
9	E Mockingbird Ln	N Navarro St	26	0.7%
10	US 77	E Red River St	24	0.6%
<b>Total Crashes</b>			<b>341</b>	<b>7.2%</b>
<b>Top 10 Roadway Segments by Total Crashes from 2018 - 2022</b>				
<b>Ranking</b>	<b>Roadway</b>	<b>Closest Roadway(s)</b>	<b>Total Crashes</b>	<b>Share of All Crashes</b>
1	BU US 77S	E Airline Rd, E Mockingbird Ln	95	2.4%
2	US 77	Ne Zac Lentz Pkwy, Broadmoor St	87	2.2%
3	US 77/TX-463-LOOP E	Mallette Dr, N Navarro St	64	1.6%
4	N John Stockbauer Dr	N Ben Jordan St, Ne Zac Lentz Pkwy	64	1.6%
5	US 59	N Ben Jordan St, N Belmar Dr	63	1.6%
6	US 77	Broadmoor St., Glasgow St	60	1.5%
7	US 59	E Juan Linn St, Se Zac Lentz Pkwy	58	1.5%
8	N Ben Jordan St	US 59, Sam Houston Dr	54	1.4%
9	US 59	US 77, N Laurent St	41	1.0%
10	US 59	US 87, Hanselman Rd	37	0.9%
<b>Total Crashes</b>			<b>623</b>	<b>13.1%</b>

**Table 3-3. Top 10 Intersections and Roadway Segments based on Crashes within the City of Victoria ETJ (Pedestrian Involved Crashes)**

<b>All 5 Intersections by Crashes (Pedestrians)</b>				
<b>Ranking</b>	<b>Roadway</b>	<b>Intersecting Roadway</b>	<b>Total Crashes</b>	<b>Share of All Crashes</b>
1	BU US 59	N Delmar Dr	1	0.02%
2	BU US 77	E Circle St	1	0.02%
3	BU US 59	W Stayton Ave	2	0.04%
4	E Red River St	N Levi St	1	0.02%
5	Lone Tree Rd	N Ben Wilson St	1	0.02%
		<b>Total Crashes</b>	<b>6</b>	<b>0.13%</b>
<b>Top 10 Segments by Crashes (Pedestrians) (NOT Including Intersections Crashes)</b>				
<b>Ranking</b>	<b>Roadway</b>	<b>Closest Roadway(s)</b>	<b>Total Crashes</b>	<b>Share of All Crashes</b>
1	BU US 59	N Ben Jordan St, N Delmar Dr	8	0.17%
2	BU US 77	Circle St, Morning Glory Dr	4	0.08%
3	N Ben Wilson St	US 87, Coffey St	3	0.06%
4	BU US 59	Sam Houston Dr, Teakwood Dr	2	0.04%
5	BU US 59	Us 77, N Laurent St	2	0.04%
6	BU US 59/N Moody St	W Goodwin Ave, W North St	2	0.04%
7	US 59	Se Zac Lentz Pkwy, County Rd	2	0.04%
8	W Stayton Ave/Memorial Dr	John F Lee Dr, N Main St	2	0.04%
9	N John Stockbauer Dr	Ne Zac Lentz Pkwy, N Ben Jordan St	2	0.04%
10	Sam Houston Dr	N Ben Jordan St, E Airline Rd	2	0.04%
		<b>Total Crashes</b>	<b>29</b>	<b>0.61%</b>

**Table 3-4. Top 10 Intersections and Roadway Segments based on Crashes within the City of Victoria ETJ (Bicyclist Involved Crashes)**

All 15 Intersections by Crashes (Bicyclist)				
Ranking	Roadway	Intersecting Roadway	Total Crashes	Share of All Crashes
1	BU US 77	US 87	1	0.02%
2	US 59	SH 185	1	0.02%
3	BU US 77	FM 1315	1	0.02%
4	BU US 59	N Ben Wilson St	1	0.02%
5	E Warren Ave	N Laurent St	1	0.02%
6	Sam Houston Dr	N Laurent St	1	0.02%
7	BU US 59	US 87	1	0.02%
8	BU US 59	US 87	1	0.02%
9	N John Stockbauer Dr	N/A	1	0.02%
10	N Laurent St	E Polk Ave	1	0.02%
11	US 87	N George St	1	0.02%
12	E Crestwood Dr	N Nimitz St	1	0.02%
13	Glasgow St	Ball Airport Rd	1	0.02%
14	Buena Vista Ave	N Levi St	1	0.02%
15	N Ben Jordan St	Sam Houston Dr	1	0.02%
		<b>Total Crashes</b>	<b>15</b>	<b>0.32%</b>
All 12 Segments by Crashes (Bicyclists) (NOT Including Intersections Crashes)				
Ranking	Roadway	Closest Roadway(s)	Total Crashes	Share of All Crashes
1	E Red River St	Tile St	1	0.02%
2	N Delmar Dr	Lone Tree Rd	1	0.02%
3	FM 1315 (Salem Rd)	Dairy Rd	1	0.02%
4	Circle St	N/A	1	0.02%
5	BU US 77	Guy Grant Rd	1	0.02%
6	N Ben Jordan St	Wildwood St	1	0.02%
7	US 77	E Colorado St	1	0.02%
8	Sam Houston Dr	E Red River St	1	0.02%
9	Sam Houston Dr	N Laurent St	1	0.02%
10	Bu Us 77	E Mockingbird Ln	1	0.02%
11	E Red River St	Avon Dr	1	0.02%
12	Lova Dr	Oaklawn St	1	0.02%
		<b>Total Crashes</b>	<b>12</b>	<b>0.25%</b>

## 4. Sidewalk Analysis

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The Victoria 2045 Metropolitan Transportation Plan used the MPO's existing sidewalk data to visualize the sidewalk network in relation to population and employment density, transit dependent populations, and environmental justice zones to identify general areas where sidewalks are lacking and needed. Higher densities of population and employment tend to stimulate higher potential for usage of a sidewalk network where sidewalks can provide important links for short trips of varying purposes while a transit needs index (TNI) and environmental justice (EJ) zones were used to identify areas of greater need for such facilities. Since these analyses were performed so recently, the project team decided to build on their results rather than rerun them with largely the same data.

The population and employment density maps show that sidewalk facilities were found to be most complete in newer suburban neighborhood developments and in the older, commercial downtown area of Victoria. In terms of the TNI and EJ equity measures, the area south of Red River St to US-59 between the Guadalupe River and Delmar Drive stands out as an area in need. While the MTP used these analyses to recommend improved connectivity in the sidewalk network, particularly in the areas identified by demographic analyses, this Active Transportation Plan (ATP) opts to begin with a risk-based analysis to identify specific roadway corridors and segments that have proven unsafe.

While the available sidewalk data provides a sense of the sidewalk network, two factors limit the data. First, the data are not tied to the street centerline level, which would offer a better baseline to identify where pedestrian infrastructure may be lacking along certain roadways. Secondly, the provided data do not consider the presence or absence of crosswalks, which are effectively an extension of the sidewalk network, bridging the gaps of every cross street. A sidewalk network is not complete without basic crosswalks, including ADA ramps and other technological enhancements to improve safety. Sidewalk and crosswalk data are notoriously labor and time intensive to gather via manual sidewalk surveys that can take months to complete; however, new methods using satellite imagery and artificial intelligence are being developed.<sup>3</sup> Once developed, these data can be labor intensive to maintain and update. In lieu of perfect data, Victoria can set priorities for further study and implementation. The following analysis identifies Pedestrian Safety Priority Corridors as a starting point.

### Methodology

This risk-based, pedestrian safety priority analysis starts with a review of the crash data of the past five years to identify roadways with multiple crashes involving pedestrians, or a high injury network. Once identified, the available sidewalk data is reviewed along the identified roadway segments and assessments are made as follows (numeric score for GIS analysis):

- Complete (1)
- > 50% complete (2)
- < 50% complete (3)
- No sidewalks (4)

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<sup>3</sup> These researchers use satellite photos, AI to map crosswalks and fill gaps. The Washington Post. February 25, 2023.

This assessment is validated against aerial imagery to better ensure the accuracy of the sidewalk data provided for these roadway segments identified as a high priority for pedestrian safety. “Complete” means sidewalks are present on both sides of the street for the entirety of the segment. Sidewalk condition does not factor into the assessment as this requires a field inspection to make a reasonable judgement of cracking, buckling, unlevel surfaces, etc. Additionally, the presence or absence of crosswalks or ADA ramps is not considered in this basic assessment of the sidewalk network along these corridors.

Finally, other factors such as bus stops, schools, and parks were introduced to illustrate the potential of expanding this risk-based assessment beyond crashes to develop a Pedestrian Priority Network of roadways that may be used to guide further study and/or infrastructure implementation in the future.

## **Analysis**

### ***Pedestrian Safety Priority Corridors***

#### **Crashes Involving Pedestrians**

The project team first identified all roadways which featured more than one crash involving a pedestrian between 2018-2022. Many of the identified corridors are US highway routes through Victoria. This is likely due primarily to sheer volume of traffic, but these roadways also present conditions, as noted in the level of traffic stress (LTS) analysis, that often render pedestrian usage uncomfortable and unsafe, such as a high number of lanes and high vehicular speeds.

US-59T Business between downtown Victoria and Telferner showed 14 crashes involving a pedestrian, around 25% of the 55 total within the Victoria ETJ. In all, the corridors identified contain 44 of the 55 crashes (80%). The other 11 are mostly found on local roads, many just off the identified corridors, suggesting a possible link between the conditions on the identified corridors and crashes located in close proximity. All segments are noted in Table 4-1.

#### **Sidewalk Network**

The sidewalk data largely appeared accurate as compared to satellite imagery. Two segments appeared possibly more complete than the data showed. Those were US-59T Business and US-77 (Navarro St). US-59T Business appeared mostly complete from downtown out to Delmar Drive except for a considerable number of driveways into businesses that appear as gaps in the sidewalk network. The situation for US-77 was similar from Zac Lents Pkwy into the center of downtown Victoria. The GIS data does not extend the sidewalk across most of these driveways, and on the ground, driveways exist somewhere in between sidewalks and intersections. They may or may not warrant crosswalks but present comfort and safety issues, nonetheless. For US-77, the sidewalk network rating of “>50% complete” was retained after inspection of the aerial imagery, but even so, the number of driveways presents considerable difficulty and stress for people walking.

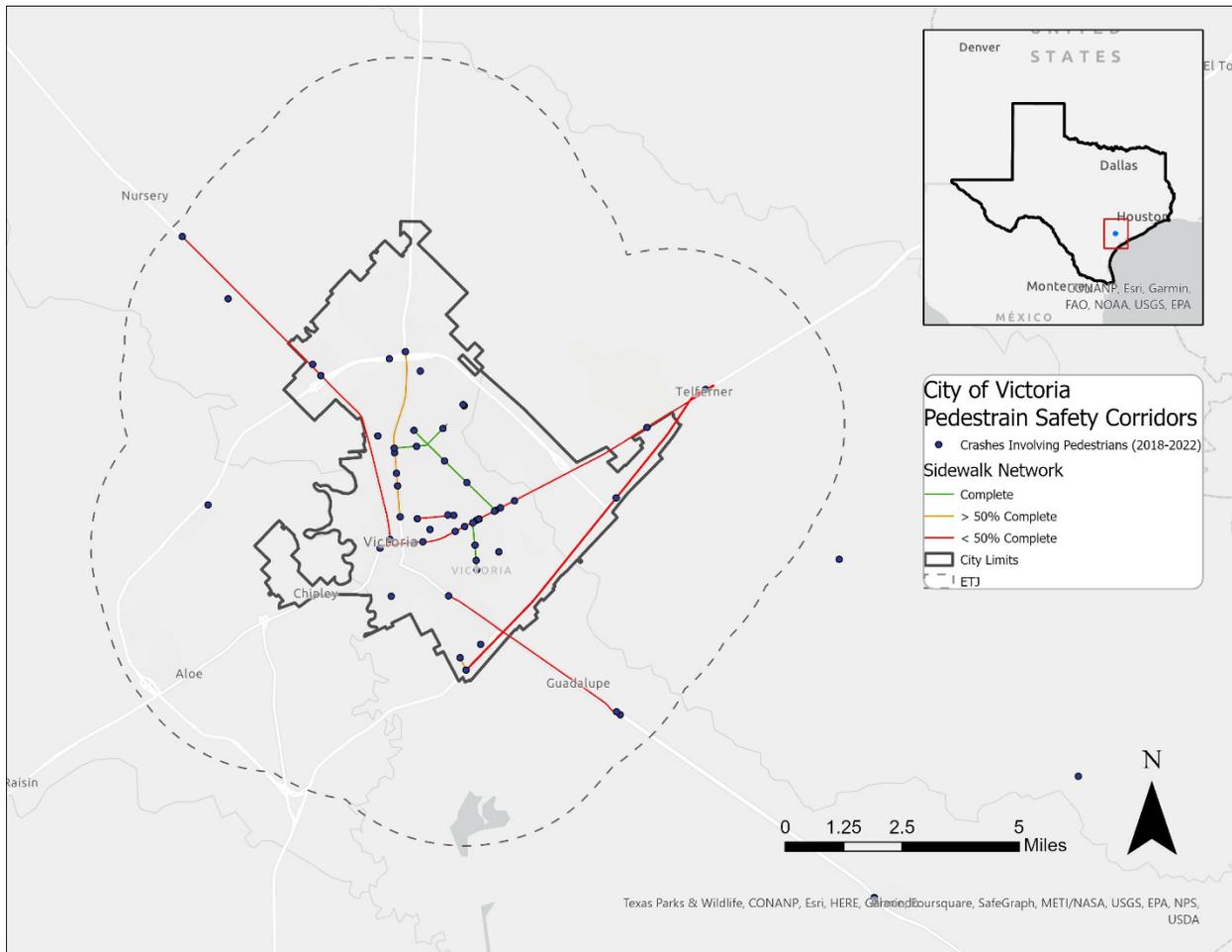
Another segment to note is US-59 N, which is a limited access divided highway with a frontage road along each side. Though the crash data depicts incidents in the median of the highway itself, the presence of the sidewalk network was noted along its frontage roads for continuity of assessing sidewalks along the identified corridors. The frontage roads could reasonably serve as an appropriate alternative path for someone on foot, though there was very little sidewalk presence noted here either. It's important to note that these crashes may involve people walking along the highway due to an automotive breakdown or even hitchhiking, but without examining individual crash reports, this is unknown. However, the purpose of the analysis remains strong, to use known crashes involving

pedestrians as a starting point for examining pedestrian infrastructure needs. At the very least, it highlights areas where we know people are walking, and beyond that, it identifies areas already known to have safety issues.

**Table 4-1. Pedestrian Safety Priority Corridors by Number of Crashes Involving Pedestrians**

Corridor	From	To	Incidents	Sidewalk Network
US-59T Business	W. Stayton Ave	FM 1686	14	<50% complete
US-77 (Navarro St)	Hathaway St	E Virginia Ave	6	>50% complete
Sam Houston Dr	Kingsway	US-59T Business	4	Complete
E Mockingbird Ln	US-77 (Navarro St)	Guy Grant Rd	3	>50% complete
N Ben Wilson St	US-59T Business	Mayfair Dr	3	Complete
US-59 N	TX 185 (Laurent St)	FM 1686	3	<50% complete
US-87 (Port Lavaca Dr)	Ben Jordan St	Guadalupe Rd	3	<50% complete
US-87 (Main St)	Cottonwood	Nueces St	3	<50% complete
E Red River St	N Levi St	Avon Dr	2	<50% complete
N John Stockbauer Dr	Williamsburg Ave	E Mockingbird Ln	2	Complete
TX 185 (Laurent St)	Allen Rd	US-59 N	2	>50% complete

Figure 4-1. Pedestrian Safety Priority Corridors



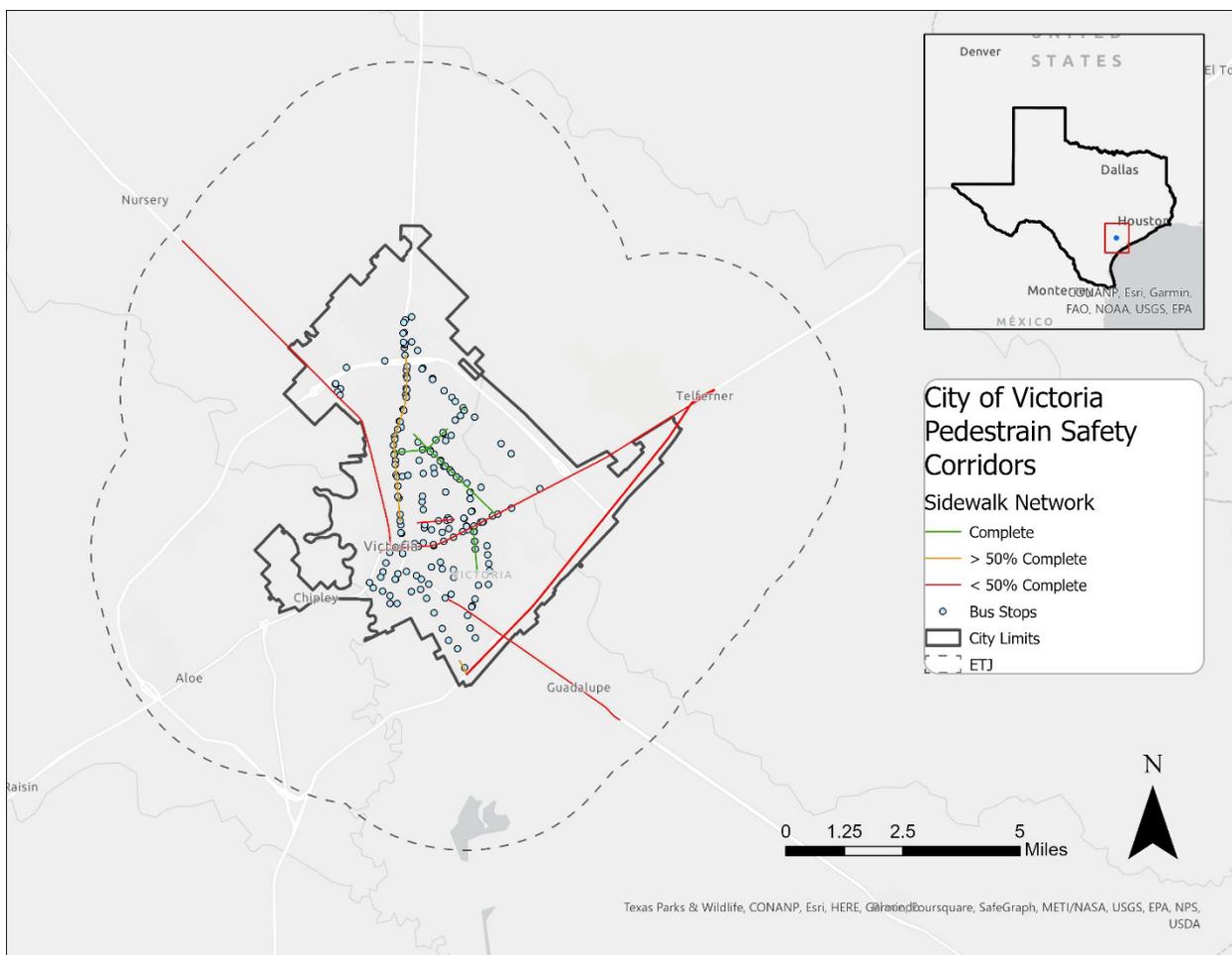
### Pedestrian Priority Network

Beyond prioritizing these roadway segments and corridors based on pedestrian safety, other factors that may represent significant priorities for pedestrian infrastructure and safety improvements could be considered. The project team looked at the location of bus stops (Figure 4-2), schools (Figure 4-3), and parks (Figure 4-4) in relation to the Pedestrian Safety Priority Corridors.

#### Bus Stops

All of the Pedestrian Safety Corridors feature bus stops within a quarter of a mile and most had stops directly along the corridor, particularly US-77 (Navarro St), US-59T Business nearer downtown, and Sam Houston Dr. Visualizing the bus stops in relation to the identified corridors shows the possibilities for a natural extension of these priority corridors. After all, bus stops represent a near guarantee of people walking, as all bus riders are a pedestrian on each end of their journey.

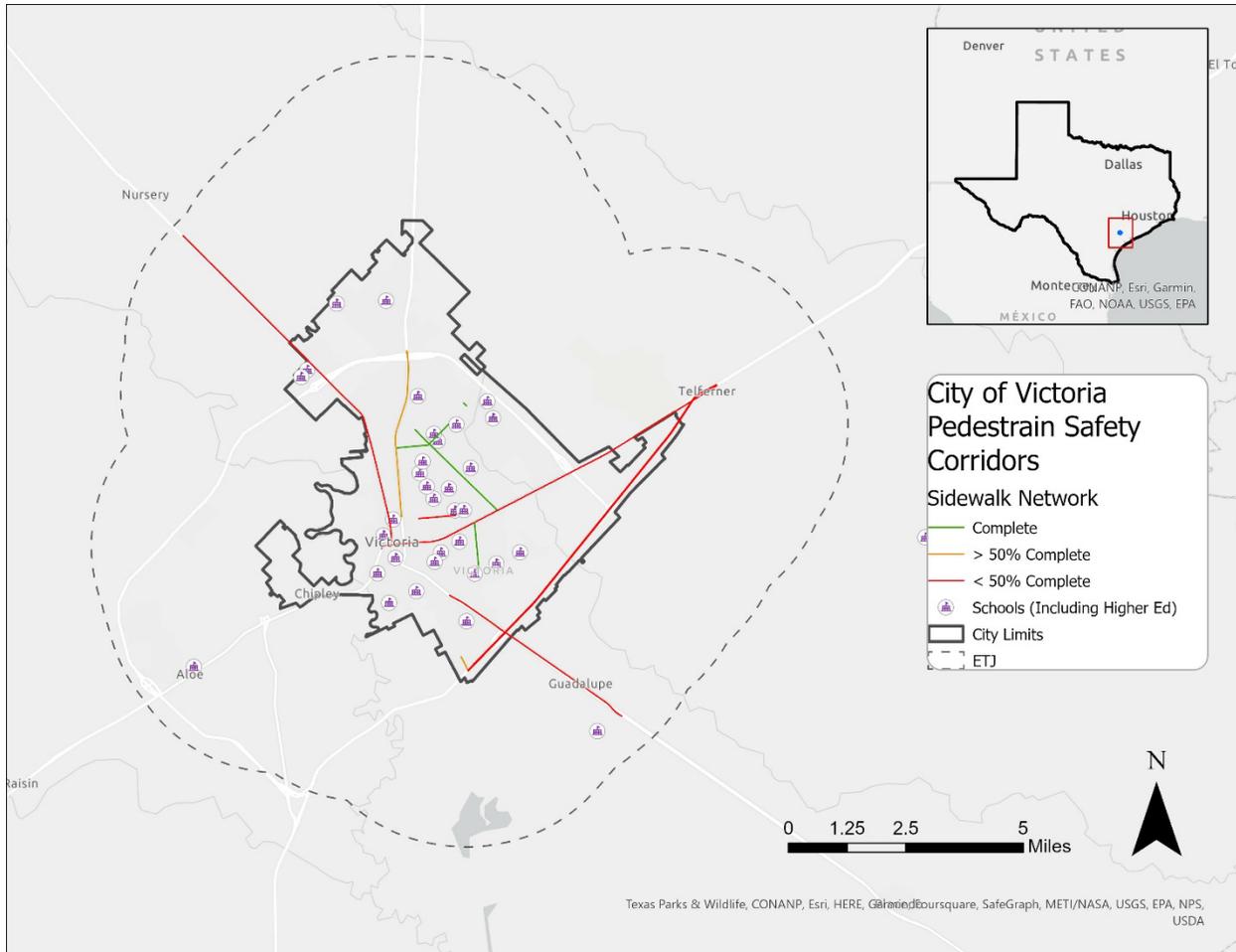
Figure 4-2. Pedestrian Safety Corridors in Relation to Bus Stops



### Schools

Looking the Pedestrian Safety Priority Corridors in relation to schools, we see fewer located directly on these corridors. Many of Victoria's schools are tucked into neighborhoods, though a cluster exists in the middle of the city, surrounded by identified segments. In many cases, one local road links a school with a nearby Pedestrian Safety Priority Corridor. Schools can be used as a proxy for walking activity as well as an indicator of the most vulnerable users, young children. Linking schools to the overall sidewalk network may offer a targeted approach to pedestrian improvement implementation.

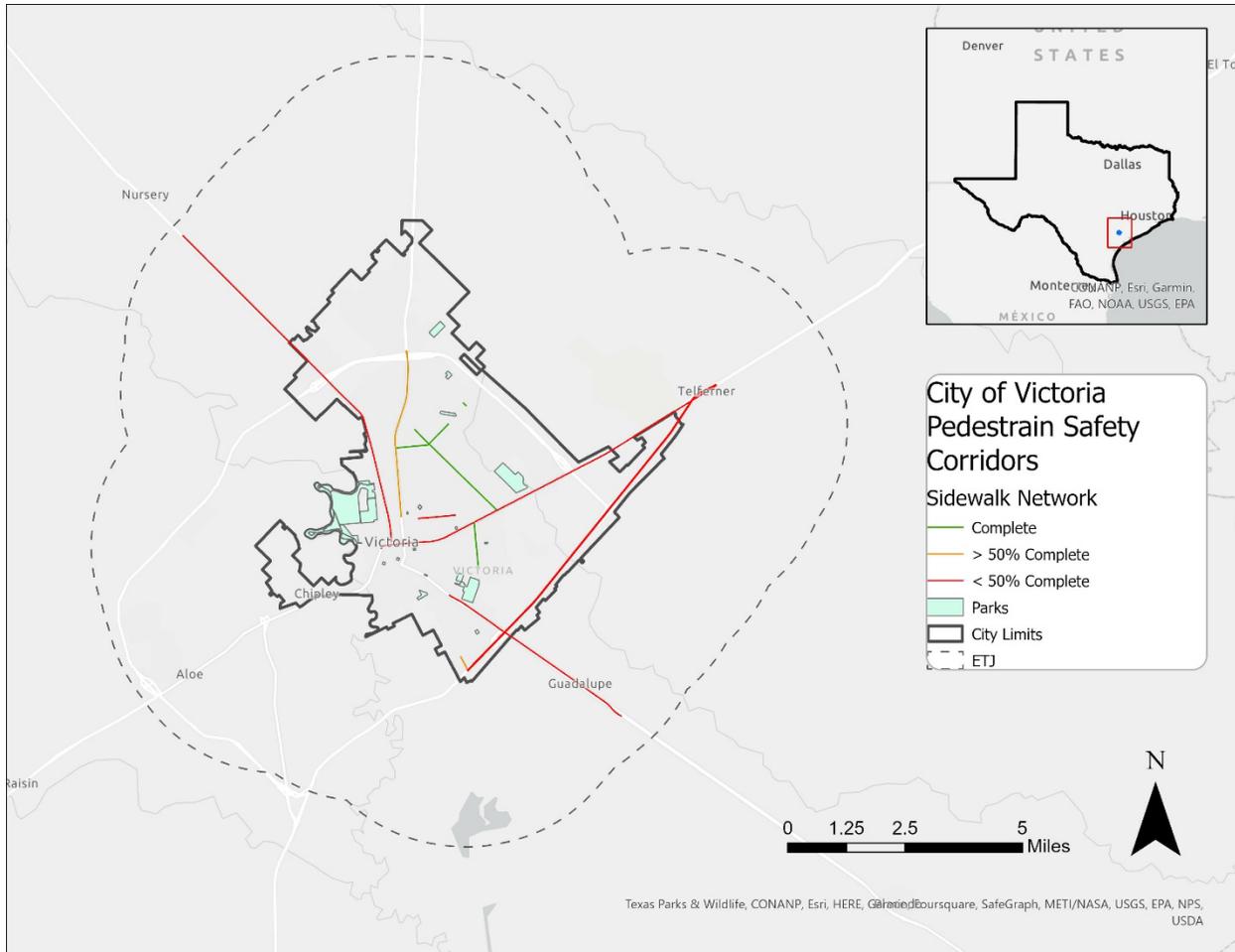
**Figure 4-3. Pedestrian Safety Corridors in Relation to Schools**



### Parks

Similar to schools, parks represent community assets that can be considered proxies for increased walking activity as well as indicators used by vulnerable populations, young and old. It is important that parks are connected to residential neighborhoods to ensure access for all, not just those who are able to drive to their favorite park. Like schools, the larger parks are located near but not directly on the identified segments, and while there may not be known safety issues bordering the parks, it's likely that people must walk along or cross these corridors to access parks.

**Figure 4-4. Pedestrian Safety Corridors in Relation to Parks**

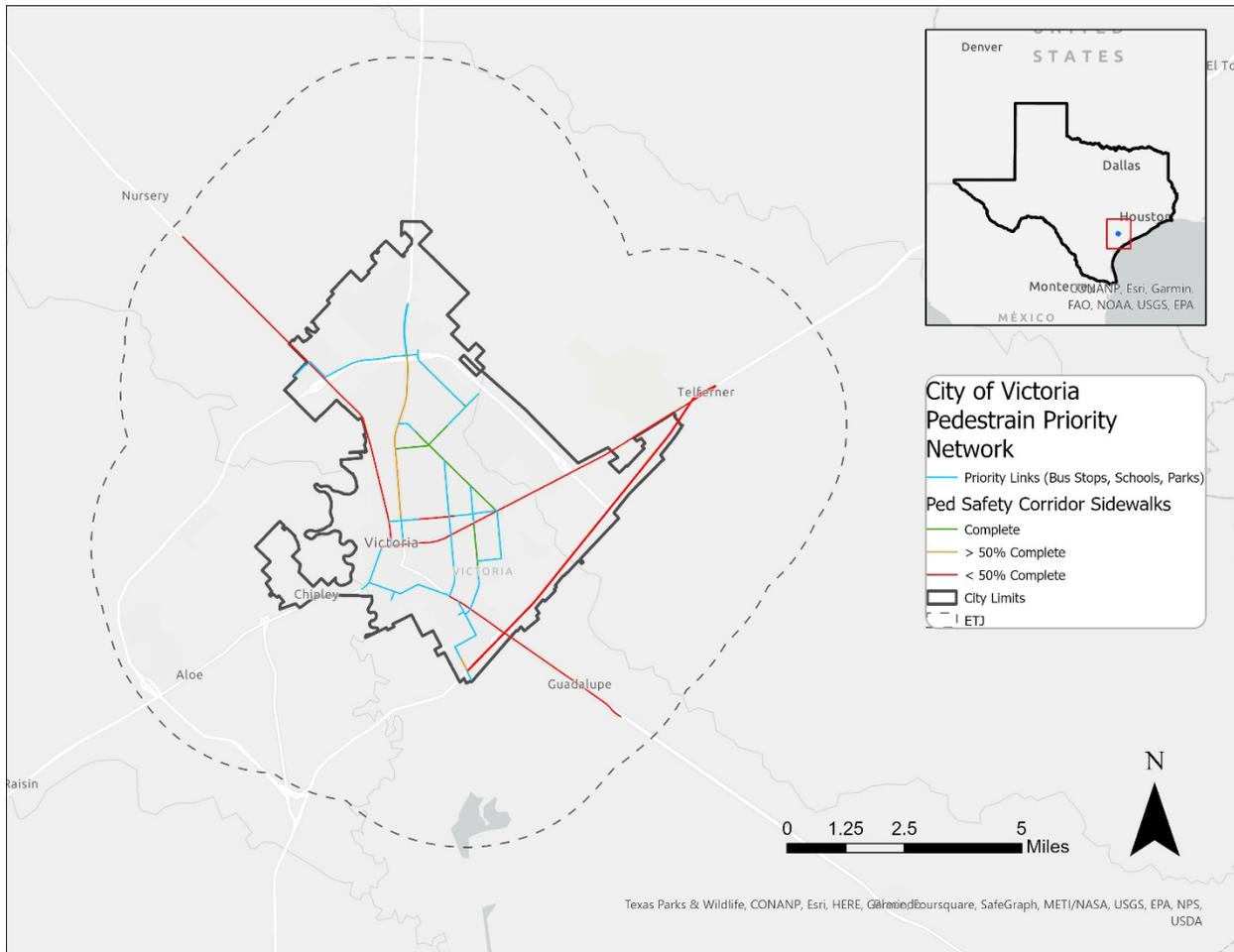


### Connecting Pedestrian Priority Network

These factors could be considered individually or holistically, based on the priorities of Victoria, to expand the Pedestrian Safety Priority Corridors into a broader Pedestrian Priority Network. The project team expanded the corridors which featured more than one crash involving pedestrians based on the locations of the isolated pedestrian crash incidents, bus routes, schools, and parks. The goal was not to connect every single crash, bus stop, school, and park but rather use these factors to reasonably extend the safety priority corridors into a cohesive network that may be used as a starting point for considering pedestrian improvement prioritization.

In addition to bus stops, schools, and parks, pedestrian barriers were also considered in terms of where important connections may be needed. These include anything that presents added difficulty for pedestrians in terms of a pinch point that limits connectivity, such as bridges over rivers or roadways passing under elevated highways. These barriers may additionally or instead represent added danger if the crossings are inadequate, in the case of bridges or underpasses, or other potential hazards like railroad crossings.

**Figure 4-5. Pedestrian Priority Network based on Bus Stops, Schools, and Parks**



## 5. Level of Traffic Stress

This section of the Existing Conditions Analysis for the Victoria ATMP uses simple roadway characteristics, such as number of lanes, average daily traffic (ADT), and posted speed limits to estimate vulnerable users’ comfort on roadways through a basic level of traffic stress (LTS) measure. Roadways with several lanes, high volumes of traffic, or high vehicle speeds may be high stress for people on bicycles, particularly if there is a lack of dedicated space for bicycles. Roadways with bicycle infrastructure or otherwise a small number of lanes, low traffic, and low speeds are more likely to be considered low stress.

This Bicycle LTS analysis identified the area’s roadway network as largely devoid of low-stress roadways, primarily due to posted speed limits of 30 mph or greater and a lack of dedicated bicycle facilities. However, this overview of the road network offers easy opportunities to improve safety on roadways and provides an inventory to guide the region’s action on future facility upgrades and alternatives.

### Methodology

This analysis was conducted using a method modified from the widely-credited report by the Mineta Transportation Institute (MTI) titled, *Low-Stress Bicycling and Network Connectivity*. [12] First, the research team confirmed the following factors were attributed to all roadway segments within the City of Victoria and its extraterritorial jurisdiction (ETJ) based on the TxDOT data gathered for the analysis.

- Number of thru lanes per direction
- Traffic volumes (or ADT)
- Posted speed limits
- Presence of bicycle facilities by type

The project team’s data-driven process considered these factors to better understand how they relate to perceptions of bicycle comfort and ultimately, safety. An LTS analysis uses a 4-point rating scale with an LTS of 1 or 2 considered “low-stress” and an LTS of 3 or 4 considered “high-stress.” This four-point scale is defined in the MTI report and is often related to different types of bicycle riders, from the most experienced adults who will bike almost anywhere to small children who may only be comfortable or safe on the lowest stress neighborhood streets.

As with all bicycle LTS and similar bicycle comfortability perception analyses, the dispersion of metrics (e.g. facility design, number of lanes, traffic volumes, and automobile speeds) into categories and outcomes are highly dependent upon the data available. The project team used MTI’s LTS methodology as a starting point for choosing applicable metrics and determining how to best apply them, but a

Figure 5-1. BLTS Comfort Index



Recommended General LTS table (Figure 5-2) from updated guidance provided by the Washington State Department of Transportation (WSDOT) in November 2022 was used to score the basic roadway attributes since no bicycle infrastructure was identified by the client.

In researching the area, portions of the Riverside Walking Trail appeared to present a viable bicycling alternative parallel to portions of McCright Drive and Memorial Drive, but upon closer inspection, the narrow sidewalk widths can't be considered a true off-street bicycle path. It is also important to note that roadway shoulder width was not considered in this analysis as it does not necessarily make a high speed or high-volume roadway comfortable for most users. While shoulder width is not incorporated in the MTI methodology, it is important to recognize that wide shoulders may be valuable for confident users and act as important connections, especially in rural and/or recreational riding networks.

**Table 5-1. WSDOT General LTS Table**

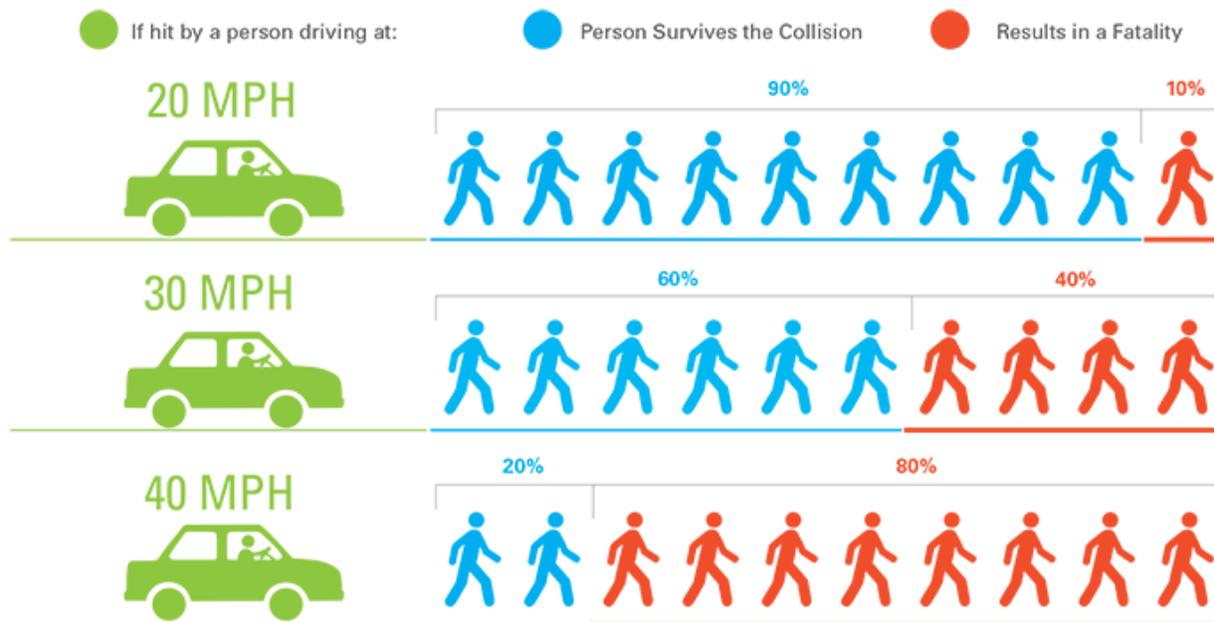
Recommended General LTS table (not accounting for bike lanes or sidewalk) used to develop tables below

Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	3	4	4	4	4
	751-1500	1	2	3	4	4	4	4
	1501-3000	2	2	3	4	4	4	4
	3000+	2	3	3	4	4	4	4
2 thru lanes per direction	0-7000	3	3	3	4	4	4	4
	>7000	3	3	4	4	4	4	4
3+ thru lanes per direction	Any ADT	4	4	4	4	4	4	4

Using the table for an example, a 2-lane road (1 thru lane in each direction) with a traffic volume of 300 vehicles per day and a 25-mph speed limit would receive a “low-stress” overall LTS of 1. The three metrics pinpoint the LTS in the first row of the table and the second column under the speeds. However, if this same example roadway had a speed limit of 45 mph, it would receive a “high stress” LTS of 4. In the latter scenario, even though two of the factors (number of lanes and ADT) are the same, the speed factor alone is enough to easily deem the roadway “high stress.” Furthermore, introducing a protected or off-street bicycle path along this roadway could be sufficient to boost its LTS into the low-stress rating. This may come into play at a later stage of the project that considers the impact of bicycle facilities recommendations.

Another way to consider the impact of LTS improvements could simply involve the lowering of vehicular speeds. A neighborhood street with one lane per direction, low traffic (<750 ADT), and a 30-mph speed limit could improve its LTS from a high-stress score of 3 to a low-stress score of 1 by simply reducing the speed limit to 25 or below. Roadway safety studies and crash data back up this logic by showing that a person hit by a car traveling at 20 mph has a 90% survival rate versus 60% if the car is traveling 30 mph.

**Figure 5-2. Vehicle Speed Comparison to Chance of Pedestrian Injury and Fatality**



Source: US Department of Transportation, Literature Reviewed on Vehicle Travel Speeds and Pedestrian Injuries. March 2000. Image credit: San Francisco MTA Vision Zero Action Plan, February 2015

## Results

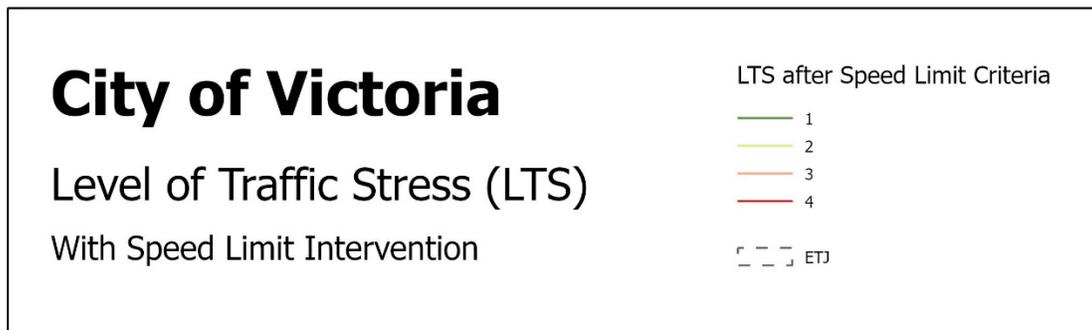
Figure 5-3 on the following page displays LTS across the City of Victoria. According to the analysis, the city has very few roadway segments considered “low stress” (LTS 1 or 2). Over half (55%) of all roadway segments are classified as the highest stress LTS 4. These segments mostly make up the arterials and suburban roads. Most of the local streets are classified as LTS 3, which is still considered high stress. Without the presence of bicycle infrastructure like protected bike lanes and off-street paths, speed limits become an even more critical factor.

A small decrease in vehicular speeds can result in a significant change in the LTS and thus the safety for people on bikes. Figure 5-4 shows that decreasing the speed limit on all local roads (by roadway classification) by just 5 miles per hour can significantly decrease the LTS on these neighborhood streets. This small change transforms most roadway segments rated LTS 3 to LTS 1, making them more appropriate and safer for vulnerable users, regardless of infrastructure improvements. Reducing speed limits on local roads by 5 mph results in 42% of all roadway segments in the network being rated as low stress LTS 1 or 2 compared to less than 1% of roadway segments with current speed limits.

Figure 5-3. Victoria Bicycle Level of Traffic Stress (LTS)



Figure 5-4. Victoria Bicycle of Level of Traffic Stress (LTS) with Reduced Speeds



## 6. Latent Demand Analysis

This section describes the latent demand analysis for active transportation in City of Victoria, TX. A spatial analysis was performed based on demographic and locational data to find the areas that are priority for investment. One challenge of planning for active transportation systems is a lack of existing facilities and usage data. In the absence of information about where people are walking or biking, or where they would like to walk or bike, spatial analyses can be performed based on factors that are known to be associated with a higher need for, or desire to walk or bike more. A latent demand analysis was conducted to identify the locations with higher priority for development of cycling and/ or walking facilities. The study helps to find places where more socially vulnerable populations reside.

### Methodology

A second challenge when using census data is the variation in size of block groups. Block groups where population is sparse can be quite large, whereas other block groups are smaller. This issue is further exacerbated when combining demographic census data with other point or line-based data. To address this issue, an identically sized hexagon grid is overlain with existing data sets to create uniform geographic areas to which the underlying data is applied. The hexagon grid sized used for Victoria is 0.25 miles, which roughly equates to a reasonable walkshed (about ten minutes).

To make a thematic hexagon map, two sets of data are collected including ACS 2021 5-year estimates at block group (BG) level for Victoria County and locational data provided by the City/MPO. Data factors and their resources are listed in the table below.

First, the census-based data was examined to find demographic scores attach to hexagons, and second, the transit routes/stops, bicycle facilities/trails, and destinations data were added later since they are all point and line based and require a different approach. All census data are binary scored based on whether they are lower or higher than the average of the respective BG.

- i. Lower than the average of the study area = 0
- ii. Higher than the average of the study area = 1

**Table 6-1. Latent Demand Analysis Factors**

Factor	Data Source (year)	Description	Unit
Population Density	NHGIS/ ACS (2017-2021)	Population per sq mile	Block group
Employment Density	ACS (2017-2021)	Employed pop per sq mile	Block group
Zero-car households	ACS (2017-2021)	% of HH without vehicle	Block group
Low-Income Households	ACS (2017-2021)	% of HH at poverty level	Block group
Minority Population	ACS (2017-2021)	% of non-Hispanic Whites	Block group
Senior Population	ACS (2017-2021)	% of pop over 64 years	Block group
Households with Children	ACS (2017-2021)	% of HH with children	Block group
Transit stops	City/MPO	Presence of transit stop	Hexagons within ¼ mile
Destinations (schools or parks)	City/MPO	Presence of schools or parks	Hexagons within ¼ mile
Trails	City/MPO	Presence of trails	Hexagons within ¼ mile

Since census data at BG level are provided for county, the average of each variable for the county was used as a basis to calculate the binary values. The scores are combined by simply summing them to arrive at a total score equal to the factor sub-scores. With the seven factors above, the highest score possible should be seven if an area were to receive a score of 1 for every factor.

A hexagon grid was developed to aggregate and summarize data into equal sized connected hexagons of approximately .25 miles across – this distance was selected as it represents a very walkable/ bikeable distance.

Demographic data sets are then joined together to result in hexagons that are scored based on the largest overlap out of different types of matching options. Locational data are analyzed to see whether park/schools, transit stops, and trails are located either less or more than 400 meters from a hexagon, so it is scored as:

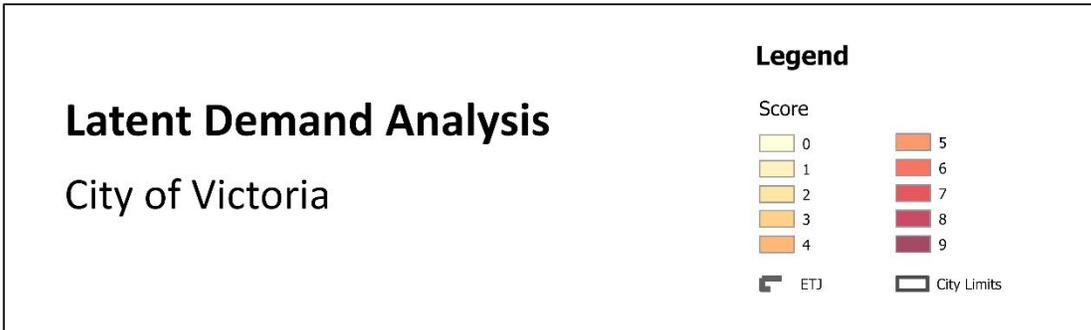
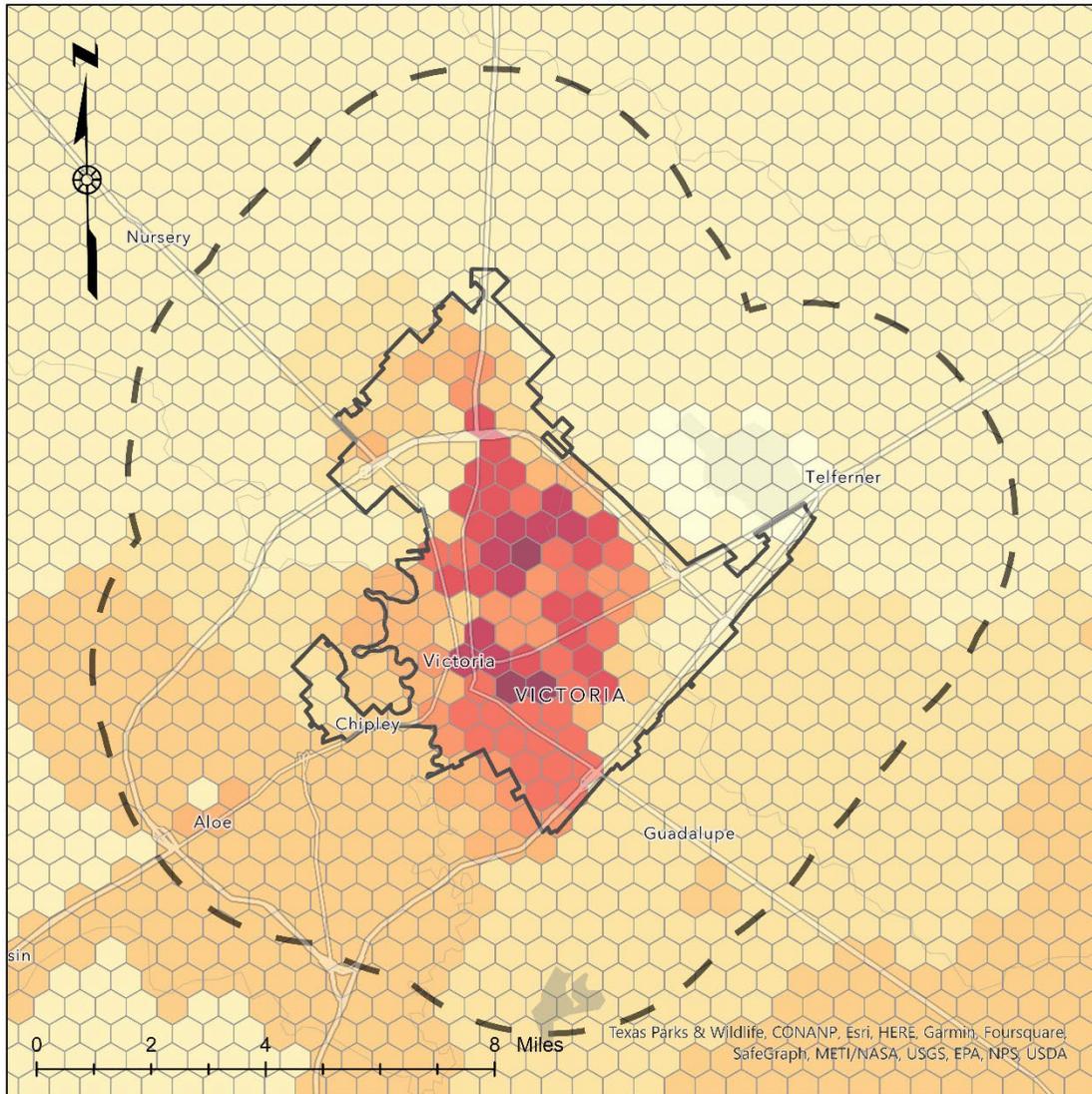
- i. Less than the 0.25 mile from a hexagon= 1
- ii. More than the 0.25 mile from a hexagon= 0

Considering the variety of factors, a hexagon can potentially have up to ten points. A final thematic map using the sum of demographic and locational factors is shown in Figure 6-1, next page. The darker hexagons represent areas where the most target population/locational factors occur in greater density. The map below demonstrates the map of latent demand in Victoria, Tx.

## Findings

The highest latent demand for walking and bicycling is located within the core of the City of Victoria. Specifically, latent demand is significantly high near Patti Welder middle school, Hope Elementary School, and along the west side of the Lone Tree Rd and Ben Jordan St. Areas adjacent to the Lone Creek Hike and Bike trail is also demonstrate high latent demand. Anywhere out of the city limit scored lower than inside the city limits, however it is noteworthy that the areas to the north score lower than those south of the city, especially near the airport where there is exceptionally low population in the area.

Figure 6-1. Latent Demand for Active Transportation



## 7. Opportunities and Constrains

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By reviewing and analyzing existing conditions, a series of opportunities and constraints were identified. These initial findings will be combined with input from the public and stakeholders, as well as best practices in the industry to align identified needs with recommendations for future areas, corridors and intersections where improvements can create a safe and comfortable network for all ages to walk and bike in Victoria, and to prioritize projects based on principles of equity, creating a network, serving all ages and abilities, and reducing severe and fatal crashes through intentional design and the use of proven safety countermeasures.

To recap some of the major findings of this memorandum:

- **Alignment with Existing Plans** – All six plans reviewed as part of the existing conditions analysis align with the need to prepare an active transportation plan in order to develop a safe and comfortable network for walking and biking in Victoria.
- **Public Support** – Previous planning efforts show strong support for improved facilities. “Walking, hiking, and biking trails” is shown to be the top used recreational facility in the last two years for 60% of public respondents who indicated themselves as users. The areas along Navarro Street near Loop 463 and the Victoria Mall stretching from Guy Grant Road on the south to Broadmoor Street (Wal-Mart and Sam’s Club vicinity) on the north were identified as the greatest places where public considered as “unsafe when driving, walking or biking”.
- **Equity** – Minority populations, lower income populations and households with lower vehicle ownership are concentrated in the core of Victoria, where bicycle facilities and sidewalks can be developed to efficiently to serve the population.
- **Connectivity** – Schools, parks and other community destinations are also clustered in several key areas such as N. Laurent St. and Sam Houston Dr. The University of Houston-Victoria and Victoria College campuses are priority areas for active transportation in Victoria. Transit routes additionally show areas where people are walking along and across roadways to reach their destinations. Evaluation of these routes has identified priority segments for improved connectivity through infilling sidewalk gaps as well as improved intersection crossings opportunities.
- **Safety** – Crash hotspots for non-motorized modes (walking and biking) occurred on the high speed arterials surrounding the center of Victoria – essentially creating a triangular barrier of US 77, US 59 and Sam Houston Dr. In addition, several other segments, such as N Moody St, West Stayton Ave, North John Stockbauer Dr, and Sam Houston Dr, are areas of concern for pedestrians and cyclists.
- **Speed Control** – The current posted speed limit in Victoria, and the prevailing speeds of vehicles on both the arterial and local street network create a challenge to the development of a safe and comfortable All Ages Network without significant physically separated facilities.



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