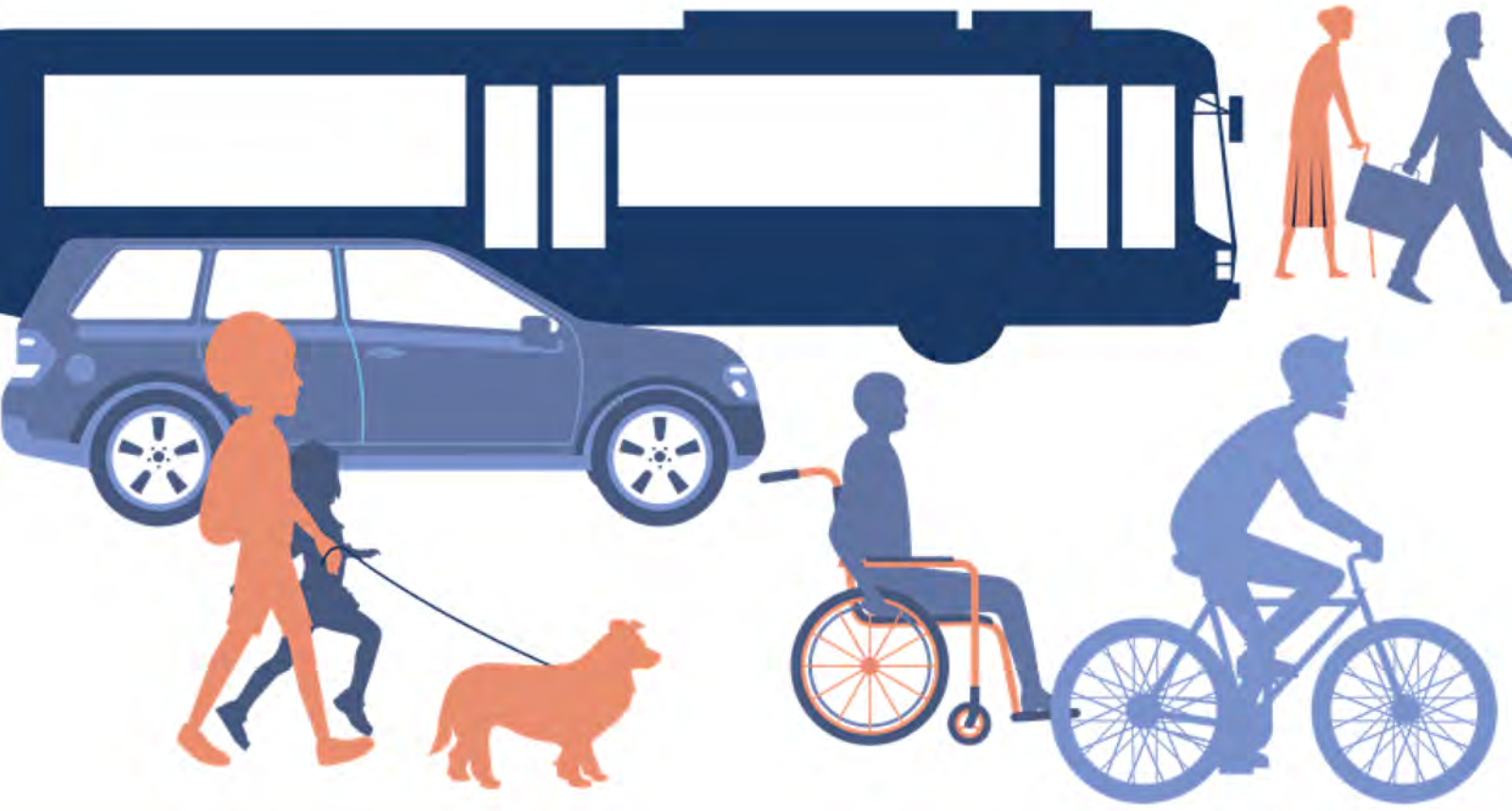
Safer Roadways

A Complete Streets Guide

May 2023

Hillsborough County Florida



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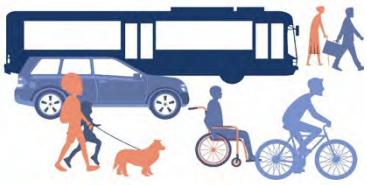
Using the Guide



The intent of the Hillsborough County Complete Streets Guide (the CS Guide) is to provide policy guidance on planning and designing County-owned streets and roadways consistent with the County's Comprehensive Plan. It is intended to inform planners, engineers, and designers in their implementation of the County's Comprehensive Plan. Users of this guide will be able to identify street elements and design features that can be applied to achieve complete streets that are sensitive to the community's context. Engineers will find guidance to help prepare design plans based on principles of safer, more comfortable, and accessible streets that provide a variety of transportation choices including walking and bicycling. The document also addresses some common concerns and perceived barriers regarding designing pedestrian and bicycle facilities. There may be elements included in this document that may not be consistent with existing regulatory standards. Depending on the regulatory oversight, a variance process or request for experimentation may be required to move forward with some preferred design elements. Complete Streets adoption and implementation can be more easily facilitated by updating regulations to reflect the guidelines put forth in this document. The layout and design of each chapter is organized in a hierarchy to guide readers from high level design principles to individual design treatments. Chapter One starts with the purpose of Complete Streets and benefits. Chapter Two describes the various elements in Complete Streets. Chapter Three illustrates all the various street typologies and summarizes the various considerations for each mode. Chapter Four reflects on the importance of placemaking and link to healthy people and communities. Chapter Five outlines intersection treatments, and Chapter Six expands on transit integration. Finally, in order to assist street design professionals in applying the guide to actual streets in Hillsborough County, Chapter Seven employs photo-realistic corridor visualizations to demonstrate the application of Complete Streets principles at select locations along two corridors, illustrating multimodal and safety best practices tailored to the community and context.

Acknowledgements

Many agencies and departments contributed to the Complete Streets Guide. Without their insights, recommendations, and thorough review, this guide would not have been possible. The individuals and groups identified below were involved on an on-going basis.

Project Team

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Complete Streets Guide Working Group

- Hillsborough County City – County Planning Commission
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- Hillsborough TPO Livable Roadways Committee
- Hillsborough TPO Citizens Advisory Committee

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ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration, part of the US Department of Transportation
HART	Hillsborough Area Regional Transit
ITE	Institute of Transportation Engineers published *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*
MUTCD	Manual on Uniform Traffic Control Devices
PLAT	Preliminary Land Use Assessment and Transportation Assessment
TPO	Hillsborough County Transportation Planning Organization
NACTO	National Association of City Transportation Officials

GLOSSARY

Lane Narrowing	Reducing the width of travel lanes to repurpose the space for other uses, typically bicycle lanes as part of resurfacing projects.
Mobility	A generalized term for the movement of people; includes walking, biking, transit, and driving, as well as transportation service providers such as carshare and ride-hail services.
Right-of-Way	The legal right for passage along land; for purposes of this guide, this often refers to the publicly owned land on which streets and sidewalks are built.
Road Diet	Reducing the total number of travel lanes on a roadway to repurpose the space for other uses such as bicycle lanes, wider sidewalk, and/or landscaping and furnishings.
Frontage Zone	The frontage zone is the area between buildings, fences, or yards, and the pedestrian zone. This zone provides a buffer between building activities and the movement along the sidewalk.
Pedestrian Zone	The pedestrian zone is the area dedicated for people walking or moving along the sidewalk.
Furnishing Zone	The furnishing zone is the area between the curb and the pedestrian zone. This zone contains street trees, landscaping, benches, transit shelters, lighting, utility poles and boxes, parking meters, bicycle racks and trash cans.
Flex Zone	The flex zone is between the furnishing zone and the travel lanes. The flex zone can be considered for parking, bicycle facilities or curb management opportunities based on contact and area needs.
Traveled Way Zone	The traveled way zone provides various types of space for motorized and non-motorized vehicles.

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Complete Streets Guide

HCFLGov.NET

1 Introduction

Build and maintain a transportation system that supports the needs of all users with respect to ability, resources, identity, and mode preference.

Comprehensive Plan

Mobility Element Goal

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1 INTRODUCTION

Hillsborough County designs roads using a concept called "Complete Streets." Complete Streets are roadways that are designed and operated to provide safe, accessible, and healthy travel for all users of the roadway system.

A Complete Street is defined by the National Complete Streets Coalition and Smart Growth America as a street where the entire right-of-way is planned, designed, and operated for all modes of transportation and all users regardless of age or ability. Complete Streets address the needs of people and the transport of goods. Pedestrians, bicyclists, transit riders and motorists of all ages and abilities must be able to safely move along and across a Complete Street. Complete Streets make it easy to walk to shops, catch the bus, bike to work, and enjoy many other healthy activities.

> *"Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities."*
>
> *– Smart Growth America*

There is no singular design prescription for Complete Streets – each one is unique and responds to its community context. Complete Street features may include sidewalks, bike lanes (or other innovative bicycle facilities or slow lanes), special bus lanes, comfortable and accessible public transportation stops, frequent and safe crossing opportunities, median refuges, accessible pedestrian signals, landscaped curb extensions, bioswales, roundabouts, on-street parking, and secure bicycle parking. A Complete Street in a suburban area may look different than a Complete Street in the urban core, but both are designed with the same principle in mind; that is to balance safety and convenience for everyone using the road.

Complete Street features closely link the community context, i.e., land use, to the roadway network. To make this connection, the Hillsborough County Comprehensive Plan includes a Context Based Classification system for all County-owned collector and arterial streets in the unincorporated areas of Hillsborough County. This Context Based Classification of roadways links the County's roadway network to its land use plan. It accomplishes this by acting as a bridge between Future Land Use, Livable Communities, and Transportation policies in the Comprehensive Plan. It allows street design to prioritize the type of users utilizing a roadway based on existing and planned development patterns. For more information, the Context Based Classification Technical Memo is provided in Appendix A.

Context Based Classification is different from functional classification. Functional classification defines the role a roadway plays in serving the flow of vehicular traffic through the network. Roadways are assigned to one of several possible functional classifications within a hierarchy, according to the character of travel service each roadway provides. Complete Streets continues to recognize functional classification but also considers the context classification of the street as part of the total picture. For example, the relationship between functional classification and access needs may be less consistent in more urban

context classifications where roadways serve a wider variety of purposes beyond moving motor vehicle traffic.

The physical characteristics of the young, the aging, and people with different physical abilities introduce a variety of human factors that can influence driving, walking, and cycling abilities. Roadway users' varying skills and abilities should influence roadway design. Roadway users should be taken into consideration when determining design details such as sidewalk widths, type of bicycle facility, design speed, signal timing and spacing, location of pedestrian crossings, number of vehicular travel lanes, intersection width, and lighting.

The intent of this document is to provide a one-stop guide for designing new or retrofitting existing streets. This chapter provides an overview of the purpose, the benefits, the principles, and how Hillsborough County will deliver the intended outcomes.

Purpose

Hillsborough County has developed the Complete Streets Guide to provide policy and design guidance to all parties involved in street design projects: governmental agencies, consultants, private developers, and community groups. It is the goal of this guide to support the development of streets that are safe for all users, with consistency in policy and design across Hillsborough County streets.

Comprehensive Plan - Mobility Element Goals

- Build a Transportation system that supports the needs of all users with respect to ability, resources, identity, or mode preference.
- Achieve Vision Zero by providing a multimodal transportation system that prioritizes the safety of all roadway users.
- Maintain the system in good repair, preserve assets, and improve resiliency to climate change.
- Provide safe and convenient connections within the transportation network that support multimodal access to key destinations, such as community focal points, employment centers and services throughout the County.
- Create a sustainable transportation system that allows people to take their mode of choice to access necessities, opportunities, recreation, and each other.
- Build a smart system that utilizes technology and strategies to improve safety, efficiency, and reliability for all modes of transportation and to meet the needs of all users.
- Provide a multimodal transportation system that supports planned future land use, respects historical and cultural assets, supports the identity of the surrounding community, and protects the natural environment.

This guide builds on the Comprehensive Plan's Context Based Classification to further the County's vision for its future built environment. It bridges the gap between Transportation and Land Use by interpreting the desires of a future condition based on community plans

and the Future Land Uses. While the Context Based Classification generally identifies streets as urban, suburban, or rural, it does not provide clarity on whether it is a neighborhood, a main street, or of a local or regional scale. This refines a street's Context Based Classification into typologies that fit seamlessly into a community's vision for its future.

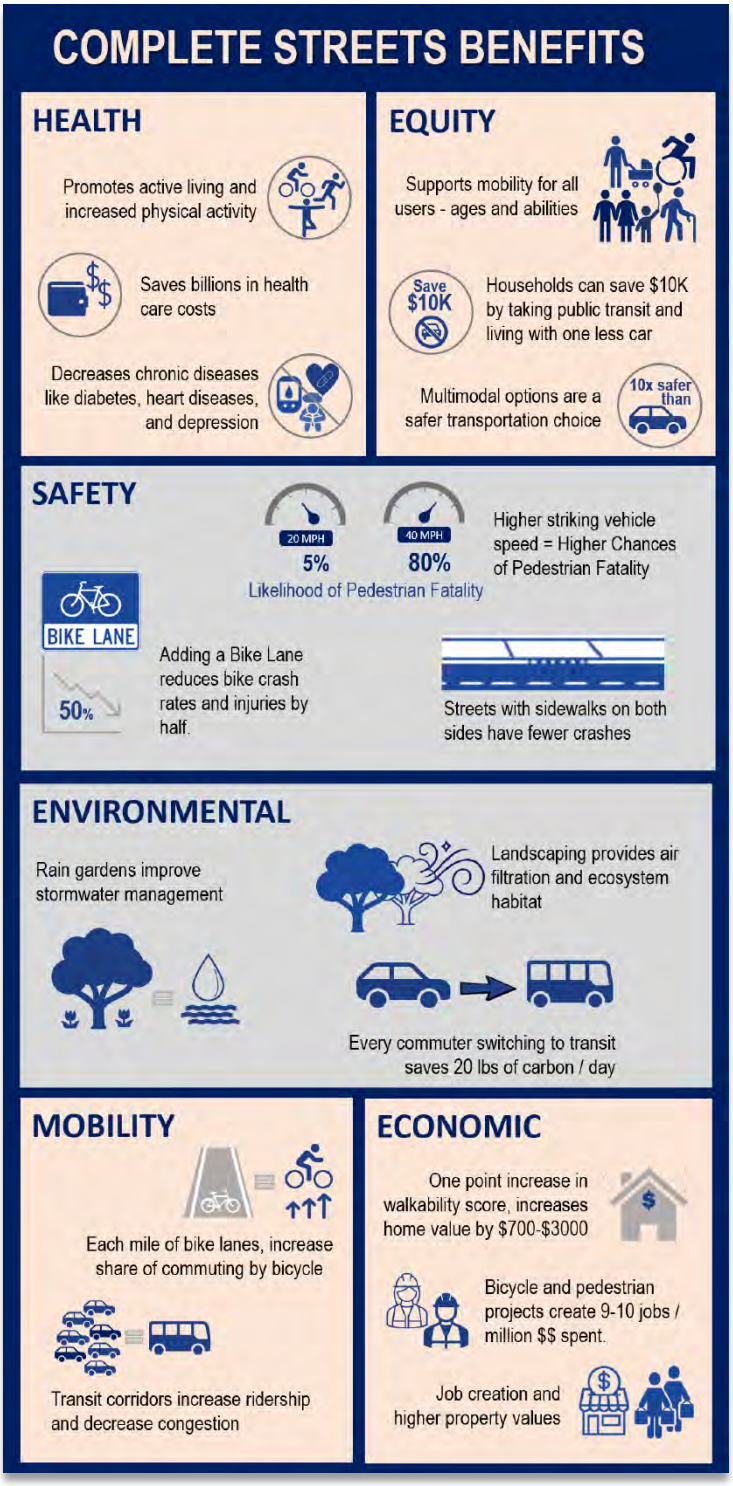
Users of this document will be able to identify context-sensitive street elements and design features that can be applied consistently with federal and state best practices. Engineers, planners, and policy makers will find guidance and criteria to help create streets based on principles of safer, more comfortable, and accessible streets so that walking and bicycling are viable transportation choices. The document also addresses some common concerns and perceived barriers regarding designing pedestrian and bicycle facilities.

People are at the heart of the Complete Streets approach; this guide embraces design as a tool to advance the health and safety of the community while promoting sustainable transportation options and vibrant public spaces.

Benefits of Complete Streets

Streets represent a large amount of publicly owned land. Orienting the design and programming of these assets toward Complete Streets is an opportunity to advance numerous County goals effectively and efficiently. Streets can provide benefits across areas as diverse as public health, equity, environmental quality, safety, mobility, and economic vitality. Designing streets with the user in mind lets the County maximize these benefits as illustrated in Figure 1-1.

Figure 1-1



Hillsborough County Florida

Principles

Community wellbeing and prosperity depends upon its streets balancing the needs of moving people and goods with the needs of those who live, work, and play nearby. The intent of this guide is to improve transportation and quality of life through street design that meets the needs of a wide range of users and community objectives. To achieve this, the following complete streets principles shown in Figure 1-2 work together to deliver a safer, healthier, and more equitable street system for Hillsborough County.

Figure 1-2

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2 Elements of Complete Streets

Protect vulnerable users, such as bicyclists, pedestrians, children, seniors and people with disabilities, through a Safe Systems Approach, speed management techniques and context-sensitive multimodal facility design.

Comprehensive Plan

Mobility Element Objective 2.2

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2 ELEMENTS OF COMPLETE STREETS

The national movement toward designing with the Complete Streets approach has resulted in the creation of many resources regarding Complete Streets design. The creation of this document was aided through a thorough review of best practices from across the country. Relevant and critical design standards are included based on their presence in several leading publications as well as a context-sensitive approach tailored to the unique needs and opportunities in Hillsborough County.

Streets that incorporate a Complete Streets approach go beyond looking at what is between the two curbs. They are designed based on the adjacent uses and include zones for various purposes. A typical street has multiple street zones, such as: Frontage Zone, Pedestrian Zone, Furnishing Zone, Flex Zone, and Traveled Way Zone that may provide different functions for the street.

Street zones (Figure 2-1) should be right sized with all users in mind, designed for people of varying needs, of human scale to enable mode respect, and encourage mode shift. Street zones should be contextualized to reflect the surrounding community that will result in multiple benefits such as connectivity, walkability, livability, and sustainability.[1]

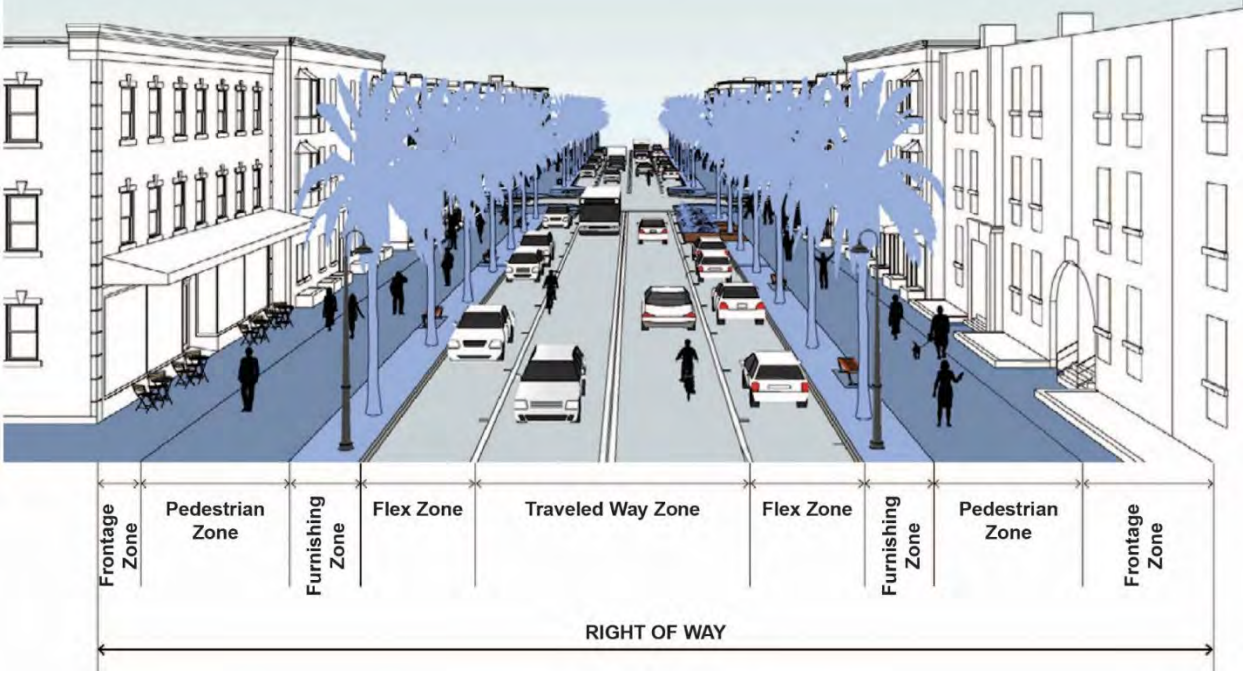
Figure 2-1 illustrates how the zones are arranged. It is important to note that elements of complete streets will be different in each of the urban, suburban, and rural contexts. Streets in the Urban General context (C4) often exhibit most of these zones. In Suburban contexts (C3), some zones may not be as prominent. On streets in rural context, Rural (C1 & C2), few of the zones will be present. Chapter Three covers each of these contexts and related street typologies.

Recent Resources and Best Practices

- *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*, Institute of Transportation Engineers/Congress for New Urbanism
- *Urban Street Design Guide*, National Association of City Transportation Officials (NACTO)
- *Urban Bikeway Design Guide, NACTO*
- *Transit Street Design Guide, NACTO*
- *Achieving Multimodal Networks, Applying Design Flexibility,* Federal Highway Administration
- *Small Town and Rural Multimodal Networks, USDOT / FHWA*
- *Bikeway Selection Guide, USDOT / FHWA*
- *Streets reconsidered, Lacofano & Malhotra*
- *A Policy on Geometric Design of Highways and Streets* (the "Green Book"), American Association of State Highway and Transportation Officials
- *The Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways* (the "Florida Greenbook")
- *The Manual on Uniform Traffic Control Devices* (MUTCD), FHWA
- Design Manual, FDOT
- Plans Preparation Manual (PPM), FDOT
- Americans with Disabilities Act (ADA) Standards for Accessible Design

[1] Streets Reconsidered, Inclusive Design for the Public Realm, Daniel Iacofano & Mukul Malhotra

Figure 2-1 Street Zones



Frontage Zone

The frontage zone is the area between buildings, fences, or yards, and the pedestrian zone. For buildings that abut the sidewalk, this zone provides a buffer between building activities (doors opening, window shoppers) and the movement along the sidewalk. This space could be used for café seating, store displays, and building entrances, etc. This zone should be maximized on main streets and in town centers, but not at the expense of reducing the pedestrian zone below the recommended minimum widths.

Pedestrian Zone


Pedestrian Zone

The pedestrian zone is the area dedicated to walking or moving along the sidewalk. It should provide a logical, straight path and line up with crosswalks, where feasible. Obstructions, displays, plantings, and furniture should not extend into the pedestrian zone and should be ADA compliant. Surfaces should allow for this zone to retain its mobility function in all weather conditions. Lighting and width are important to creating a welcoming environment that accommodates all users, particularly in high pedestrian volume areas.

Encouraging people to walk, bicycle, or access transit safely requires a connected pedestrian and bicycle network. People on foot often travel slower, make shorter trips than

automobiles, and seek direct routes. When Context Based Classification anticipates a higher level of pedestrian usage, it is important that these networks be permeable and offer multiple options to keep trips direct.

Furnishing Zone

The furnishing zone is the area between the curb and the pedestrian zone. This zone contains street trees and landscaping, benches and transit shelters, lighting and signal poles, utility boxes, parking meters, and trash cans. Locating these items in the furnishing zone prevents obstructions within the pedestrian zone. These items also establish a comfort and safety buffer between moving traffic and pedestrians on the sidewalk and can also provide space for people accessing parked cars.

This zone should be maximized to provide as great a buffer as possible between traffic and pedestrians. This can also be accomplished with the flex zone with bike lanes or street parking where there is not enough room for a large enough furnishing zone. Where on-street parking is provided, curb extensions or other elements can be used to calm traffic and provide extra space for furniture and greenscaping.

The furnishing zone and flex zone can, at times, be combined. Flex zones may be expanded to include "flush" cycle tracks and traffic calming features such as parklets and midblock crosswalks. The flex zone should remain clear of obstacles to allow for access to parked vehicles.

FURNISHING ZONE AMENITIES

Street furniture adds life and comfort to the pedestrian realm of a street. Benches create opportunities to sit and rest, socialize, and watch the world. Bike racks allow for easy access between bike lanes and store fronts and apartments. Bollards and planters can create a barrier between the sidewalk and traveled way, increasing safety from dangerous vehicles, and frame the space. Trash and recycling containers help keep the street clean and facilitate collection by the appropriate group.

Benches

Seating can be provided through the provision of traditional benches or through extensions of landscaping planters. Seats should be oriented toward views of natural vistas or people walking by and with the backs of seating options toward a fixed object (such as a tree trunk or building) to provide a sense of security. The pedestrian zone should be respected as a clear space, with seating placed either in the frontage zone or in the furnishing zone.

Clear zones should be provided around benches and be ADA compliant to allow for maintenance of both seats and other street items.

Bicycle Parking and Racks

The lack of bicycle parking at many destinations is a deterrent for cyclists. Bicycle parking encourages people to ride, but it also has some specific benefits, even for non-cyclists[2]:

- Bicycle parking is good for business – Bicycle racks provide additional parking spaces which customers can use to patronize local businesses.
- Designated, well-designed parking promotes a more orderly streetscape and preserves the pedestrian right-of-way: it presents a more orderly appearance for buildings, it prevents damage to trees and street furniture, and it keeps bicycles from falling over and blocking the sidewalk.
- Bicycle parking helps legitimize cycling as a transportation mode by providing parking opportunities equal to motorized modes.

Bicycle parking facilities fall into two categories: short-term and long-term. Short-term parking normally occurs for less than two hours; simple bicycle racks are unsheltered and not actively monitored. The typical application for short-term parking can be seen at commercial, retail, medical/healthcare, parks and recreation areas, and community centers. Bike racks should be provided in the furnishing zone to provide a buffer between the traveled way and the pedestrian zone, and to avoid conflicts between bike riders and pedestrians. When the frontage zone is large enough, placing racks in this zone can allow for use of a building's overhang or awning to provide sheltered bike parking.

Long-term bike parking is for longer than two-hour durations, where lockers and racks in secured and sheltered areas are preferred. Long-term bike parking is most appropriate in urban contexts, employment centers and transit station locations.

Bollards

Bollards are an effective treatment to create physical separation between the curb and the street. Bollards can be permanent or temporary vertical elements (most often posts) which offer physical protection from vehicles. They are most often used to separate motor vehicles from people walking or riding a bike and can also be used to restrict vehicular access to plazas or buildings. Flexible or "breakaway" bollards can be an effective means of providing separation while still allowing for emergency vehicle access.

National Bicycle Parking Guides

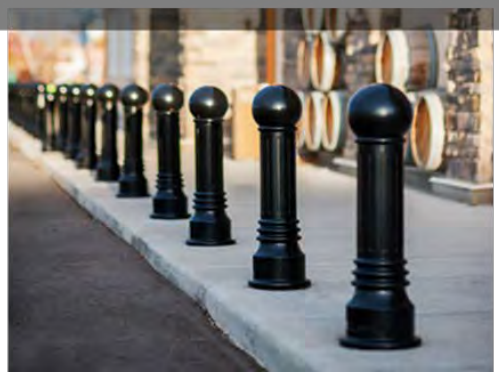
- *APBP Bicycle Parking Guidelines, 2nd Edition*
- *FHWA, University Course on Bicycle and Pedestrian Transportation, Lesson 17: Bicycle Parking and Storage*

[2] Association of Pedestrian and Bicycle Professionals, Bicycle Parking Guidelines, 2nd Edition

Potential uses for bollards include:

- Limit vehicular access to car-free areas, including boardwalks and trails
- Prevent delivery vehicles from using sidewalks to park
- Reduce turning radii through curb extensions
- Protect spaces for parklets, street furniture, and green stormwater features
- Traffic calming installations such as chicanes and midblock crosswalks
- Security for key institutional buildings

Permanent Decorative or Flexible Bollard Examples


Lighting

Street lighting is an important part of creating a safe and welcoming environment on the sidewalk. It can also be used to highlight features of an area. Lighting fixtures can be part of the creation of a cohesive sidewalk design in urban and suburban contexts. Lighting should focus light down onto the sidewalk, minimizing stray light that can disturb neighbors or create light pollution.

To stimulate nighttime activity and improve safety, person-scaled lighting should be used in areas with higher pedestrian volumes. Lighting should also focus on critical points such as crosswalks, ramps, transit stops, and benches. The alignment of poles can be used to frame a streetscape; the poles may also offer opportunities for hanging banners or pennants to advertise for districts or upcoming events. Pedestrian level light fixtures should be in the furnishing zone where space allows, leaving the pedestrian zone clear.

Flex Zone

The flex zone is located between the furnishing zone and the travel lanes. The flex zone can be considered for parking, bicycle facilities or curb management opportunities based on the context and area needs. Capital investments should be implemented with an eye toward the ever-changing transportation paradigm. The transportation system of 2030 may be all but unrecognizable to the 2023 user of this guide. With that in mind, investments should allow for maximum flexibility in street space programming.

BICYCLE FACILITIES

General characteristics and preferences of both existing and potential active transportation users are important to understand before selecting and designing a bicycle facility. A variety of factors influence an individual's decision to travel by bike, such as neighborhood characteristics, traffic volumes and speeds, the quality of existing facilities, distance between destinations, and personal preferences. There are a range of existing and potential users who each may have different motivations, barriers, preferences, and needs. People who travel by bicycle can be categorized in several ways, including by demographics, trip purpose, or by level of experience.

The generally accepted way to categorize people who cycle is based on people's willingness to use a bicycle for transportation. The general population can be classified into a 'bicycle rider spectrum' made up of the following four groups of bicycle users, ordered by their level of stress and risk tolerance from high to low:

Strong and Fearless - People who are generally comfortable riding on major roads, regardless of motor vehicle volumes or speeds, weather conditions, or the presence of existing bicycle facilities.

Enthused and Confident - People who are generally comfortable on most roads with bicycle facilities. These people may select a route with lower motor vehicle volumes or speeds, or separated facilities where provided, over a more direct route.

Interested but Concerned - These people often own a bicycle but do not ride frequently due to concerns about the safety of cycling. They are interested in cycling more, but usually restrict their riding to roads with physically protected facilities or lower motor vehicle volumes and speeds. This is the largest segment of the population in communities of all sizes and contexts. There is a significant opportunity to focus on the needs of this large market segment to achieve a substantial increase in regular bicycle ridership. This is generally the recommended design user, as the resulting bikeway network will serve bicyclists of all ages and abilities, which includes Strong and Fearless and Enthused and Confident Bicyclists.

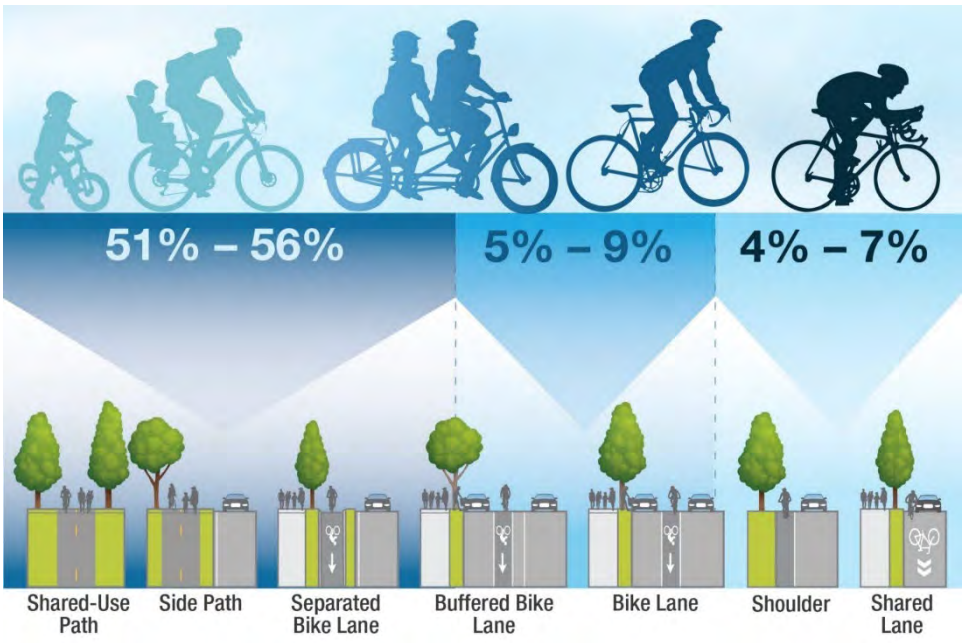
No Way, No How - This group may be uninterested or unable to ride a bicycle, or they may perceive severe safety issues with cycling in motor vehicle traffic. A significant portion of this group will likely never choose to ride a bicycle under any circumstances.

Bicyclists are vulnerable road users who experience fatality rates significantly higher than the general mix of road users. Varying skills of riders will also perceive and experience different levels of stress on roads. According to research conducted by the Portland Bureau of Transportation, most bicyclists that use on road bicycle facilities are classified as strong and fearless and are generally comfortable operating a bicycle intermixed with high traffic volumes and fast speeds. All other types of bicyclists are not comfortable riding in mixed traffic.

Excluding the No Way, No How user group, Figure 2-2 illustrates the feeling of safety on different types of bicycle facilities. Various bicycle facility selection criteria exist from AASHTO, NACTO, FDOT and others that identify speed, volume, user levels, and traffic mix. The Washington State DOT has created selection criteria for "Interested but Concerned Cyclist" as shown in Figure 2-3. The primary takeaway from the Washington State criteria is

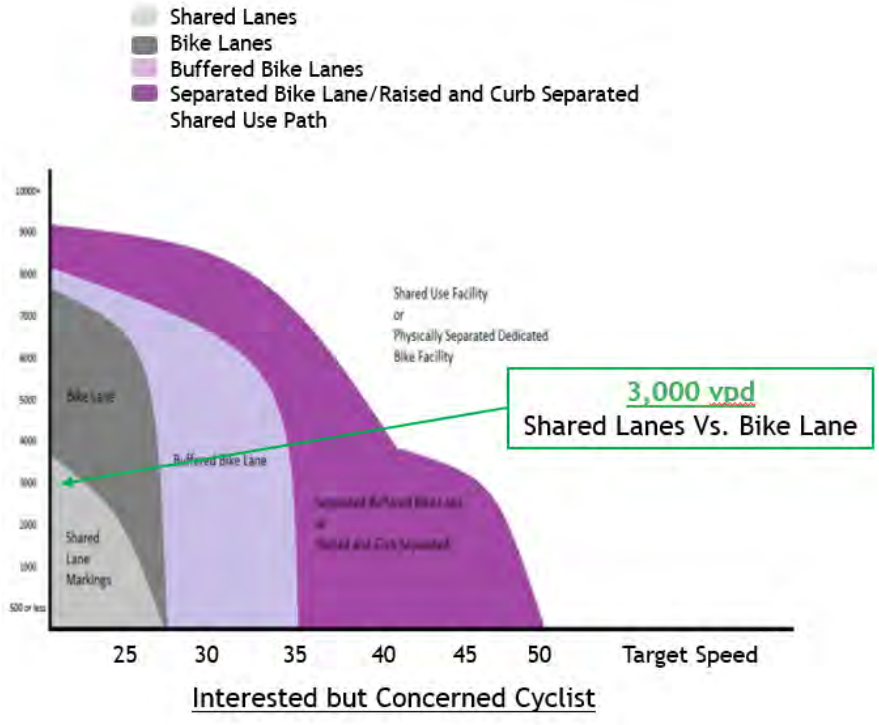
that it emphasizes that shared (sharrows) travel lanes should only be considered on streets with speeds less than 25MPH and with volumes less than 3,000 vehicles per day. Any street exceeding that criteria should provide exclusive bicycle facilities.

Figure 2-2 Bicycle Facilities and Perceived Safety (ITE, CNU, 2010)



People riding bicycles vary in their level of skill and confidence, trip purpose and preference for facility types; thus, the mobility needs of bicyclists vary. Bicycle facilities should encompass a system of interconnected routes, paths, and on-street bicycle lanes that provide for safe and efficient bicycle travel. Not all facilities may include a bicycle lane, however, bicyclists are permitted to use any street for travel (with the exception of where specifically prohibited.)[3]

Figure 2-3 WSDOT Bike Facility Selection Criteria (wsdot.wa.gov)



Many communities across the US are focusing on developing bicycle networks with an emphasis on all ages and abilities. Integrating bicycle facilities in the transportation network should not be an afterthought, but an

[3] ITE, Congress for the New Urbanism, Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, 2010

intentional decision. The following should be considered when providing for bicycle facilities[4]:

- People riding bicycles should have safe, convenient, and comfortable access to all destinations.
- Every street is a bicycle street, regardless of whether a designated bicycle facility or bicycle route is present.
- Street design should accommodate all types, levels, and ages of bicyclists.
- In high pedestrian zones, people riding bicycles should be separated from pedestrians, except under special circumstances such as shared-use pathways or shared-space streets.
- Bikeway facilities should consider vehicle speeds and volumes, with:
  - ✓ Shared use on low volume, low-speed roads.
  - ✓ Separation on higher volume, higher-speeds roads.
- Bikeway treatments should provide clear guidance to enhance safety for all users.
- Since most bicycle trips are short, a complete network of designated bikeways has a grid spacing of roughly ½ mile.

The typologies (discussed in Chapter Three) are intended to provide bicycle facilities for the interested but concerned rider, so applying the right features, designing for the right speed, and encouraging different user mix of people riding or rolling will be achieved.

ALTERNATIVE BICYCLE FACILITY SELECTION

For circumstances where bicycle facilities cannot be provided according to the appropriate typology, the Hillsborough TPO has developed a Bicycle Facility Selection Toolkit[5] in 2019 to provide guidance to transportation professionals and implementation staff on projects. This guide outlines a decision-making framework that leverages the Bicycle Level of Traffic Stress (LTS) assessment and helps transportation professionals identify the necessary bicycle facility type to make the street a low stress trip. The goal of LTS scores is to help plan a complete bicycle network that is useful to the general population, leverage low-stress streets that are already comfortable for most people, and help identify the appropriate bicycle facility based on key characteristics of the street. The LTS scores range from an LTS1, which is defined as comfortable for most of the general population, to an LTS 4, which is defined as uncomfortable for even experienced bicyclists. The guide also provides a framework for network planning in a way that leverages existing low stress streets and assets such as trails and shared use paths. A facility selection process was also developed and shown in Figure 2-4.

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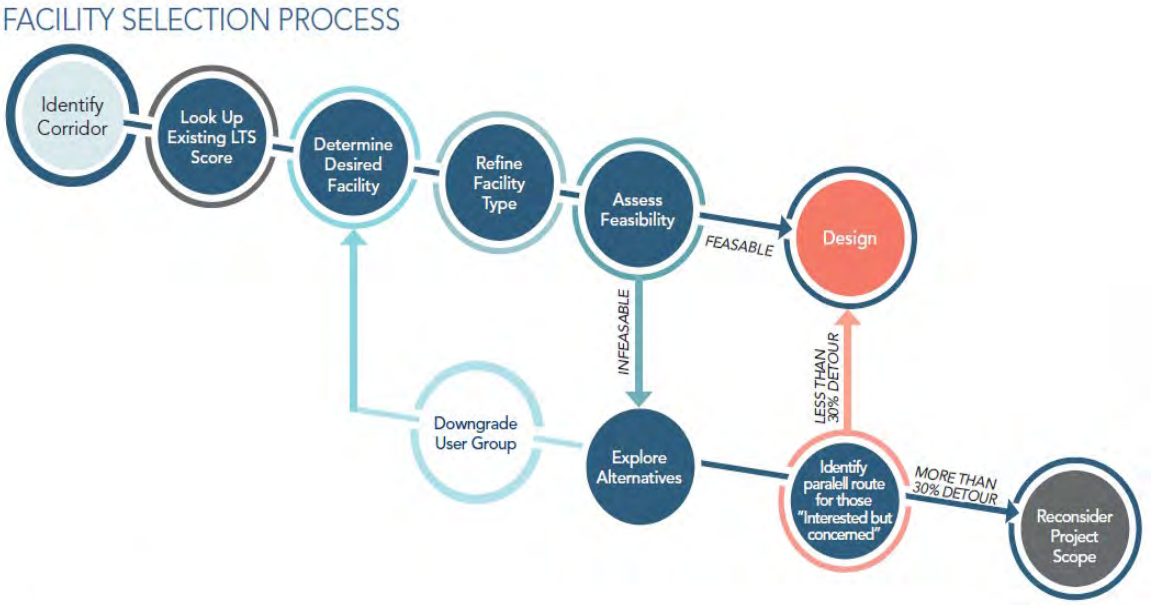
[4] Broward MPO, Complete Streets Guidelines, Chapter 9 Bikeway Design http://www.browardmpo.org/images/WhatWeDo/completestreetsinitiative/broward_complete_streets_guidelines_parts/CH-9-Bikeway-Design-final.pdf

[5] Hillsborough TPO, A Bicycle Facility Selection Toolkit, 2019 http://www.planhillsborough.org/wp-content/uploads/2019/04/Bicycle-Facility-Selection-Guidance-FINAL-DRAFT.pdf

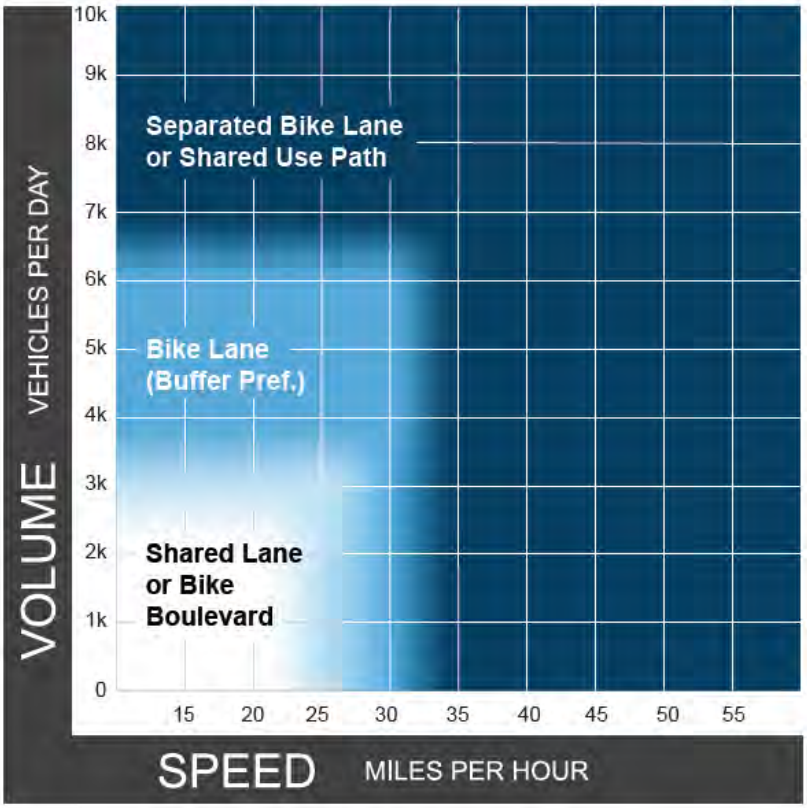
Figure 2-4 LTS Bicycle Facility Selection Process



To allow active transportation to be a viable transportation option, bicycle facilities must be designed to entice the Interested but Concerned to use that mode for short trips. Figure 2-5 provides guidance for how motor vehicle volume and speed can be taken into consideration to determine a preferred bikeway type[6]. Generally, the higher the speed and volume of a road, the more protective the recommended bikeway. Shared lanes or bicycle boulevards are recommended for the lowest speeds and volumes; bike lanes for low speeds and low to moderate volumes; and separated bike lanes or shared use paths for moderate to high speeds and high volumes. The Interested but Concerned cyclist is the design user; therefore, the most appropriate recommendation may be a more protective facility than necessary for an Enthused and Confident user.

[6] USDOT Bikeway Selection Guide, 2019
https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf?fbclid=IwAR3rIcVmBOPJblEwbbaD_EoFkoWgkaCani9taKPXxZuP9Jb8PJpgUGdGwoo

Figure 2-5 – Preferred Bikeway Type for Urban, Suburban and Rural Activity Contexts – FHWA (safety.fhwa.dot.gov)



Amenities

Similar to pedestrian facilities, people who ride a bike need certain amenities to ensure their trip is comfortable. Communities across the US are now providing foot rails at intersections, bicycle counters, and repair stations on connected networks.

Bike Traffic Signal, Footrest, Repair Station, and Counter


Source: City of Seattle, 2021

CURB-LANE MANAGEMENT

The curb-lane includes pick-up and drop-off zones, freight delivery zones, short-term parking for retail, long-term parking in residential contexts, and operating space for streetcars and buses.

The market penetration of Transportation Network Companies (e.g., Lyft, Uber) has increased demand for curbside loading zones, largely in urban contexts, with high demand around nightlife destinations. In addition, delivery vehicles frequently use the curb-lane. The provision of a safe loading space is important for the safety of all street users; vehicles that drop-off and pick-up by double parking put other drivers at risk, can block bike lanes, and require their passengers to walk in the street. The demand for curbside space will likely further increase with the market penetration of Autonomous Vehicles (AV) as discussed in the AV section below. While a decreased need for on-street parking may allow for greater curb-lane flexibility, portions of the curb-lane may need to be retained as an interaction point between vehicles and their patrons.

While the curb-lane will likely continue to act as the place where transit, parking, and pick-up/drop-off interact with the sidewalk, shifts in how streets are used provide opportunities to extend the sidewalk realm into the curb-lane. Items such as parklets, bike parking, and bikeshare stations represent traditional sidewalk uses that are suited to curb-lane use. By moving larger furniture items to the curb-lane, more sidewalk space can be preserved for café seating and through movement space.

PARKING

On-street parking is important in urban environments for three reasons: 1) for the success of the retail businesses that line the street, 2) to provide a buffer for people walking or riding a bike, and 3) to help calm traffic speeds.

On-street parking should be located based on the context of the urban roadway and the needs of the adjacent land use. On-street parking should be primarily parallel parking on Urban Main Street or Suburban Town Center typologies. Angle parking may be used on low-speed and low-volume commercially oriented streets, primarily those serving as main streets.

Curb extensions should be provided in place of on-street parking at mid-block crosswalks and intersection crosswalks. Curb extensions reduce the distance that pedestrians must cross within the traveled way, help to calm traffic, and serve as opportunities for rain gardens and other forms of aesthetic enhancement.

Smart technology streets recognize the potential to better manage on-street parking. The next evolution of parking management includes sensors which detect parking space occupancy and allow for dynamically priced on-street parking. Sensor installation can help direct vehicles to on-street parking availability, helping reduce the congestion and emissions which are generated by drivers looking for parking. Generally, dynamic pricing can help balance the demand for spots in urban contexts and encourage turnover where it is important to street-level retail.

MOBILITY HUBS

Mobility hubs are centers of activity that bring together alternative transportation choices, virtual trip-planning and placemaking at select curbside locations. Mobility hubs provide both the physical and information infrastructure required to assist users in making informed travel choices. Mobility hubs are located at prominent destinations where:

Mobility Hub, Columbus, OH

- Alternative transportation choices such as bus stops, electric vehicle charging, and bicycle, scooter and car share parking are co-located to enable seamless transfers.
- Trip-planning is facilitated by providing real-time global positioning system information to users to improve access and connectivity to alternative travel modes.
- Placemaking is enhanced by creating comfortable and desirable streetscapes and supplementing them with interactive digital displays about local community facilities, history, and events.

The mobility hub concept broadens the reach of transportation through the creation of a "hub". Expanded wayfinding, opportunities to connect with upgraded biking and walking facilities, bikeshare and carshare stations, and convenient transit service all combine to significantly improve the options available for transportation connections. These options should also be made available for all distances, price points, and carbon footprints. Mobility hubs tend to be present in contexts where high levels of people walking, using a bike, or taking transit are expected.

Traveled Way Zone

The Traveled Way Zone provides various types of space for motorized and non-motorized vehicles. There are variable street functions such as arterial, collector and local streets as well as driveways for access. These functions, known as the functional class system, have traditionally focused on the volume of automobile travel that the road serves.

Traveled way, in this section, refers to the portion of the roadway for the movement of vehicles, excluding shoulder and auxiliary lanes. The Complete Streets Guide expands on the traditional functional classification system to consider not only the automobile traffic that the road will serve, but also the context, or surrounding land uses. The traveled way includes the design elements that allow for the movement of all vehicles, including bikes, transit vehicles, automobiles, and trucks. The design of the traveled way typically utilizes the largest portion of the right-of-way and affects not just the users in the traveled way, but those using the entire right-of-way, including the areas adjacent to the street.

SAFETY AND SPEED

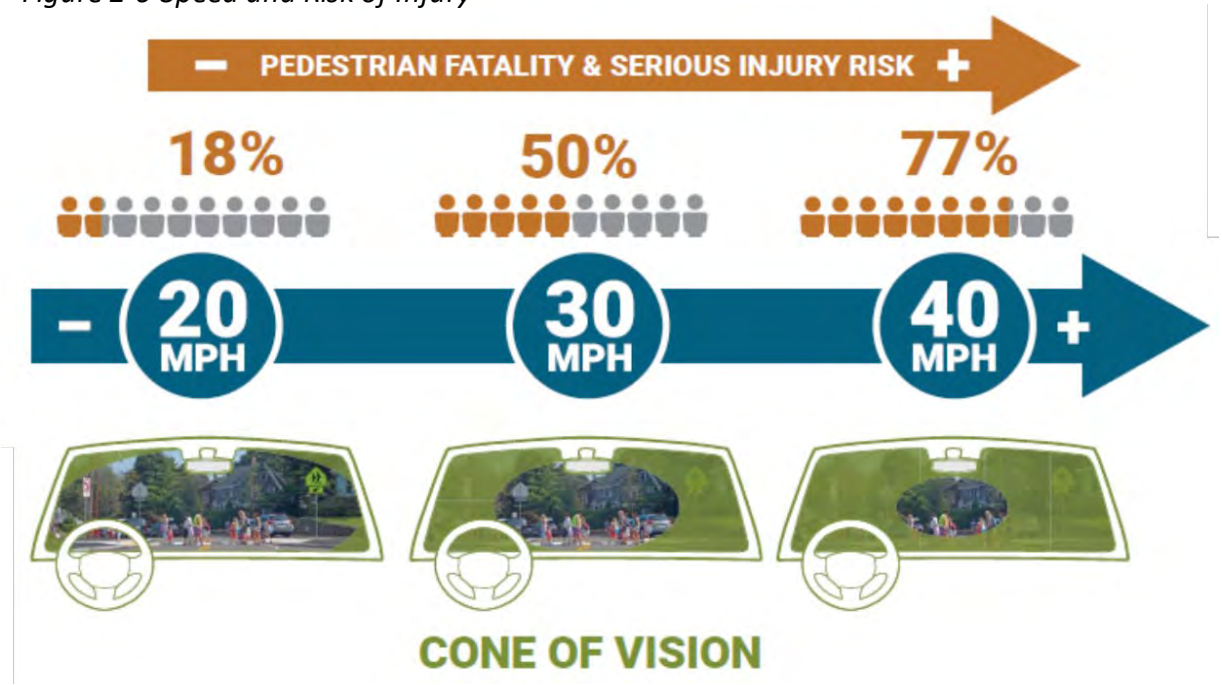
Speed is the most prominent factor in both the perceived comfort and safety of streets. Consider the relative risk that a person on a bike is asked to assume when using a bicycle lane alongside traffic with no physical separation compared to the risk a driver assumes in that same situation. Safe street design should reinforce safety elements for all users, particularly the most vulnerable, and reductions in speed play a large role in that effort.

When planning for and constructing improvements, streets should be reviewed for instances where the current number of travel lanes, travel lane configuration, and/or lane sizes are inconsistent with the purpose that the street serves.

Streets and their respective design guidelines are formed in large part on the understanding that speed is a major risk factor when it comes to road deaths. As speed increases, a driver's field of vision narrows, making it less likely that they will see another vehicle entering an intersection, someone riding a bike on the side of the road, or a child stepping off a curb.

Figure 2-6 demonstrates the danger to people walking compared to the driver's speed. The risk of death increased dramatically as speed increases; in fact, a doubling of speed is associated with an eight-fold increase in mortality rate for those pedestrians and bicyclists who are struck.

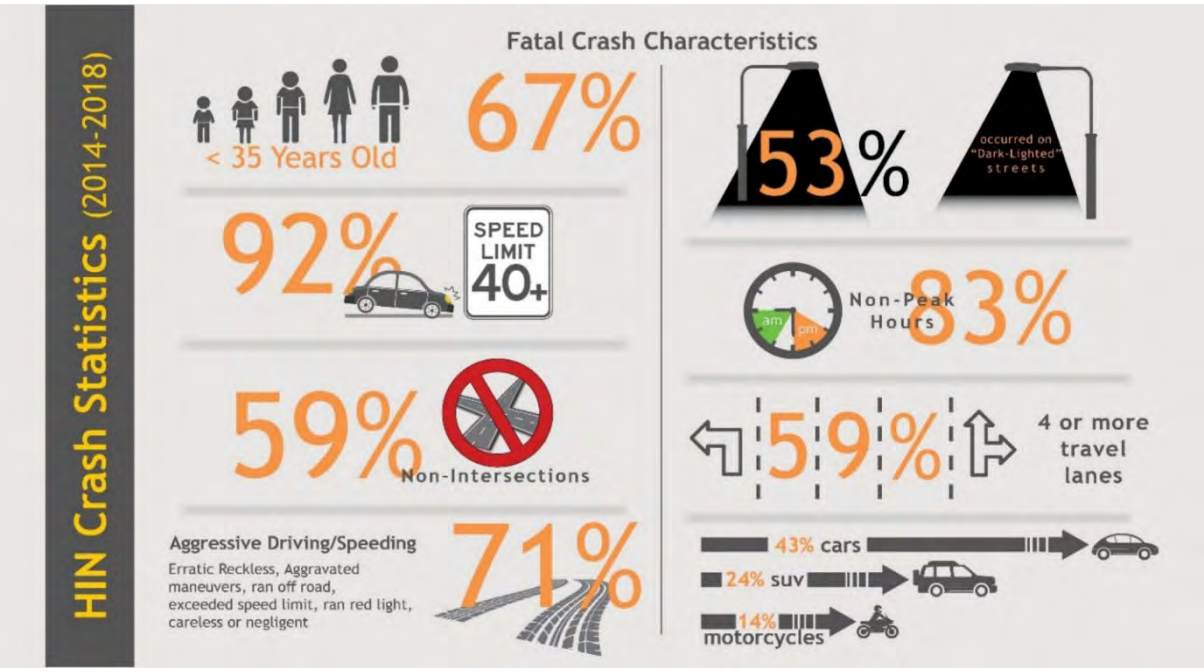
Figure 2-6 Speed and Risk of Injury



The Hillsborough County Speed Management Action Plan[7] sheds significant light on regional Fatal Crash Characteristics observed in the Top 20 High Injury Network (HIN) of corridors throughout Hillsborough County (multi-jurisdictional). Figure 2-7 shows the summary statistics and their correlation to speed, aggressive driving behaviors, location, and time of day.

[7] Hillsborough TPO, Speed Management Action Plan, July 2020

Figure 2-7 HIN Crash Statistics



In Hillsborough County, 94% of fatal crashes occurred on corridors where posted speeds exceeded 40 MPH. Of the total fatal crashes, 83% occurred during non-peak travel periods when volumes are lower, and speeds are higher. In addition, almost 60% of the fatal crashes occurred at mid-block locations and where more than four travel lanes exist.[8]

The Speed Management Action Plan consulted national best practices to validate if the posted speed limits on the Top 20 High Injury Network corridors were appropriate and provided rationale for their context. The High Injury Network consists of the deadliest corridors in Hillsborough County based on the latest crash records. Overall, it was found that 70% of the deadliest corridors in the County have posted speed limits that are 5-10 MPH above national best practices. An additional 15% of the corridors have posted speed limits that are 15-20 MPH above national best practices. It is critically important to note that the high posted speed limits on the Top 20 HIN corridors are facilitating high risk exposure that result in fatal and serious injuries for all users (motor vehicles, pedestrians, and bicyclists).

Target Speed = Design Speed = Posted Speed

Speed limits frame expectations for drivers and other roadway users. Properly set speed limits provide a safe, consistent, and reasonable speed to protect drivers, pedestrians, and bicyclists along the roadway. At the same time, speed limits can be a source of frustration and confusion; for example, not all drivers like to travel at the same speed, and some people may not understand why the speed limit changes on a particular road. In addition,

[8] Hillsborough Transportation Planning Organization, Speed Management Action Plan, 2020 http://www.planhillsborough.org/speed-management-action-plan/

community residents often have concerns that traffic is moving too fast through neighborhoods.

The application of design speed for Complete Streets is different than for conventional transportation practices where the roadways are designed for a higher speed than the posted speed. Complete streets create communities with vibrant social and retail life and increase the value of adjacent land uses. Local businesses and economies thrive on attracting people using all modes of transportation.

According to the Hillsborough County Design Bulletin 21-01, vehicle speed concepts can be classified into four types[9]:

Design Speed - A selected speed used to determine geometric design elements of the roadway. Select an appropriate Design Speed to attain a desired degree of safety, mobility, and efficiency.

Operating Speed - the speed at which drivers are observed traveling during free flow conditions.

Posted Speed Limit - A posted speed limit sign notifies the driver of the maximum operating legal speed that is considered reasonably safe in optimum weather and visibility conditions. For the County, the design speed will be set equal to the posted speed for Hillsborough County Transportation Projects. This would not prohibit lowering the posted speed.

Target Speed - The speed at which vehicles should operate on a corridor in a specific context. The Target Speed must be consistent with the level of multimodal activity generated by adjacent land uses, to provide both mobility for motor vehicles and a desirable environment for pedestrians, bicyclists, and public transit users. Target Speed can be set in the project development phase or early in the design process. Target Speed serves as the "target or goal" for Posted/Design Speed. Ideally, the Target Speed and Posted/Design Speed should all be the same. Speed management strategies should be established to achieve the desired Target Speed.

Ideally, the target speed, design speed and posted speed are the same in Hillsborough County. On existing facilities, these speeds may be different from each other, which can result in inconsistent driver expectation about the preferred operating speed. A roadway may have been designed at 45 MPH, have a posted speed of 40 MPH, but now have a target speed of 30 MPH. When the current design speed does not match the target speed, roadway design and operation changes are needed to move the design speed and posted speed toward the target speed and help the road "read" more consistently for road users. Multiple design modifications may be necessary to achieve the target speed[10]. In some cases, additional projects may be needed to reconfigure the roadway design such that the target speed is achieved over time.

Complete Streets should establish a design speed that creates a safer and more comfortable environment for pedestrians, bicyclists, and motorists. This approach increases access to

[9] Hillsborough County Transportation Design Bulletin 21-01

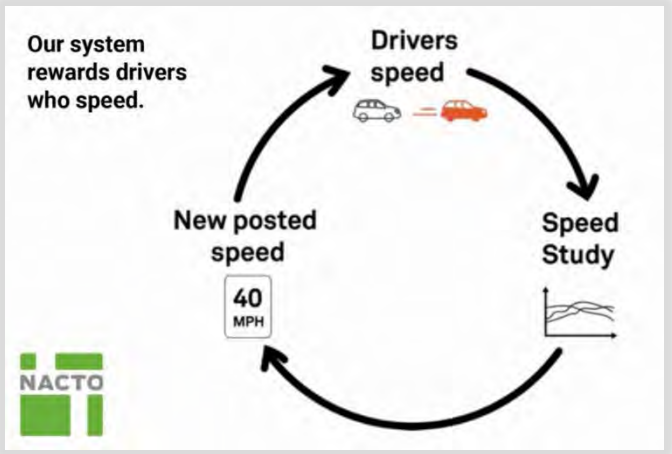
[10] Florida Department of Transportation, FDOT Context Classification Guide, July 2020

adjacent land, thereby increasing its value, and therefore is appropriate for the surrounding context. Features associated with high-speed designs, such as large curb radii, straight and wide travel lanes, ample effective clear zones (no on-street parking or street trees), guardrails, etc., degrade the walking/biking experience. A slower design speed allows the use of features that enhance the walking/biking environment; they include small curb radii, narrower sections, trees, on-street parking, curb extensions, and street furniture, which in turn slows traffic. Context appropriate speed is discussed in Chapter Three, Street Typologies.

Design streets using target speed, the speed you intend for drivers to go, rather than operating speed. Use design criteria that are at or below the target speed of a given street. The use of higher speeds should be reserved for limited access freeways and highways and is inappropriate on other streets, including arterials[11]. Design speed can be brought into alignment with the target speed by implementing measures to reduce and stabilize operating speeds as appropriate. Narrower lane widths, roadside landscaping, speed humps and raised intersections, and curb extensions are some design features that reduce traffic speeds and improve the quality of the bicycle and pedestrian realm.

How speed limits are set has received a lot of attention by various safety organizations such as the National Highway Traffic Safety Administration and US Department of Transportation (USDOT) and by professional organizations such as NACTO and ITE. The attention is focused on the current system that rewards drivers who speed, forcing higher 85th percentile speeds, that ultimately result in higher posted speeds. State and local transportation agencies set speed limits by completing engineering speed studies and following the guidance presented in the Manual of Uniform Traffic Control Devices (MUTCD). There are three base methods to set speed limits including the 85th percentile method, the USLIMITS2 method, and the Safe Systems Approach. USLIMITS2 recommends setting speeds closer to the 50th percentile speed. The 85th percentile speed setting method is based on the premise that the majority of drivers choose reasonable speeds for given road conditions and should be accommodated. However, with time, this premise has been shown to be fallible. If applied, this system leads to higher operating speed and an undesirable cycle of speed escalation resulting in higher exposure for users that has resulted in higher rates of crashes and fatalities.

Speed Posting Process



The MUTCD's recent Notification of Planned Amendments for the upcoming 11th Edition will be recommending posted speed limits to be within five MPH of the 85th percentile speed only on Freeways, Expressways and Rural highways. New support documentation directs

[11] National Association of City Transportation Officials (NACTO), Urban Street Design Guide

practitioners to resources such as USLIMITS2 to re-evaluate speed limits within speed zones. It is anticipated the FDOT Greenbrook will then be updated to support this national change.

Strategies to address speed when not rebuilding a road include various tools often referred to as traffic calming and speed management.

VEHICLE LANE WIDTHS

Narrow lanes have been shown to result in slower vehicle speeds. Lane widths have traditionally been wide (12 feet). Lane dieting, a reduction in lane widths, can be an effective way to repurpose space on streets which otherwise seem full.

The AASHTO Green Book offers substantial flexibility on lane widths depending on the desired speed, capacity, and context of the road. Per FHWA guidance, ten-foot lanes are appropriate for urban environments where posted speeds are less than 45 MPH and "narrower lane widths may be chosen to manage or reduce speed and shorten crossing distances for pedestrians." An 11-foot outside lane may be provided on designated truck or transit routes to allow for increased safety of all users and to improve the efficiency of bus operations.

Saturation flow rates do not change for lanes between 10-12 feet according to the Florida Department of Transportation[12]. Lane diets should be considered during routine maintenance and resurfacing projects to increase the space available to other modes.

DESIGN VEHICLE

The design vehicle influences several geometric design features including lane width, corner radii, median nose design, and other intersection design details. Design vehicles are identified by AASHTO in four general classes including passenger vehicles, trucks, buses, and recreational vehicles. Figure 2-8 illustrates the different sizes and wheelbases for trucks and buses. Designing for a larger vehicle than necessary is undesirable, due to the potential negative impacts larger dimensions may have on pedestrian crossing distances and the speed of turning vehicles. On the other hand, designing for smaller vehicles can result in operational problems if larger vehicles frequently use the facility.

Figure 2-8 Different Bus and Truck Wheelbases (Seattle Streets Illustrated)

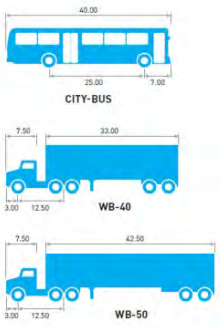
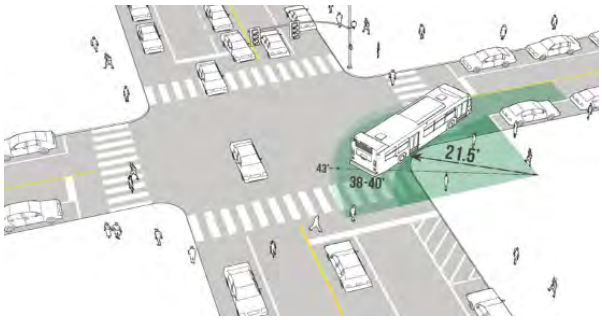


Figure 2-9 Turn Radii of City Bus (NACTO)



[12] Florida Department of Transportation *Conserve by Bicycle Report* http://www.fdot.gov/safety/4-reports/Bike-Ped/CBBphase1%20Apps%20A-P.pdf

For design purposes, the WB-40 (wheelbase 40 feet) is appropriate unless larger vehicles are more common. On bus routes and truck routes, designing for the bus (city bus or similar) or large truck (either the WB-50 or WB-62FL design vehicle) may be appropriate, but only at intersections where these vehicles make turns. For example, for intersection geometry design features such as corner radii, different design vehicles should be used for each intersection or even each corner, rather than a "one-size-fits-all" approach, which results in larger radii than needed at most corners. Figure 2-9 illustrates the turn radii of a city bus. The design vehicle should be accommodated without encroaching into opposing traffic lanes. It is generally acceptable to have encroachment onto multiple same direction traffic lanes on the receiving roadway. Figure 2-10 illustrates a corner radius with acceptable encroachment onto multiple same direction traffic lanes, as well as the distance (in seconds) for select size wheelbase vehicles to turn the corner. Figure 2-11 shows a recessed stop line, which allows a city bus to encroach on opposite flow traffic lanes to maneuver around the given corner.

Figure 2-10 Corner Radii (NATCO)

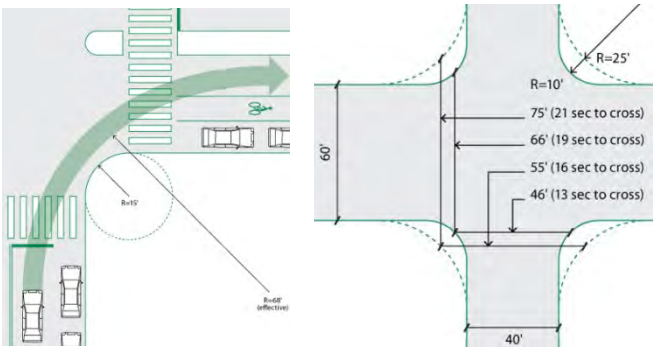
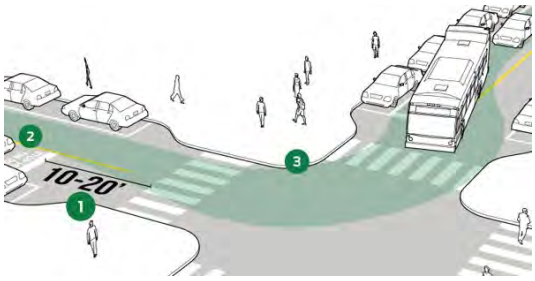


Figure 2-11 Recessed Stop Line (NATCO)



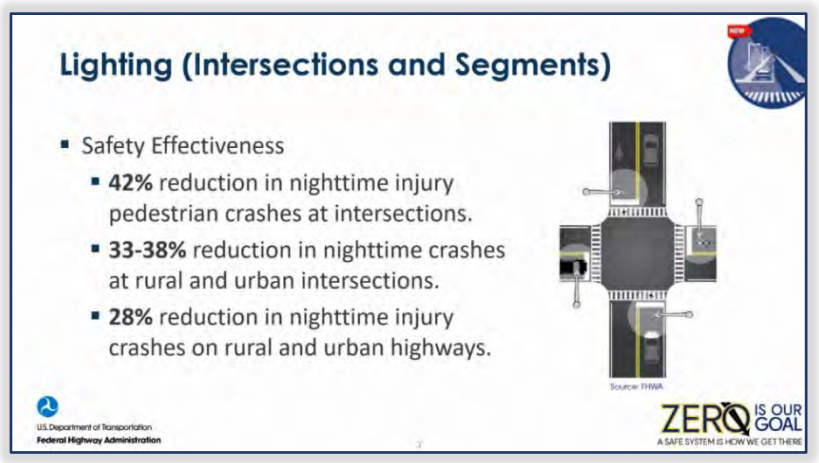
It also may be inappropriate to design a facility by using a larger "control vehicle," which uses the street infrequently, or infrequently makes turns at a specific location. An example of a control vehicle is a vehicle that makes no more than one delivery per day to a business. Depending on the frequency, by under designing for the control vehicle, the vehicle can be allowed to encroach on opposing traffic lanes or make multiple point turns.

HORIZONTAL CLEARANCE/CLEAR ZONE

Horizontal clearance is the lateral distance from a specified point on the roadway, such as the edge of the travel lane or face of the curb, to a roadside feature or object. The clear zone is the relatively flat unobstructed area that is to be provided for safe use by errant vehicles. In Suburban Town (C3T) and Urban General (C4) contexts, horizontal clearance based on clear zone requirements for rural and suburban highways is not practical because these areas are characterized by more bicyclists and pedestrians, lower speeds, more dense abutting development, closer spaced intersections and accesses to property, higher traffic volumes, and restricted rights-of-way. Therefore, streets with curbs and gutters in these areas do not have sufficiently wide roadsides to provide clear zones. Consequently, while there are specific horizontal clearance requirements for these streets, they are based on clearances for normal operation. Properly designing self-enforcing streets through Complete Streets will reduce, if not eliminate, errant vehicles. The minimum horizontal clearance is 1.5 feet measured from the face of the curb. This is primarily intended for signposts and

bicycle parking racks, so they are not hit by large vehicles with overhangs maneuvering close to the curb. The desired horizontal clearance for bicycle parking racks is four feet to minimize the likelihood that a bicycle parked at the rack will be struck by a vehicle overhang maneuvering close to the curb.

STREET LIGHTING



Pedestrians are disproportionately hit when visibility is poor: at dusk, night, and dawn. Providing illumination or improving existing lighting increases nighttime safety at intersections and mid-block crossings, as motorists can better see pedestrians. Pedestrian scale lighting along sidewalks provides greater security. Transit stops require both kinds of lighting: strong illumination of the traveled way for safe street crossing, and pedestrian scale illumination at the stop or shelter for security[13].

According to FHWA, lighting is a proven safety countermeasure recommended for intersections and segments of roadways. Lighting significantly reduces nighttime injury pedestrian crashes at intersections, for all nighttime crashes on rural and urban intersections. Consistent lighting of a road is preferred to avoid dark / bright spots along a corridor; illumination should be continuous and even.

Traffic Calming

While traffic calming takes various approaches, the outcome is usually the same: reduced traffic speeds. Traffic calming is the combination of mainly physical measures that a) reduce the negative effects of motor vehicle use, b) alter driver behavior, and c) improve conditions for non-motorized street users.

> ***Reduce the Negative Effects of Motor Vehicle Use*** - changing the role and design of streets to accommodate motorists in ways that reduce the negative social and environmental effects on individuals, neighborhoods, districts, retail areas, corridors, downtowns, and society in general (e.g., reduced speeds, reduced sense of intrusion/ dominance, reduced energy consumption and pollution, reduced sprawl, and reduced automobile dependence).

[13]FHWA-HRT-08-053, Informational Report on Lighting Design for Mid-block Crosswalks, April 2008

Alter Driver Behavior - street design that helps drivers self-enforce lower speeds, resulting in less aggressive driving and increased respect for non-motorized users of the streets.

Improve Conditions for Non-Motorized Street User - promoting walking and cycling, changing expectations of all street users to support equitable use of the street, increasing safety and comfort, improving the aesthetics of the street, and supporting the context of the street.

Maximizing the utility of the traveled way calls for use of a toolbox of design elements and facilities for inclusion on Hillsborough County streets. These range from safety elements incorporated to slow speeding vehicles and promote livable streets to dedicated facilities for bikes and transit to increase the efficiency, throughput, and safety for all modes of travel.

The greatest benefit of traffic calming is increased safety. Traffic calmed streets typically have fewer collisions and even higher reductions in injuries and fatalities. These dramatic safety benefits are mostly the result of slower speeds for motorists that result in greater driver awareness, wider fields of vision, shorter stopping distances, and less kinetic energy during a collision. Other contributing factors to these superior safety results include a more legible street environment and design advantages for pedestrians and cyclists.

Traffic calming can be achieved through cost-effective, tactical retrofits using paint, flex posts, and planters as well as through more permanent reconstruction projects. There are three types of traffic calming measures that could be considered for higher level roads. These include "Narrowing's," Horizontal Measures, and Vertical Measures which are intended to reduce speed and enhance the street environment for non-motorists[14]. Narrowing's refer to physically narrowing the traveled way to accommodate multimodal facilities. Horizontal Measures force traffic to be displaced horizontally such as roundabouts, chicanes, medians, and pinch points. Vertical Measures displace traffic vertically such as raised crosswalks/intersections, speed humps, or tables. The following provides a basic summary of other very common and appropriate traffic calming measures available for Hillsborough County to utilize. There are additional measures to be considered and illustrated at the ITE Traffic Calming Measures online website. Chapter Three, Street Typologies, identifies appropriate traffic calming techniques for each typology it defines.

MID-BLOCK NECKDOWNS

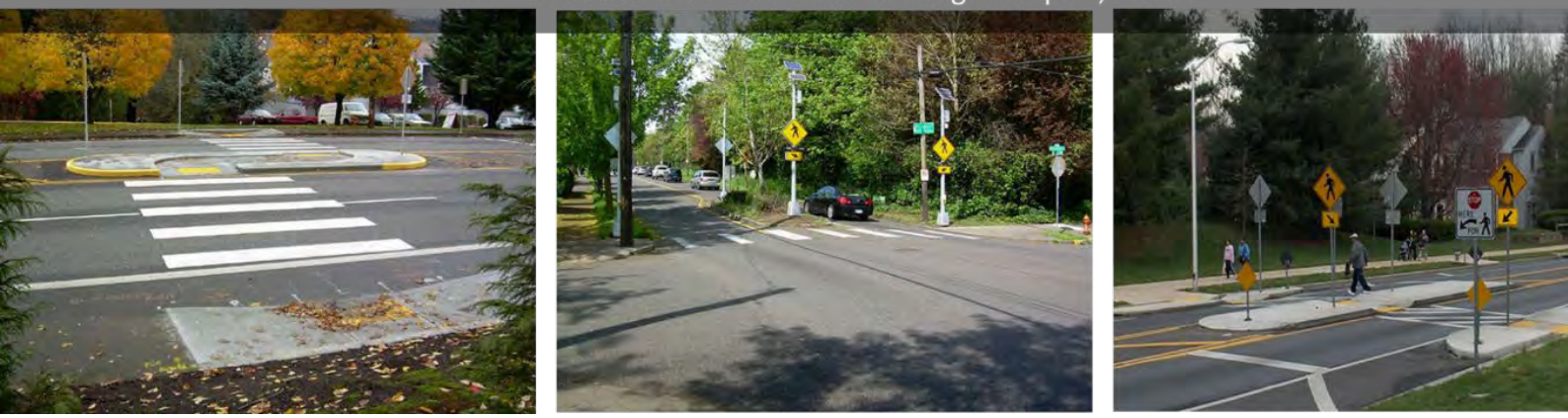
The presence of long blocks tends to favor high speeds as vehicles have longer travel distances between intersections. The tendency to continue accelerating can be tempered through mid-block neckdowns, often called "pinch-points," which are mid-block curb extensions. They can add public space to the sidewalk realm by allowing for additional landscaping or seating and can also be used to facilitate mid-block crosswalks. This treatment is often paired with on-street parking, where appropriate.

[14] Institute of Transportation Engineers, Traffic Calming Measures
https://www.ite.org/technical-resources/traffic-calming/traffic-calming-measures/

MEDIAN ISLANDS

Median islands are effective tools for narrowing the street at key locations and providing for pedestrian crossings and the inclusion of greenscape elements. Median islands are short medians parallel to the direction of travel and act as inverted mid-block neckdowns, reducing available street width from the middle rather than from the edges. Safety is improved by slowing speeds, providing a barrier to head-on collisions, and by limiting left -turns to locations where it is expressly permitted. Median islands that provide a pedestrian refuge should be at least six feet wide to be ADA compliant. Median islands can incorporate stormwater planters to collect and filter stormwater runoff.

Median Island and Pedestrian Crossing Examples, FHWA



CORNER EXTENSION / BULB-OUT

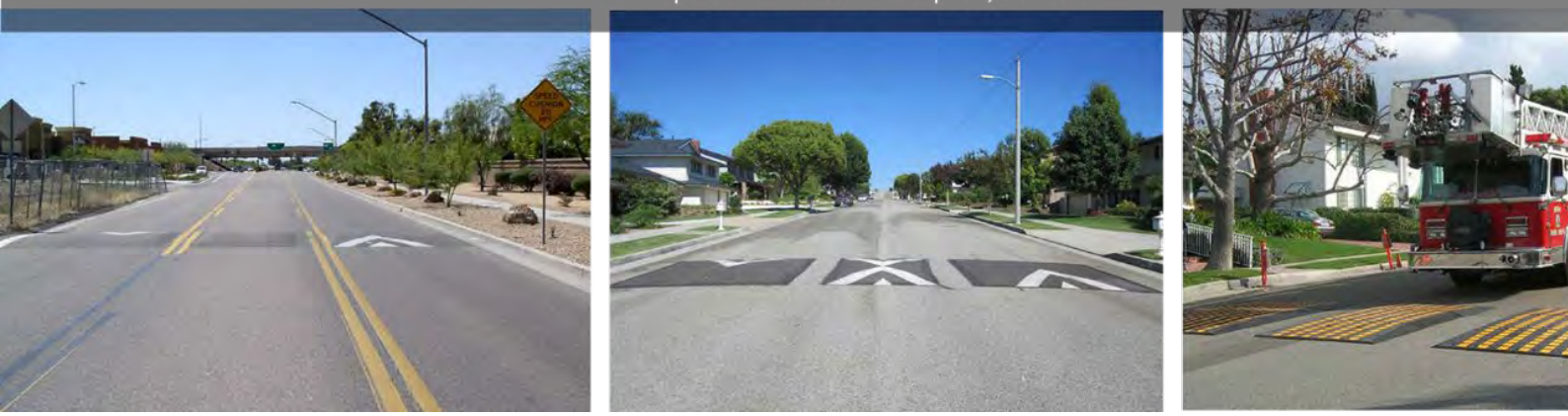
Corner extensions or Bulb-outs are horizontal extensions of sidewalk into the street, resulting in a narrower roadway section. If this treatment is located at a mid-block location, it is typically called a choker or a mid-block neckdown as described on the previous page. When combined with on-street parking, a corner extension can create protected parking bays. This is an effective method for shortening pedestrian crossing distances, add queuing space at intersections, and help place people waiting to cross in the sight line of drivers. Extensions also create room for street furniture on otherwise narrow sidewalks, allow space for ADA-compliant curb ramps, and increase overall safety of an intersection by preventing vehicles from parking too close to the intersection and reducing sight lines.

Corner Extension Examples, FHWA

SPEED CUSHIONS

On emergency vehicle routes, speed cushions should be used. Speed cushions, unlike speed humps, include wheel cutouts for large vehicles to pass them unaffected by the vertical deflection. Speed cushions can also be used to install traffic calming devices on routes that may have bus or truck activity. These are often placed in a series typically at mid-block locations. Speed cushions are appropriate in suburban and urban contexts, with limited application in rural contexts.

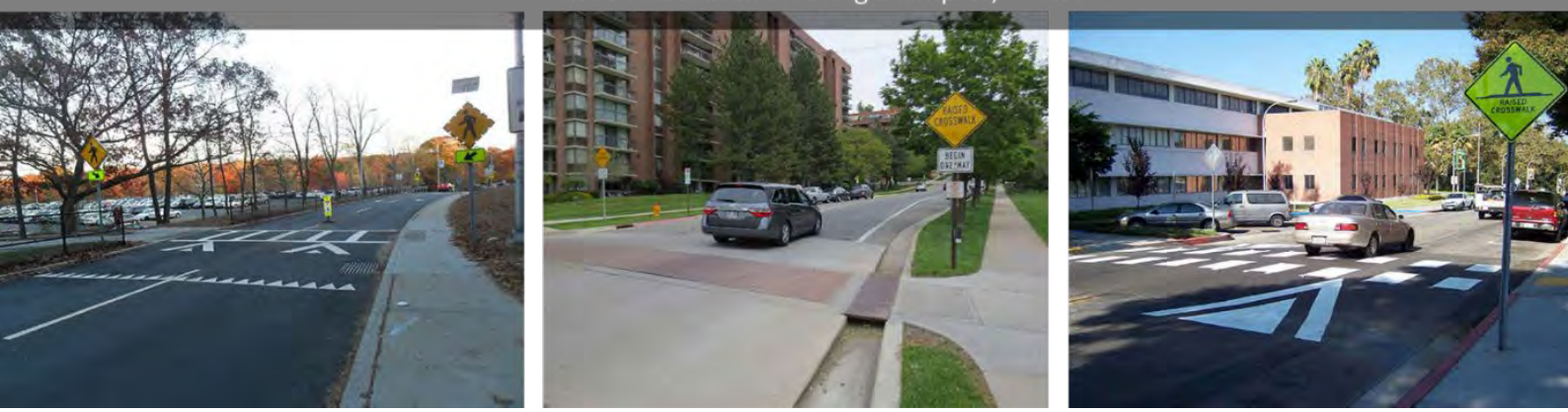
Speed Cushion Examples, FHWA



RAISED PEDESTRIAN CROSSINGS / INTERSECTIONS

Raised pedestrian crossings, or raised intersections, are also known as Speed Tables. Raised pedestrian crossings are vertical elements which are longer than speed humps (22 feet) and flat on top rather than the rounded speed hump design. They allow for slightly higher operating speeds and can support transit and emergency vehicle access. They can also be incorporated into mid-block crossings and curb extensions to increase the safety of such crossings and signal that priority should be given to pedestrians rather than vehicles. Clear markings and signage are necessary to alter street users of their presence.

Raised Pedestrian Crossing Examples, FHWA



ROUNDABOUT

A roundabout is a type of round intersection or junction in which road traffic is permitted to flow in one direction around a central island and priority is typically given to traffic already in the junction. Roundabouts reduce the likelihood and severity of collisions greatly by reducing traffic speeds and minimizing right angle and head on collisions. Roundabouts provide significant benefits for all road users by reducing the number of conflict points that can occur when compared to a signalized or unsignalized intersection.[15]

Figure 2-12 demonstrates how vehicular conflicts are reduced from thirty-two to eight points while eliminating crossing conflicts, which are the main cause of serious injuries and fatalities. According to the Highway Safety Manual, this has been found to increase overall safety for roadway users by reducing the number of serious injuries and fatalities by 79% when compared to a signalized intersection.[16] Although the number of conflicts increases at multilane roundabouts when compared to single-lane roundabouts, the overall severity (and often number) of conflicts is typically less than other intersection alternatives.

Figure 2-12 Roundabout Vehicle Conflict Points (NCHRP)

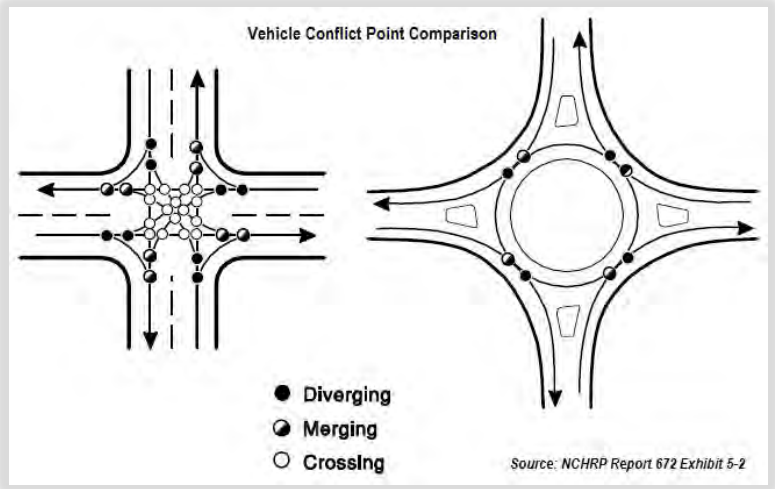


Figure 2-13 shows roundabouts have 50% fewer pedestrian-vehicle conflict points than a comparable stop or signal-controlled intersection. Pedestrians cross a shorter distance of only one direction of traffic at a time since the entering and exiting flows are separated. Lower speeds in a roundabout, deliver better yielding rates, reduced vehicle stopping distances, and lower risk of collision injury or fatality[17].

Where bicycle facilities lead to a roundabout, a bicyclist should be given the option to either ride in the travel lane or use a ramp to and from a separated shared use path. Normal travel speeds through a roundabout are in the 15-20 MPH range. A roundabout can be used at intersections with high volumes of large trucks and buses, depending on design. They are

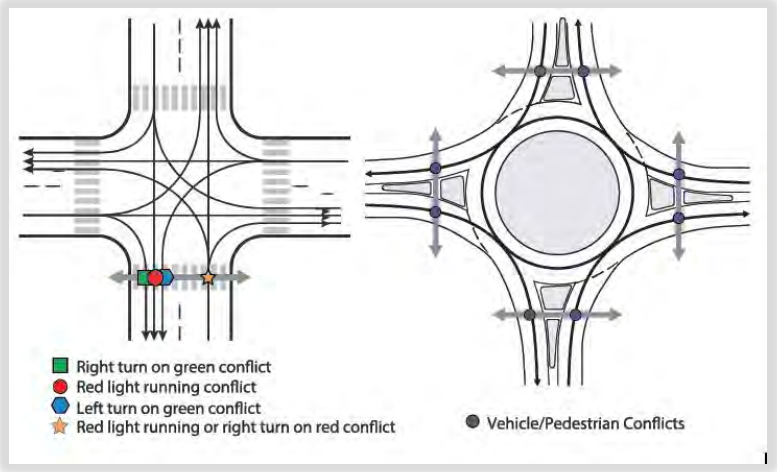
[15] NCHRP Report 672 – Roundabouts: An Informational Guide – Second Edition, 2010

[16] Crash Modification Factors Clearinghouse http://www.cmfclearinghouse.org/detail.cfm?facid=4184

[17] FHWA, Roundabouts with Pedestrians and Bicycles https://safety.fhwa.dot.gov/intersection/roundabouts/fhwasa15016.pdf

appropriate in rural, suburban, and urban contexts, they often have one or more entering lanes.

Figure 2-13 Roundabout Pedestrian Conflict Points (NCHRP)



TRAFFIC CIRCLE

Traffic circles are raised islands placed in unsignalized intersections around which traffic circulates. Approaching users yield to other users already in the intersection similar to roundabouts, only traffic circles are much smaller and do not have entry islands that often provide deflection. Traffic circles are appropriate at intersections in neighborhood context where traffic volumes and speeds are low. These circles are appropriate for both one-way and two-way streets in urban and suburban settings.

Traffic circles are also being applied along bicycle facilities such as trails and shared use paths. Example locations would be at junctions of trails, bridges, or where high volumes of turning traffic may warrant additional guidance.

Preparing for Autonomous Vehicles

The Comprehensive Plan Mobility Section acknowledges the transportation landscape is changing rapidly because of the onset of technology such as connected or self-driving vehicles and smart infrastructure. These have been facilitated by the convergence of communication, computer, and vehicular technologies. Likewise, shared mobility enables the short-term use of transit, ride-hailing services, shared cars, bicycles and even scooters to get around.

Autonomous vehicles (AVs) will impact communities on a variety of fronts – land use, transportation planning, social equity, and the economy. Autonomous technology is developing quickly but is still years from widespread adoption. At this juncture, communities have a unique opportunity to shape an autonomous future that puts people at the core of all decision-making. The autonomous future will enhance aspects of transportation systems, from improving safety for all road users, re-balancing the use of the right-of-way, and expanding mobility for all.

The design and management of streets is one of the most powerful tools that communities can exercise to achieve safety goals, improve transit service, and reduce carbon emissions. AVs are being programmed to follow a complex set of traffic rules, abiding by the geometries that communities plan, engineer, and construct. This power over street geometry gives communities unique opportunities. To ensure safety in the autonomous age, communities should prioritize high-capacity transit and active transportation.

There are various levels of vehicle automation currently in development starting with level one such as adaptive cruise functions to level five where vehicles are fully autonomous. The real impacts will be felt when most of the vehicle fleet is converted to AVs. These vehicles could have significant effects on roadway safety, reducing or even, in the most optimistic cases, eliminating roadway crashes and fatalities. It is critical that policies regarding AVs be used to continue support for Complete Streets and safety improvements. According to FHWA, due to the complex nature of AVs, market penetration is critical to experiencing the anticipated outcomes of the technology.

At this point, only a 40% market penetration of level two AVs are anticipated by 2040. Full fleet automation could result in significant flexibility in the following areas of street design:

- Lane widths: AVs may allow for lane widths to be reduced to 8'-9' resulting in more non-vehicle space on streets.

- On-street parking: could be replaced by loading zones spaced similarly to today's transit stops.
- Signage, road markings: Vehicle-to-Infrastructure communications may render much of today's street signage and markings oriented toward vehicles useless, helping to declutter the furnishing zone and reducing street maintenance. Furnishing zone elements could be designed toward comfort and away from serving as a barrier to errant drivers.
- Clear zone: the clear zone setback at the edge of the roadway could potentially be eliminated, restoring even more sidewalk space from vehicles to pedestrians.

So, streets should be designed to ensure that streetscape improvements, like redesigned curbs, do not impede future opportunities. For example, flexible sidewalks can be designed at the same grade as the rest of the street, with bollards and planter boxes providing the same sense of safety as concrete curbs. As travel lanes for cars decrease in size, the extra space created can be used for wider sidewalks, more trees, and more bicycle and pedestrian amenities.[18]

[18] Streets Reconsidered, Design for Tomorrow, Daniel Iacofano & Mukul Mahotra

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Complete Streets Guide

HCFLGov.NET

3 Street Typologies

Create a sustainable transportation system that allows people to take their mode of choice to access necessities, opportunities, recreation and each other.

Comprehensive Plan

Mobility Element Goal

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3 STREET TYPOLOGIES

Hillsborough County's Context Based Classification system establishes five contexts based on Future Land Use and Community Plans. These contexts are Rural (C1&C2); Suburban Residential (C3R), Suburban Commercial (C3C), Suburban Town(C3T), and Urban General (C4). Figure 3-1 (also shown in Appendix A) illustrates the County's Context Classification system. This chapter will translate and specify the elements that define and characterize Complete Streets in each of the five Contexts. It also further defines the variations of streets in different settings.

Context Based Classification communicates the overall development pattern and form for a street. It ensures that streets are built to support the future vision of the community, rather than reinforce the current development pattern. To address the variations in land use and resulting differences in street design needs, several common typologies were developed for each of the five Context-Based Classifications.

Typologies focus on design decisions to address user needs, connectivity, walkability, placemaking, livability and community values. The number of typologies reflects the wide variety of ways in which streets serve the community and reflects the need for the design to be more closely aligned with the environment it serves.

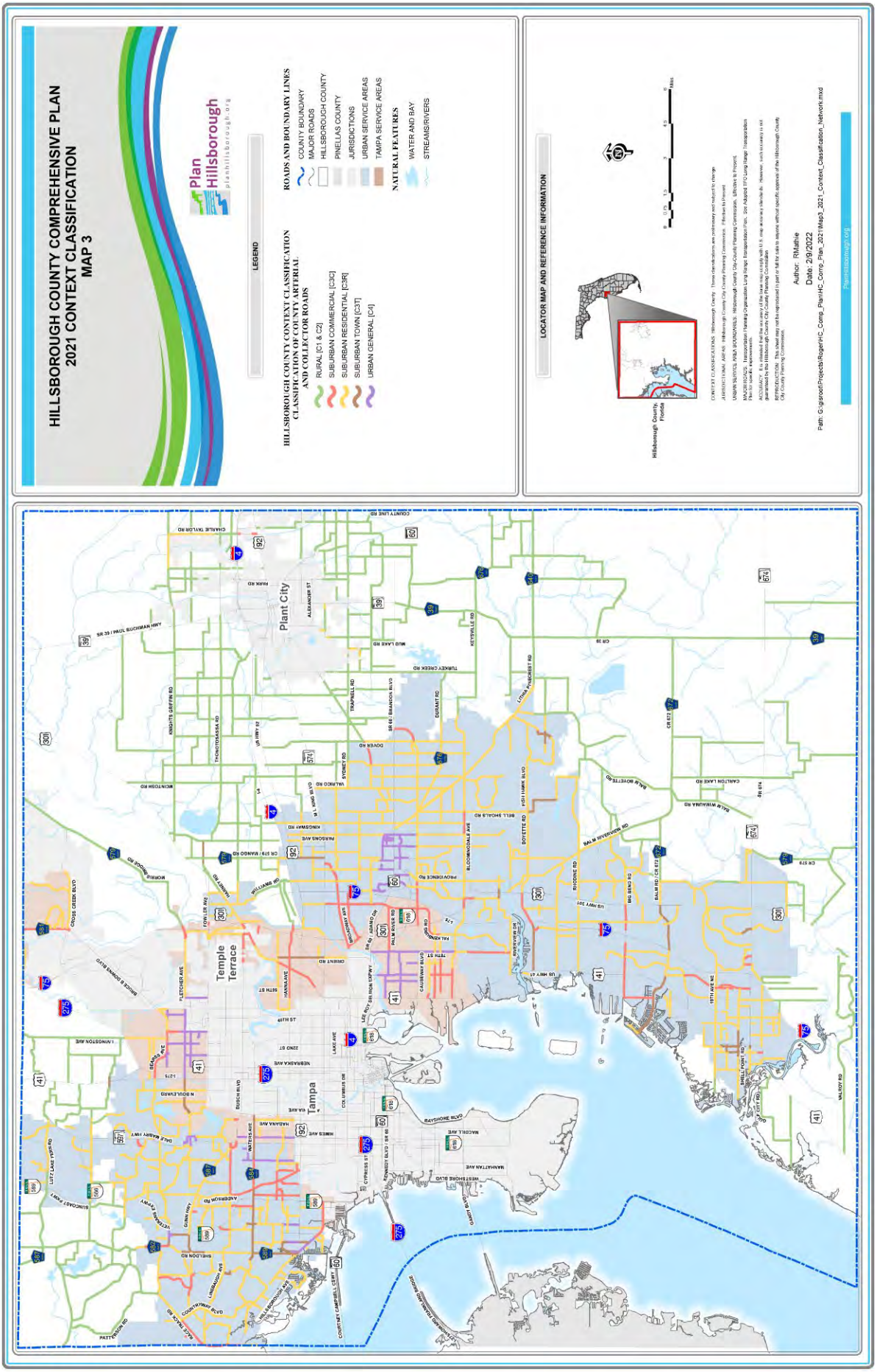

Figure 3-1 Context Based Classification Map

Choosing Typologies

A street's Context Based Classification is the starting point for typology identification. It may not always be evident which typology should be applied in a given context. Figure 3-2 illustrates the Typology Selection Process that was developed. A significant portion of a street frontage, for example, may be undeveloped. This is likely to occur in Suburban Town (C3T) and Urban General (C4) Contexts, where a community's main street has yet to develop or where the area has not yet redeveloped into an urban area. Once the Context Based Classification is identified, the Future Land Use Map is consulted. If the future land use is residential and the context is Urban General (C4), it is clear that Urban Neighborhood should be the typology. If, however, the future land use is mixed use and the context is Urban General (C4), professional judgment must be exercised in deciding on a typology. This should include a review of the future land use designations along the corridor, and an understanding of the future character of the area, which may involve review of plans, zoning, permits, and sometimes even market potential. To assist in choosing the appropriate typology, Tables 3-1 through 3-4 can be consulted.

Figure 3-2

Typology Selection Process

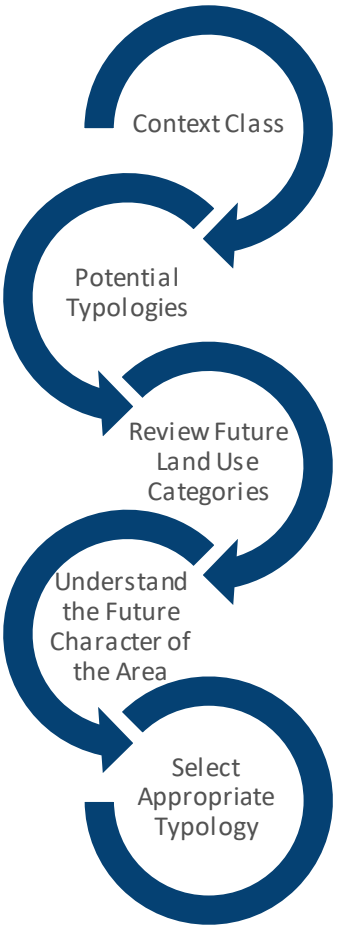

Table 3-1 -Typology Identification: Rural (C1&C2) and Suburban Residential (C3R)			
RURAL (C1&C2)	**Typical Future Land Uses**	**Predominant Building Form and Use Mix**	**If Vacant**
Rural Neighborhood	Residential Categories outside of the Urban Service Area	Low-density single-family houses with direct access to the street.	Use Rural Other Typology
Rural Other	Natural Preservation Mining Agriculture	Agricultural operations, mining, preservation areas, and vacant land.	
Rural Activity Center	Can occur anywhere in the Rural Service Area	Clusters of institutional uses, such as schools and churches as well as commercial activity.	
Suburban Residential (C3R)	**Typical Future Land Uses**	**Predominant Building Form and Use Mix**	**If Vacant**
Suburban Neighborhood	Residential	Predominantly single-family or multifamily dwellings with direct access to the street. May include institutional uses, such as schools and churches and/or open space, such as parks and connecting trails.	Use Suburban Neighborhood Connector Typology
Suburban Neighborhood Connector	Residential	Predominantly single or multifamily dwellings do not have direct access to the street. May include institutional uses, such as schools and churches and/or open space, such as parks and connecting trails.	

Table 3-2 -Typology Identification: Suburban Commercial (C3C)			
Suburban Commercial (C3C)	Typical Future Land Uses	Predominant Building Form and Use Mix	If Vacant
Neighborhood Commercial	Residential or suburban scale mixed use.	Small individual commercial and office buildings or multi-tenant centers serving a market area within walking or biking distance. Typically located at the edges of neighborhoods.	In residential Future Land Uses, review property's zoning. If not commercial, use Suburban Neighborhood Connector. In Mixed Use categories, use Neighborhood Commercial typology if size is under 20 acres per intersection quadrant.
Regional Commercial	Nonresidential, except for industrial categories	Big box anchored shopping centers or shopping malls serving a market area beyond walking or biking distance. Typically located on heavily traveled arterial roads.	Review zoning, site development, and building permits to identify unbuilt Regional Commercial. If there are over 20 acres of vacant land at any quadrant, review the comprehensive plan to determine if the area is designated a regional activity center. If not, conduct a market study to determine if the future population of the area is sufficient to warrant a new Regional Commercial center. If not, use Neighborhood Commercial Typology.
Industrial	Light or Heavy Industrial	Warehousing, manufacturing, and assembly facilities relying on significant freight movement.	Use Industrial Typology

Table 3-3 -Typology Identification: Suburban Town (C3T)			
Suburban Town (C3T)	Typical Future Land Uses	Predominant Building Form and Use Mix	If Vacant
Town Center	Any	Mixed uses, commercial, office, residential, buildings fronting the street. Aging strip commercial centers. May include Institutional uses, such as schools and churches and/or open space, such as parks and connecting trails.	Consult Community Plans for text and maps that identify streets as destinations.
Town Neighborhood	Any	Single-family or multifamily dwellings with direct access. May include Institutional uses, such as schools and churches and/or open space, such as parks and connecting trails.	Consult Community Plans for text and maps that identify streets as destinations. Town Neighborhood streets will typically be within walking distance to and run parallel or perpendicular to destination streets.

Table 3-4 -Typology Identification: Urban General (C4)			
Urban General (C4)	Typical Future Land Uses	Predominant Building Form and Use Mix	If Vacant
Urban Neighborhood	High density residential and mixed-use categories	Single-family or multi-family dwellings fronting the street. Multi-level buildings should have rear or side-street access but predominantly constructed as apartment complexes accessing the street via one or two driveways. May include some neighborhood-scale commercial uses. If street is fronted on only one side by these conditions, use Urban Neighborhood Typology.	Review community plans for streets and locations identified as destinations. Review zoning, site development, and building permits to identify unbuilt commercial. If so, use Main Street Typology.
Main Street	Community Mixed Use 12 and higher categories	Multi-level buildings built on or near the right-of-way line. Ground floor retail and commercial uses, with residential or office uses above. Any commercial areas, including Regional Commercial, Neighborhood Commercial, collections of individual commercial buildings, and strip commercial. If street is fronted on only one side by these conditions, use Urban Neighborhood Typology.	

Given the number and expected type of users, each typology includes specific street element recommendations to enable all users by providing the right facilities to connect them to places and services. While the typology is a single illustrative cross-sectional view of the different street elements recommended for consideration, Chapter Five provides the guidance on the connective points (intersections and crossings) to connect mode facilities to adjacent communities. Each of the typologies may have mode-specific treatments that may not be depicted, such as different bicycle or parking facilities that may need to be determined on a block-by-block basis. For each Context (Rural, Suburban and Urban) a summary table is provided identifying user features, travel zones, pedestrian zone, bicycle facilities, transit, traffic calming and speed management, placemaking, access management, and parking for their respective typologies within the Context. The tables are the starting point in selecting appropriate street design characteristics.

Table 3-5 summarizes the recommended Target Speeds. Design speeds higher than 35 MPH should not be used in Suburban (C3) or Urban General (C4) contexts, or within Rural Neighborhoods and Rural Activity Centers. The Context Target Speed ranges provided in this document are aligned with national best practices and are different from the FDOT speed

ranges. While the FDOT ranges may be appropriate at a statewide level that serves the classification of state roads, the speed ranges may be too high for local municipalities and especially in urbanized areas.

Table 3-5 - Target Speeds

Context Classification	Typologies	Target Speed Range
RURAL (C1&C2)	Rural Neighborhood	25 MPH - 35 MPH
	Rural Other	35 MPH - 45 MPH
	Rural Activity Center	20 MPH - 25 MPH
Suburban Residential (C3R)	Suburban Neighborhood	25 MPH - 30 MPH
	Suburban Neighborhood Connector	25 MPH - 35 MPH
Suburban Commercial (C3C)	Neighborhood Commercial	25 MPH - 35 MPH
	Regional Commercial	25 MPH - 35 MPH
	Industrial	25 MPH - 35 MPH
Suburban Town (C3T)	Town Neighborhood	20 MPH - 25 MPH
	Town Center	20 MPH - 25 MPH
Urban General (C4)	Urban Neighborhood	20 MPH - 25 MPH
	Main Street	20 MPH - 25 MPH

These typologies illustrate how to include street elements and how they are expected to relate to and support fronting land uses. These illustrations show critical elements with ideal width and assume right-of-way is not constricted. Elements like drainage and utilities should be addressed through best engineering judgement through the application of this guide. Open drainage is the preferred rural condition and closed is the preferred urban and suburban condition.

When right-of-way is constricted, planners and engineers must identify the trade-offs and reflect on the community values and needs within the corridor. To assist with this, street elements for each typology have been color-coded to indicate which elements are required, and of those required, their relative priority. The color-coding of priorities can be seen in the figures throughout the Guide.

Required Elements with High Priority - These elements are required and should be provided using ideal widths.

Required Elements with Lower Priority - These elements are required, but the width may be narrowed when right-of-way is constricted.

Optional Elements - Elements can be considered, omitted, or consolidated if a specific need is not established. If provided, minimum design widths are acceptable.

At the end of this chapter, planning guidance for constricted conditions and transitions between contexts and typologies is provided.

Rural (C1&C2)

Rural environments require different considerations when it comes to complete streets. Those who live in rural contexts may still need multimodal facilities to connect to services and jobs. Beyond walking, bicycling, driving, and transit, residents in rural areas need

traveled ways to support movement of farm equipment and freight. These other modes may include:

Freight - Freight traffic normally on Rural Other type roads, especially large trucks may require additional travel lane width. On designated multilane truck routes, one travel lane, preferably the outside travel lane in each direction, should be 12 feet wide. Not all roads are designated truck routes.

Farm Equipment - On roadways where farm equipment is expected frequently, consider including eight-foot-wide shoulders, or include pull-offs to allow faster-moving traffic to pass the farm equipment.

Near a Rural Activity Center, such as Lutz Lake Fern Trailhead, Alafia River State Park, or Little Manatee River State Park or Neighborhood, visitors may arrive on foot or bike. Those residents that are part of the agricultural workforce may travel on private buses, walk or bike to pick up spots, or walk or bike from rural housing near their workplaces.

Rural (C1&C2) context streets are further categorized as one of three typologies: Rural Neighborhood, Rural Other, and Rural Activity Center. Summary Table 3-6 provides street characteristics for these typologies, and the Typology Profiles are shown in Figures 3-3 and 3-4.

RURAL NEIGHBORHOOD

Rural Neighborhood streets are roadways with low vehicle volume and slow speed to serve local trips; mostly residential and may have low pedestrian and bicycle volume.

RURAL OTHER

Rural Other are roadways that have higher speed and/or high truck volume. Pedestrian and bicycle facilities may be provided for connectivity purposes only.

RURAL ACTIVITY CENTER

A Rural Activity Center is not reflected in the Summary Table or Typologies shown but reflect similar conditions as a Suburban Town Center. These activity centers are often at a junction of two roads. The types of users and activities warrant special consideration, especially related to the higher target speeds accompanied on these rural streets. Streets in these areas should have slower vehicle speeds, medium vehicle volumes, and medium pedestrian and bicycle volumes. Examples include Lutz Lake Fern at Gunn Highway and Tarpon Springs Road; Seffner or Dover area in the northeast; Balm area in south county, or Lithia Pinecrest Road at S. County Road 39 in east county.

If constricted conditions do not permit inclusion of all elements, the *USDOT/FHWA Small Town and Rural Multimodal Networks* design guide should be consulted for specific references for appropriate pedestrian, bicycle, and road design treatments for this context.

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Table 3-6 -Summary Considerations	RURAL (C1&C2) Rural Neighborhood
User Features	
Pedestrian and Bicycle Volumes	Low pedestrian and bicycle volume
Traffic Speeds	Slow to medium speed local traffic - 25 - 35 MPH
Truck Volumes	Local truck volume
Traveled Way	
Travel Lanes	Typically, 2 lanes
Lane Width	11 feet, wide shoulders for slower vehicles and bikes
Median	N.A.
Pedestrian Facilities	
Pedestrian Zone - Total Width	N.A.
Sidewalk Width	Minimum 6 feet, buffered from travel lanes, marked crossings
Bicycle Facilities	
Separated Facility	Preferred, may be used in speed zones greater than 30 MPH
Protected Bike Lane	Preferred, may be used in speed zones greater than 25 MPH
Bike Blvd / Sharrows / Bike Lane	May be used in speed zones less than 25 MPH
Bike Lane Extensions	Bicycle pavement markings through intersections, marked crossings
Other Amenities	Bicycle racks at key destinations
Transit Stop Features	
Transit Stops	N.A.
Access to Transit Stop	N.A.
Transit Amenities	N.A.
Traffic Calming / Speed Management	
Street Width Reduction	Corner Extensions/Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees
Horizontal Deflection	Mid-block Neckdowns/Pinch Points, Traffic Circle, Roundabouts
Vertical Deflection	Speed Cushions/ Tables, Raised Crosswalk/Intersection
Operational Elements	Target Speed reduction
Placemaking	
Green Infrastructure	Bioswales, Planters, Trees, Infiltration Trenches
People Space	N.A.
Street Amenities	N.A.
Street Lighting	Street and Pedestrian-scale lighting at intersections and crossings
Access Management	
Driveways	Should not be allowed in intersection functional area
Median Design	N.A.
Parking Management	
On-Street Parking	Appropriate
Off-Street Parking	Preferred
Technology Considerations	N.A.
Wayfinding	Pedestrian and Bicycle wayfinding to destinations - Libraries, schools, parks, recreational destinations, other activity centers

RURAL (C1&C2) Rural Other
Low pedestrian and bicycle volume High speed through traffic - 35-45 MPH Median truck volume
Typically, 2-4 lanes 10-11 feet, wide shoulders for slower vehicles and bikes Appropriate, for drainage or landscaping
N.A. Minimum 6 feet, buffered from travel lanes, marked crossings
Preferred Optional N.A. Bicycle pavement markings through intersections, marked crossings Bicycle racks at key destinations, repair station may be considered
N.A. N.A. N.A.
Median Island, Lane Elimination, Lane Narrowing, Street Trees Roundabouts N.A. Target Speed reduction
Bioswales, Trees, Infiltration Trenches, Riparian Buffers, Constructed Wetlands N.A. N.A. Street and Pedestrian-scale lighting at intersections and crossings
N.A. N.A.
N.A. Preferred N.A. Pedestrian and Bicycle wayfinding

Landscaped Median on a two (2) lane Rural Roadway

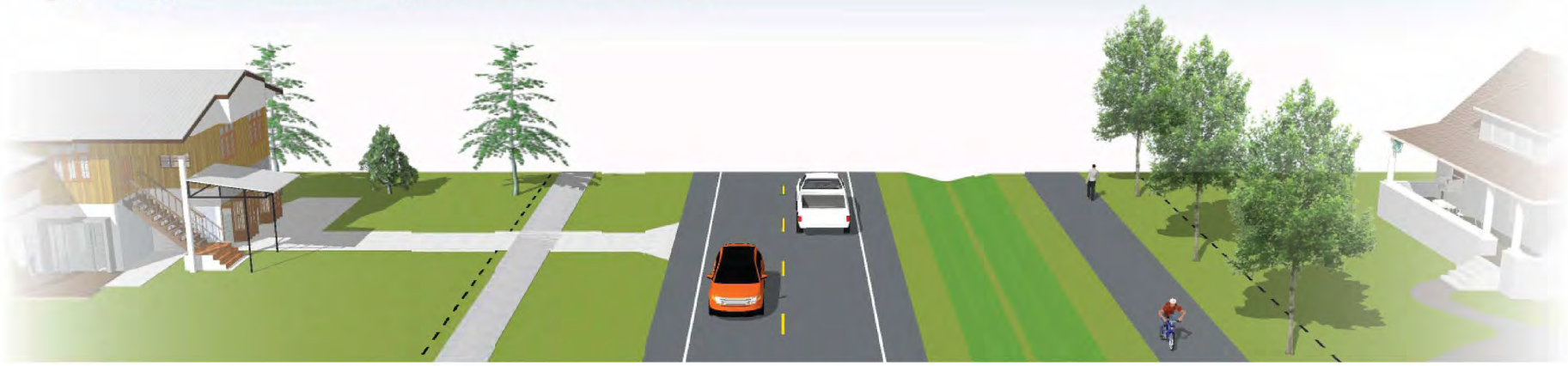
Roundabout on a two (2) lane Rural Roadway

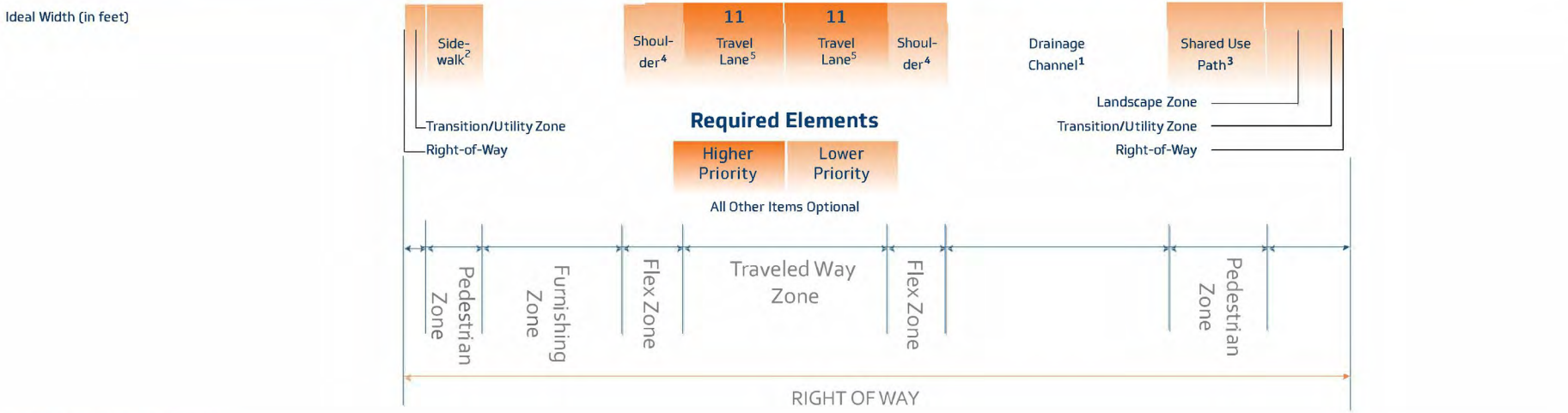
*Separated Bike Lane along a Rural Roadway**

*Photo Credit: Small Town and Rural Design Guide; https://ruraldesignguide.com/

Figure 3-3

Typology: Rural Neighborhood, C1&C2





Design Considerations

Expected Users

Pedestrians	Walking, Recreation
Bicyclists	Riding, Recreation
Transit	Low Frequency
Auto	Through and Local Traffic
Freight	Local Traffic[5]

Target Speed

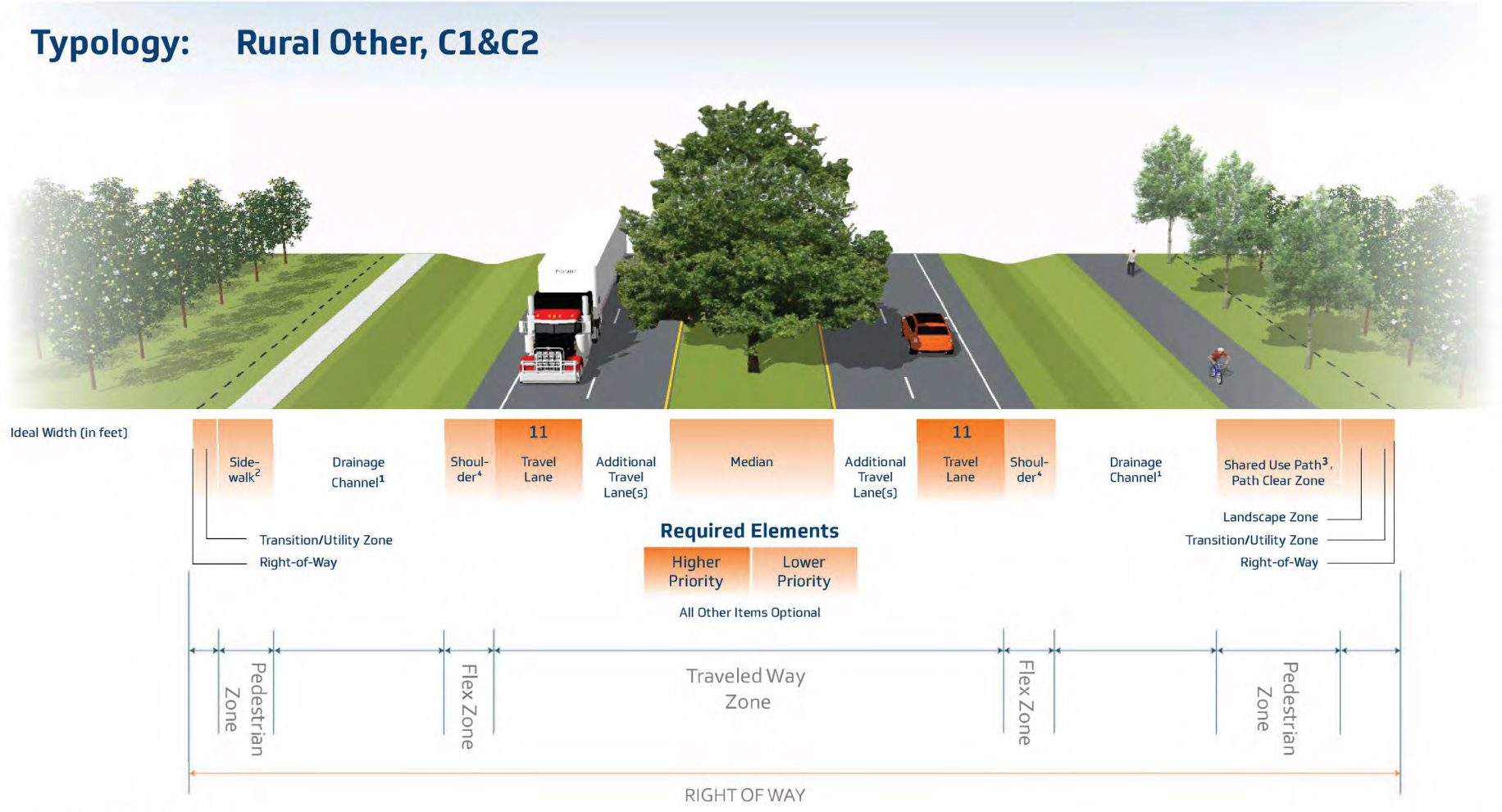
25-35 MPH

Slower Target Speeds may be appropriate where development patterns are suburban in character.

Notes

[1] Drainage Channels will vary and rely on engineering study needs.
[2] Sidewalks should be provided in all neighborhoods, especially as an essential connector to schools, parks, and activity centers.
[3] Shared use paths should be considered where right-of-way is available and to connect to rural activity centers.
[4] Wide (6' - 8') paved shoulders should be provided to accommodate bikes in rural settings.
[5] Through traffic is expected on truck routes.

Figure 3-4



Design Considerations

Expected Users

Pedestrians	Walking, Recreation
Bicyclists	Riding, Recreation
Transit	Low Frequency
Auto	Through and Some Local Traffic
Freight	Through and Some Local Traffic

Target Speed

35-45 MPH

Slower Target Speeds may be appropriate where development patterns are suburban in character.

Notes

1. Drainage Channels will vary and rely on engineering study needs.
2. Sidewalks should be provided in all neighborhoods, especially as an essential connector to schools, parks, and activity centers.
3. Shared use paths should be considered where right-of-way is available and to connect to rural activity centers.
4. Wide (6' - 8') paved shoulders should be provided to accommodate bikes in rural settings.

Suburban Residential (C3R)

The Suburban Residential (C3R) context is located within the Urban Service Area and is comprised of areas with mostly residential uses within a disconnected or sparsely connected roadway network. Future Land Use categories include low to medium density residential (one to six dwelling units per acre).

Streets in Suburban Residential (C3R) are further defined by the way residences front them. These typologies include Suburban Neighborhood, where residents have direct pedestrian or vehicular access to the street, and Suburban Neighborhood Connector, where only the side and rear of homes are adjacent to the street. A summary of typology characteristics is presented in Table 3-7, and their typology profiles are shown in Figures 3-5 and 3-6.

SUBURBAN NEIGHBORHOOD

Streets have relatively low vehicle volumes and slow speeds, serving shorter trips. High pedestrian and bicycle volumes can be observed for access to homes as well as parks, schools, and other destinations that serve neighborhoods.

Suburban Neighborhood

SUBURBAN NEIGHBORHOOD CONNECTOR

Allows through travel through neighborhoods and connect neighborhoods to other activity areas. Separation is considered between vehicles and pedestrians or bicyclists for safety and comfort.

Suburban Neighborhood Connector

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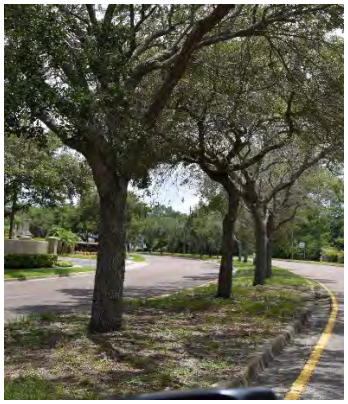
Table 3-7 - Summary Considerations	SUBURBAN RESIDENTIAL (C3R) Suburban Neighborhood
User Features	
Pedestrian and Bicycle Volumes	High pedestrian and bicycle volume
Traffic Speeds	Slow speed local traffic - 25-30 MPH
Truck Volumes	Local truck volume
Traveled Way	
Travel Lanes	Typically, 2 lanes
Lane Width	10 feet
Median	Optional
Pedestrian Facilities	
Pedestrian Zone - Total Width	10-12 feet
Sidewalk Width	Minimum 6 feet, buffered from travel lanes
Crossings	Marked and frequent, 1/8th of a mile preferred
Bicycle Facilities	
Separated Facility	Optional, may be used in speed zones greater than 30 MPH
Protected Bike Lane	Preferred, may be used in speed zones greater than 25 MPH
Bike Blvd / Sharrows / Bike Lane	Appropriate, may be used in speed zones less than 25 MPH
Bike Lane Extensions	Bicycle pavement markings through intersections
Other Amenities	Bicycle racks at key destinations, repair station may be considered
Transit Stop Features	
Transit Stops	Signed bus stops, preferred spacing: 0.25 - 0.50 mile
Access to Transit Stop	Safe, convenient, and frequent street crossings should be provided
Transit Amenities	Bus shelters in high use areas, benches, system/route map, bike racks, lighting
Traffic Calming / Speed Management	
Street Width Reduction	Corner Extensions/Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees
Horizontal Deflection	Chicane, Realigned Intersection, Traffic Circle, Roundabouts
Vertical Deflection	Speed Cushions/Tables/ Humps, Raised Crosswalk/Intersection
Operational Elements	On-Street parking, Target Speed reduction
Placemaking	
Green Infrastructure	Bioswales, Planters, Trees
People Space	Parklets, Parks, Trails
Street Amenities	Benches, trash cans
Street Lighting	Pedestrian-scale street lighting
Access Management	
Driveways	Should not be allowed in intersection functional area
Median Design	N.A.
Parking Management	
On-Street Parking	Appropriate
Off-Street Parking	Appropriate
Technology Considerations	N.A.
Wayfinding	N.A.

SUBURBAN RESIDENTIAL (C3R) Suburban Neighborhood Connector
Medium to high pedestrian and bicycle volume Slow speed local traffic - 25-35 MPH Low local truck volume (<10%)
Typically, 2+ lanes 10-11 feet Optional, may include refuge islands
10-12 feet Minimum 6 feet, buffered from travel lanes Marked on all four quadrants, High visibility, 1/8th of a mile preferred
Preferred, may be used in speed zones greater than 30 MPH Appropriate, may be used in speed zones greater than 25 MPH Optional, may be used in speed zones less than 25 MPH Bicycle pavement markings through intersections Bicycle racks at key destinations, bike counter and repair station may be considered
Signed bus stops, preferred spacing: 0.25 - 0.50 mile Safe, convenient, and frequent street crossings should be provided Bus shelters in high use areas, benches, system/route map, bike racks, lighting
Corner Extensions/Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees Two-way street, Traffic Circle, Roundabouts Speed Cushions/ Tables/ Humps, Raised Crosswalk/Intersection On-Street Parking, Signal Progression to Target Speed, Target Speed Reduction
Bioswales, Planters, Trees, Permeable Pavements Parklets, Parks, Trails Benches, trash cans Street and Pedestrian scale street lighting
Adequate commercial driveway throat length. Shared driveways should be used to reduce curb-cuts. Provide frequent safe crossings for pedestrians, bikes, and cross traffic
Preferred Appropriate Parking Meters Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers

Green Infrastructure on a Suburban Residential Roadway



Median with Trees along a Suburban Roadway

Figure 3-5

Design Considerations

Expected Users	Use of Street
Pedestrians	Walking
Bicyclists	Riding
Transit[2]	Medium Frequency
Auto	Local Traffic
Freight	Local Traffic

Target Speed

25-30 MPH

Notes

[1] When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.

[2] Includes on-demand transit and school transportation services.

[3] Bicyclists may be accommodated in shared travel lane (as shown) if vehicle speeds and volumes meet specific thresholds; otherwise, provide separated bike lanes.

Figure 3-6

Design Considerations

Expected Users	Use of Street
Pedestrians	Walking
Bicyclists	Riding
Transit[2]	Medium Frequency
Auto	Through Traffic
Freight	Through Traffic

Target Speed

25-35 MPH

Notes

[1] Alternative protected bicycle facility design may by considered in constrained right-of-way's. If on-street bicycle facilities are appropriate, sidewalks are required on both sides.

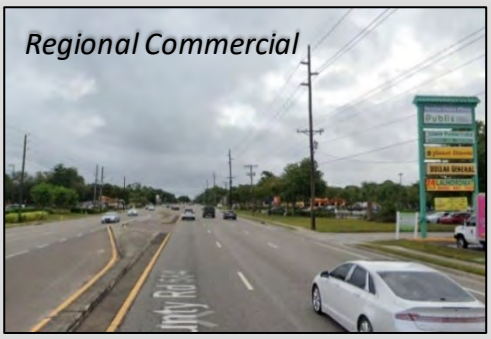
[2] Additional travel lanes must be justified whether a new lane or existing.

[3] When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.

Suburban Commercial (C3C)

The Suburban Commercial (C3C) context is in the Urban Service Area and comprised of non-residential and mixed uses, typically with large buildings and parking lots. Street networks in these areas are usually disconnected or sparse. Future Land Use categories include Suburban Mixed Use, Neighborhood Mixed Use, Research/Corporate Park, Light Industrial, Heavy Industrial, and Energy Industrial Park.

Three typologies have been identified within the Suburban Commercial (C3C) context, based on common land uses and scale of use. These include Neighborhood Commercial, Regional Commercial, and Industrial. Table 3-8 provides a summary of their typology characteristics, and typology profiles are provided for each in Figures 3-7, 3-8, and 3-9.



NEIGHBORHOOD COMMERCIAL

Access in Neighborhood Commercial is predominantly provided from the rear or a sideroad and the streets typically have lower vehicle volumes. Higher pedestrian and bicycle volumes with short trips and more developed transit amenities can be observed.

REGIONAL COMMERCIAL

Regional Commercial streets have relatively higher vehicle volumes, connecting to neighborhood streets, and move greater volumes of freight on longer trips to access commercial uses. Vehicles are separated from pedestrians or bicyclists for safety and comfort.

INDUSTRIAL

Industrial Roadways have relatively higher speeds which move greater volumes of vehicles and freight. Employees of surrounding industrial parcels typically generate local pedestrian and bicyclist trips.

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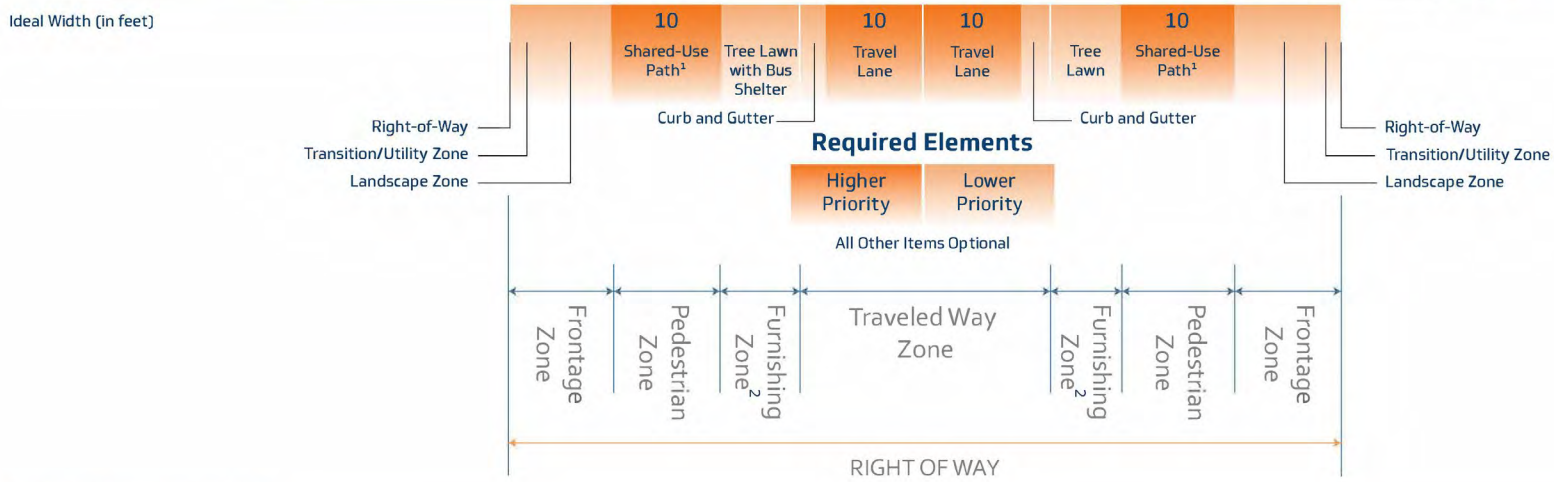
Table 3-8 - Summary Considerations	SUBURBAN COMMERCIAL (C3C) Neighborhood Commercial
User Features	
Pedestrian and Bicycle Volumes	High pedestrian and bicycle volume
Traffic Speeds	Slow to Medium speed, local traffic - 25-35 MPH
Truck Volumes	Low local truck volume
Traveled Way	
Travel Lanes	Typically, 2+ lanes
Lane Width	10-11 feet
Median	Optional, may include refuge islands
Pedestrian Facilities	
Pedestrian Zone - Total Width	10-12 feet
Sidewalk Width	8 -10 feet, buffered from travel lanes
Crossings	Marked on all four quadrants, High visibility, frequent at 1/8-mile intervals
Bicycle Facilities	
Separated Facility	Appropriate, may be used in speed zones greater than 30 MPH
Protected Bike Lane	Preferred, may be used in speed zones greater than 25 MPH
Bike Route / Sharrows / Bike Lane	May be used in speed zones less than 25 MPH
Bike Lane Extensions	Bicycle pavement markings through intersections
Other Amenities	Frequent provision of bicycle racks and repair stations, micromobility hubs, Bicycle Counter
Transit Stop Features	
Transit Stops	Signed bus stops, preferred spacing: 0.25 - 0.50 mile
Access to Transit Stop	Safe, convenient, and frequent street crossings should be provided
Transit Amenities	Bus shelters in high use areas, benches, system/route map, bike racks, lighting
Traffic Calming / Speed Management	
Street Width Reduction	Corner Extensions/Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees, Building lines (zero setback)
Horizontal Deflection	Chicane, Traffic Circle, Roundabouts
Vertical Deflection	Speed Cushions/ Tables/ Humps, Raised Crosswalk/Intersection
Operational Elements	On-Street Parking, Signal Progression to Target Speed, Target Speed Reduction, Speed Radar Feedback Signs
Placemaking	
Green Infrastructure	Bioswales, Planters, Trees, Permeable Pavements
People Space	Parklets, Parks, Trails
Street Amenities	Benches, trash cans
Street Lighting	Street and Pedestrian scale street lighting
Access Management	
Driveways	Adequate commercial driveway throat length, Shared driveways should be used to reduce curb-cuts
Median Design	Provide frequent safe crossings for pedestrians, bikes, and cross traffic
Parking Management	
On-Street Parking	Preferred
Off-Street Parking	Appropriate
Technology Considerations	Parking Meters
Wayfinding	Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers

SUBURBAN COMMERCIAL (C3C)	
Regional Commercial	Industrial
Medium to low pedestrian and bicycle volume Low to Medium speed through traffic - 25-35 MPH Low local and through truck volume (<10%)	Medium to low pedestrian and bicycle volume Low to Medium speed through traffic - 25-35 MPH Medium local and through truck volume (<10%)
Typically, 2-4 lanes, turn lanes 10-11 feet Appropriate, landscaping, trees	Typically, 2 -4 lanes, turn lanes 10-11 feet Appropriate, landscaping, trees
10-12 feet 6-8 feet, buffered from travel lanes Marked on all four quadrants, High visibility, 1/8-mile intervals, Mid-block crossings for adequate spacing to be considered	10-12 feet 6-8 feet, buffered from travel lanes Marked on all four quadrants, High visibility, 1/8-mile intervals, Mid-block crossings for adequate spacing to be considered
Preferred, may be used in speed zones greater than 30 MPH Appropriate, may be used in speed zones greater than 25 MPH May be used in speed zones less than 25 MPH Bicycle pavement markings through intersections Bicycle racks at key destinations, Bicycle Counter, repair station may be considered	Preferred, may be used in speed zones greater than 30 MPH Appropriate, may be used in speed zones greater than 25 MPH May be used in speed zones less than 25 MPH Bicycle pavement markings through intersections Bicycle racks at key destinations, Bicycle Counter, repair station may be considered
Signed bus stops, preferred spacing: 0.25 - 0.50 mile Safe, convenient, and frequent street crossings should be provided Bus shelters in high use areas, benches, system/route map, bike racks, lighting	Signed bus stops, preferred spacing: 0.25 - 0.50 mile Safe, convenient, and frequent street crossings should be provided Bus shelters in high use areas, benches, system/route map, bike racks, lighting
Corner Extensions/Curb Bulb-outs, Lane Elimination, Lane Narrowing, Street Trees Two-way street, Roundabouts Speed Cushions/Tables, Raised Crosswalk/Intersection On-Street Parking, Signal Progression to Target Speed, Target Speed Reduction, Red Light Cameras, Speed Cameras	Corner Extensions/Curb Bulb-outs, Lane Elimination, Lane Narrowing, Street Trees Two-way street, Roundabouts Speed Cushions/ Tables, Raised Crosswalk/Intersection Signal Progression to Target Speed, Target Speed Reduction, Red Light Cameras, Speed Cameras
Bioswales, Trees, Permeable Pavement Parks, Trails Benches, trash cans Street and Pedestrian scale street lighting	Bioswales, Trees, Permeable Pavements Parks, Trails Benches, trash cans Street and Pedestrian scale street lighting
Adequate commercial driveway throat length, Shared driveways should be used to reduce curb-cuts Provide frequent safe crossings for pedestrians, bikes, and cross traffic	Adequate commercial driveway throat length, Shared driveways should be used to reduce curb-cuts Provide frequent safe crossings for pedestrians, bikes, and cross traffic
N.A. Preferred N.A. Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers	N.A. Appropriate N.A. Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers

Figure 3-7

Typology: Neighborhood Commercial, C3C



Design Considerations

Expected Users

Pedestrians	Walking
Bicyclists	Riding
Transit	Medium Frequency
Auto	Local Traffic
Freight	Local Traffic

Target Speed

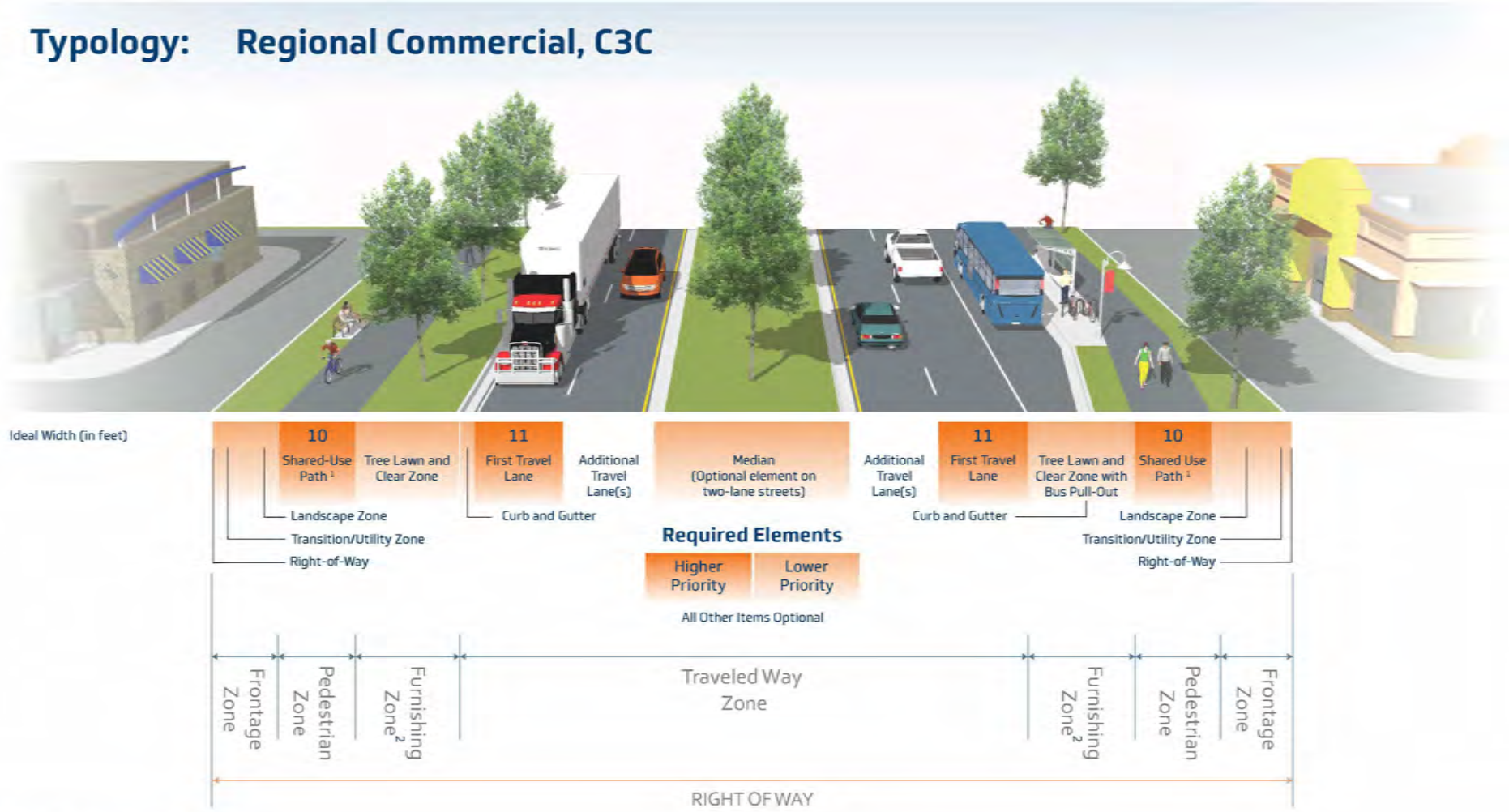
25-35 MPH

Notes

[1] Protected bike lanes may be appropriate on lower speed and volume roads.

[2] When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.

Figure 3-8



Design Considerations

Expected Users	Use of Street
Pedestrians	Walking
Bicyclists	Riding
Transit	Medium Frequency
Auto	Through and Local Traffic
Freight	Local Traffic

Target Speed

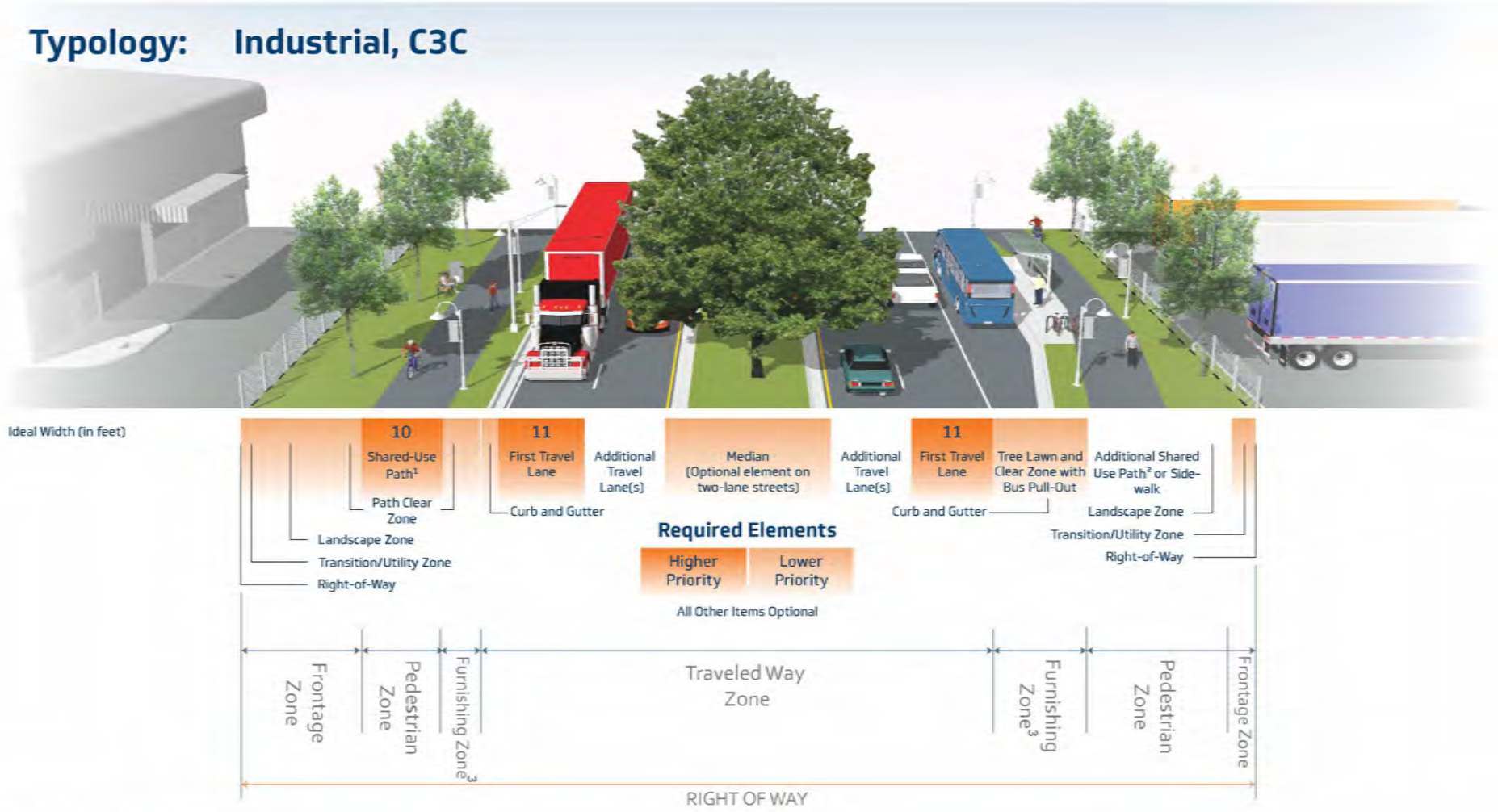
25-35 MPH

Notes

[1] Where right-of-way is constricted, protected bike lanes and sidewalks may be acceptable in lieu of providing shared use paths.

[2] When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.

Figure 3-9



Design Considerations

Expected Users	Use of Street
Pedestrians	Walking
Bicyclists	Riding
Transit	Medium Frequency
Auto	Through and Local Traffic
Freight	Through and Local Traffic

Target Speed

25-35 MPH

Notes

[1] Where right-of-way is constricted, protected bike lanes and sidewalks may be acceptable in lieu of providing shared use paths.

[2] Second shared use path is optional, but a sidewalk must be provided.

[3] When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.

Suburban Town (C3T)

The Suburban Town (C3T) context includes areas planned for small "town centers" or concentrations of mixed-use development which are typically surrounded by residential uses. Streets in this context generally fit into one or two typologies, Town Neighborhood and Town Center. Special attention to typology selection should be used in these areas, as land-use cues may not provide guidance in the selection. Community Plans provide the basis for how the street segment will ultimately appear as they contain text, illustrative maps and graphics that paint a picture of the desired outcomes. Table 3-9 provides a summary of characteristics for these typologies. Typology profiles are provided in Figures 3-10 and 3-11.

TOWN NEIGHBORHOOD

Streets through these areas will have some driveway access away from intersection functional areas. Plan for slower vehicle speeds, low to moderate vehicle volumes, and higher pedestrian and bicycle volumes. On-street parking and transit facilities should be considered.

TOWN CENTER

Streets are intended to be majority-commercial districts of a walkable scale and form and should have slower vehicle speeds. Plan for medium vehicle volumes, and higher pedestrian and bicycle volumes. On-street parking and transit facilities are encouraged.

Table 3-9 - Summary Considerations	SUBURBAN TOWN (C3T) Town Neighborhood
User Features	
Pedestrian and Bicycle Volumes	High pedestrian and bicycle volume
Traffic Speeds	Slow speed local traffic - 20-25 MPH
Truck Volumes	Local truck volume
Traveled Way	
Travel Lanes	Typically, 2 lanes
Lane Width	10 feet
Median	Optional, may include refuge islands
Pedestrian Facilities	
Pedestrian Zone - Total Width	10-12 feet
Sidewalk Width	Minimum 6 feet, buffered from travel lanes
Crossings	Marked, High Visibility, 1/8-mile intervals, Mid-block Crossings, Painted Crosswalks
Bicycle Facilities	
Separated Facility	N.A.
Protected Bike Lane	Preferred, may be used in speed zones greater than 25 MPH
Bike Route / Sharrows / Bike Lane	May be used in speed zones less than 25 MPH
Bike Lane Extensions	Bicycle pavement markings through intersections
Other Amenities	Bicycle racks at key destinations, Bicycle Counters and repair station may be considered
Transit Stop Features	
Transit Stops	Signed bus stops, preferred spacing: 0.25 - 0.50 mile
Access to Transit Stop	Safe, convenient, and frequent street crossings should be provided
Transit Amenities	Bus shelters in high use areas, benches, system/route map, bike racks, lighting
Traffic Calming / Speed Management	
Street Width Reduction	Corner Extension/Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees, Painted Intersections
Horizontal Deflection	Chicane, Mid-block Neckdowns/Pinch Points, Traffic Circle, Roundabouts
Vertical Deflection	Speed Cushions/ Tables/ Humps, Raised Crosswalk/Intersection
Operational Elements	On-Street parking, Speed Radar Feedback Signs, Signals set for Target Speed
Placemaking	
Green Infrastructure	Bioswales, Planters, Trees
People Space	Parklets, Parks, Trails, Street Art
Street Amenities	N.A.
Street Lighting	Pedestrian-scale street lighting
Access Management	
Driveways	Should not be allowed in intersection functional area
Median Design	N.A.
Parking Management	
On-Street Parking	Appropriate
Off-Street Parking	Appropriate
Technology Considerations	N.A.
Wayfinding	Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers

SUBURBAN TOWN (C3T)
Town Center
High pedestrian and bicycle volume Slow speed local traffic - 20-25 MPH Low truck volume
Typically, 2+ lanes 10 feet Optional, may include refuge islands
15-20 feet 10-15 feet, furniture zone, buffered from travel lanes Marked, High visibility, 1/8-mile intervals, Mid-block Crossings, Painted Crosswalks
N.A. Preferred, may be used in speed zones greater than 25 MPH May be used in speed zones less than 25 MPH Bicycle pavement markings through intersections. Frequent provision of bicycle racks and repair stations, Bicycle Counters, micromobility hubs
Signed bus stops, preferred spacing: 0.25 - 0.50 mile Safe, convenient, and frequent street crossings should be provided Bus shelters, benches, system/route map, bike racks, lighting
Gateway Treatments, Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees, Painted Intersections Chicane, Mid-block Neckdowns/Pinch Points, Traffic Circle, Roundabouts Speed Cushions/ Tables, Raised Crosswalk/Intersection On-Street Parking, Red Light Cameras, Speed Cameras, Signals set for Target Speed
Bioswales, Planters, Trees, Permeable Pavements Parklets, Parks, Trails, Street Art Benches, Trash Cans, Decorative Flags, Planters Pedestrian-scale street lighting
Adequate commercial driveway throat length, Shared driveways should be used to reduce curb-cuts Optional, Landscaped
Preferred, Loading Zones Appropriate Parking Meters Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers

Bioswale along a Suburban Roadway

Curb Extensions / Bulb-outs on a Town Center Roadway

Figure 3-10

Design Considerations

Expected Users	Use of Street
Pedestrians	Walking
Bicyclists	Riding
Transit	Medium Frequency
Auto	Local Traffic, Parking
Freight	Local Traffic

Target Speed

20-25 MPH

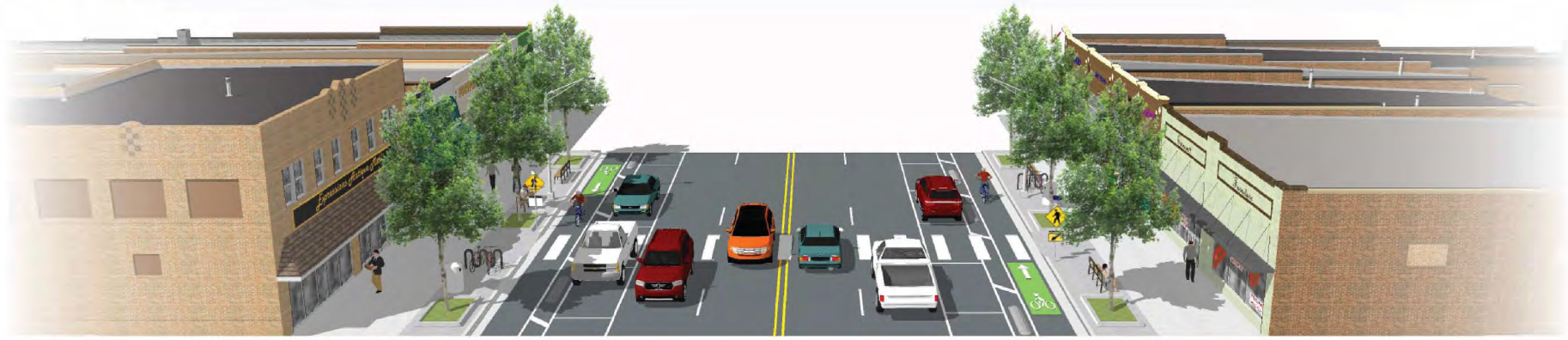
Notes

[1] When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.

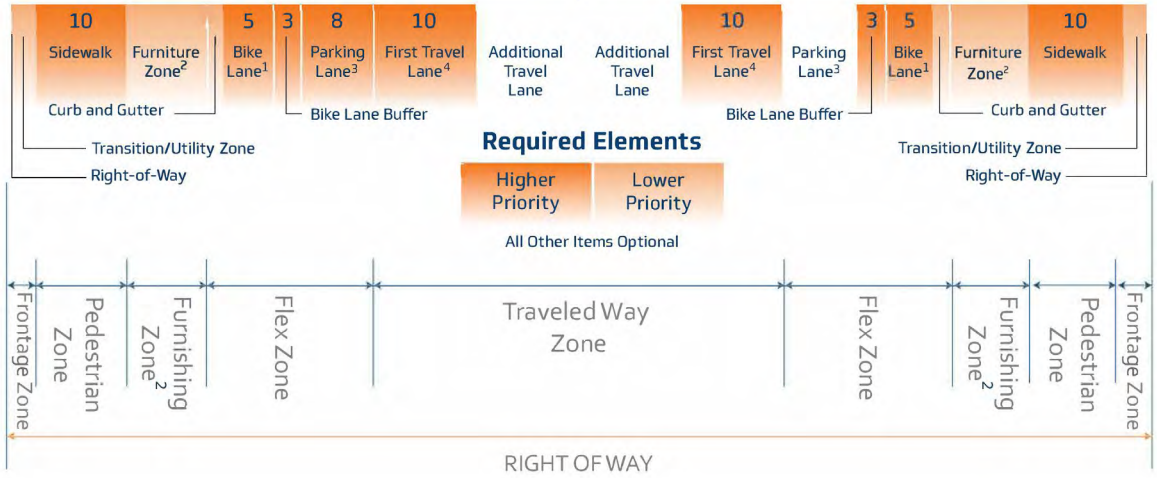
[2] Bicyclists may be accommodated in shared travel lane (as shown) if vehicle speeds and volumes meet specific thresholds; otherwise, provide separated bike lanes.

Figure 3-11

Typology: Town Center, C3T



Ideal Width (in feet)



Design Considerations

Expected Users

Pedestrians	Walking, Strolling, Sitting
Bicyclists	Riding, Parking
Transit	Medium Frequency
Auto	Traveling, On-Street Parking
Freight[4]	Traveling, Deliveries

Target Speed

20-25 MPH

Notes

1. Bicyclists may be accommodated in shared travel lanes in lieu of bike lanes if vehicle speeds and volumes meet specific thresholds.
2. When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.
3. Parking required on at least one side of the street. Parking strongly encouraged where structures are built on the right-of-way line.
4. Loading zones will need to be accommodated in business districts.

Urban General (C4)

The Urban General (C4) context is located in the Urban Service Area and should have a well-connected street network that is comprised of a mix of uses at the highest densities expected in Hillsborough County's unincorporated urbanized areas. Urban General (C4) streets typically align with one of two typologies: Urban Neighborhood and Main Street. Special attention to typology selection should be used in these areas, as land-use cues may not provide guidance in the selection. Community Plans may provide the basis for how the street segment will ultimately appear as they contain text, illustrative maps, and graphics that paint a picture of the desired outcomes. Additional study may be required, including market analysis and a review of surrounding development patterns. A summary of typology characteristics is presented in Table 3-10, and typology profiles are provided in Figures 3-12 and 3-13.

URBAN NEIGHBORHOOD

These streets are fronted by a majority-residential mix of land use and driveways are discouraged. Rear loaded residential is the preferred form, but these areas may not have built out with that condition. Streets are planned to have slower vehicle speeds, moderate vehicle volumes, and high volume of pedestrians and bicyclists traveling on short trips between home and parks, schools, and activity centers. On-street parking and transit facilities should be considered, as needed.


Urban Neighborhood

MAIN STREET

Main Streets are intended to be walkable districts, fronted by majority-commercial and retail mix of uses. Streets are planned to have slow to moderate vehicle speeds, and high volumes of pedestrians and bicycles. In these districts, the safety and comfort of non-motorists is prioritized. On-street parking and transit facilities are necessary to support the commercial function of the street.

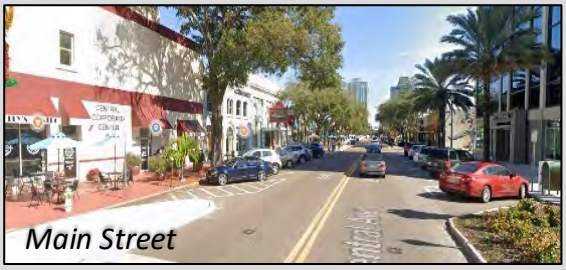

Main Street

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Table 3-10 - Summary Considerations	URBAN GENERAL (C4) Urban Neighborhood
User Features	
Pedestrian and Bicycle Volumes	High pedestrian and bicycle volume
Traffic Speeds	Slow speed local traffic - 20-25 MPH
Truck Volumes	Local truck volume
Traveled Way	
Travel Lanes	Typically, 2 lanes
Lane Width	10 feet
Median	Optional, may include refuge islands
Pedestrian Facilities	
Pedestrian Zone - Total Width	10-12 feet
Sidewalk Width	Minimum 8 feet, buffered from travel lanes
Crossings	Marked, high visibility, 1/8-mile intervals, Painted Crosswalks
Bicycle Facilities	
Separated Facility	N.A.
Protected Bike Lane	May be used in speed zones greater than 25 MPH
Bike Route / Sharrows / Bike Lane	May be used in speed zones less than 25 MPH
Bike Lane Extensions	Bicycle pavement markings through intersections
Other Amenities	Frequent placement of bicycle racks and repair stations, micromobility hubs
Transit Stop Features	
Transit Stops	Signed bus stops, preferred spacing: 0.25 - 0.50 mile
Access to Transit Stop	Safe, convenient, and frequent street crossings should be provided
Transit Amenities	Bus shelters, benches, system/route map, bike racks, lighting
Traffic Calming / Speed Management	
Street Width Reduction	Corner Extensions/Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees, Building Lines, Painted Intersections
Horizontal Deflection	Chicane, Pinch Points/Mid-block Neckdowns, Traffic Circle, Roundabouts, On-Street Parking
Vertical Deflection	Speed Cushions/ Tables/ Humps, Raised Crosswalk/Intersection
Operational Elements	On-Street parking, Speed Radar Feedback Signs, Signals set for Target Speed
Placemaking	
Green Infrastructure	Bioswales, Planters, Trees
People Space	Parklets, Parks, Trails, Street Art
Street Amenities	Benches, Trash Cans
Street Lighting	Pedestrian-scale street lighting
Access Management	
Driveways	Should not be allowed in intersection functional area
Median Design	Frequent openings
Parking Management	
On-Street Parking	Preferred
Off-Street Parking	Appropriate
Technology Considerations	N.A.
Wayfinding	Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers

URBAN GENERAL (C4) Main Street
High pedestrian and bicycle volume Slow speed local traffic - 20-25 MPH Local truck volume
Typically, 2 lanes 10 feet Optional, may include refuge islands
15-20 feet 10-15 feet, furniture zone, buffered from travel lanes Marked, high visibility,1/8-mile intervals, Mid-block Crossings, Painted Crosswalks
N.A. May be used in speed zones greater than 25 MPH May be used in speed zones less than 25 MPH Bicycle pavement markings through intersections Frequent placement of bicycle racks and repair stations, micromobility hubs
Signed bus stops, preferred spacing: 0.25 - 0.50 mile Safe, convenient, and frequent street crossings should be provided Bus shelters, benches, system/route map, bike racks, lighting
Gateway Treatments, Corner Extensions/Curb Bulb-outs, Median Island, Lane Elimination, Lane Narrowing, Street Trees, Painted Intersections, Building Lines Chicane, Mid-block Neckdowns/Pinch Points, Traffic Circle, Roundabouts Speed Cushions/Tables, Raised Crosswalk/Intersection, On-Street Parking, Target Speed Reduction On-Street parking, Speed Radar Feedback Signs, Red Light Cameras, Signals set for Target Speed
Bioswales, Planters, Trees, Permeable Pavements Parklets, Parks, Trails, Street Art Benches, Trash Cans Pedestrian-scale street lighting
Shared driveways should be used to reduce curb-cuts N.A.
Preferred Appropriate, rear of building Parking Meters, Parking Occupancy detectors in high use parking structures Pedestrian and Bicycle wayfinding; High use destinations - Libraries, schools, parks, recreational destinations, other activity centers

Sidewalk Cafe along a Main Street in an Urban Area

Pedestrians using a High Visibility Crosswalk

Bike Station along an Urban Roadway

Figure 3-12

Design Considerations

Expected Users	Use of Street
Pedestrians	Walking
Bicyclists	Riding
Transit	High Frequency
Auto	Local Traffic, Parking
Freight	Local Traffic

Target Speed

20-25 MPH

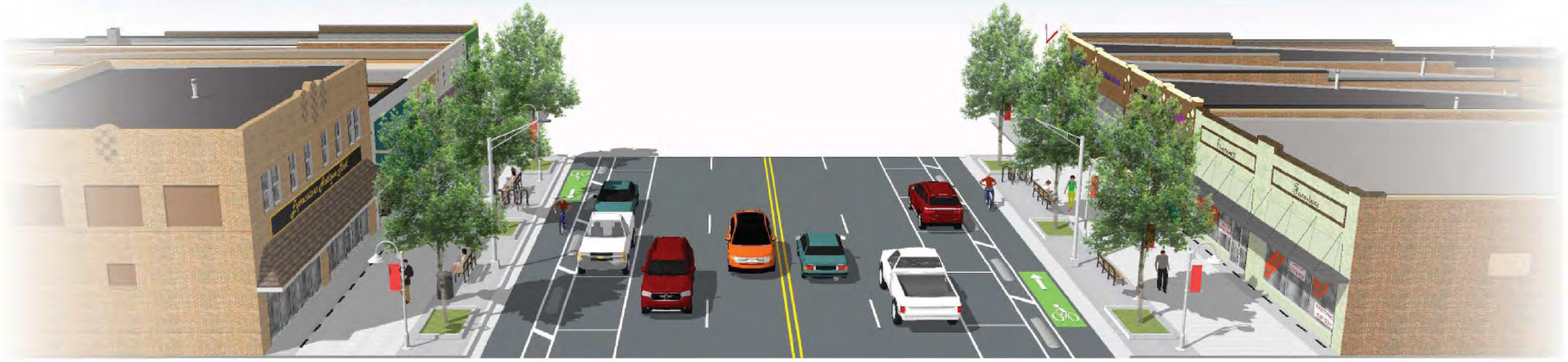
Notes

[1] Bicyclists may be accommodated in shared travel lanes in lieu of bike lanes if vehicle speeds and volumes meet specific thresholds.

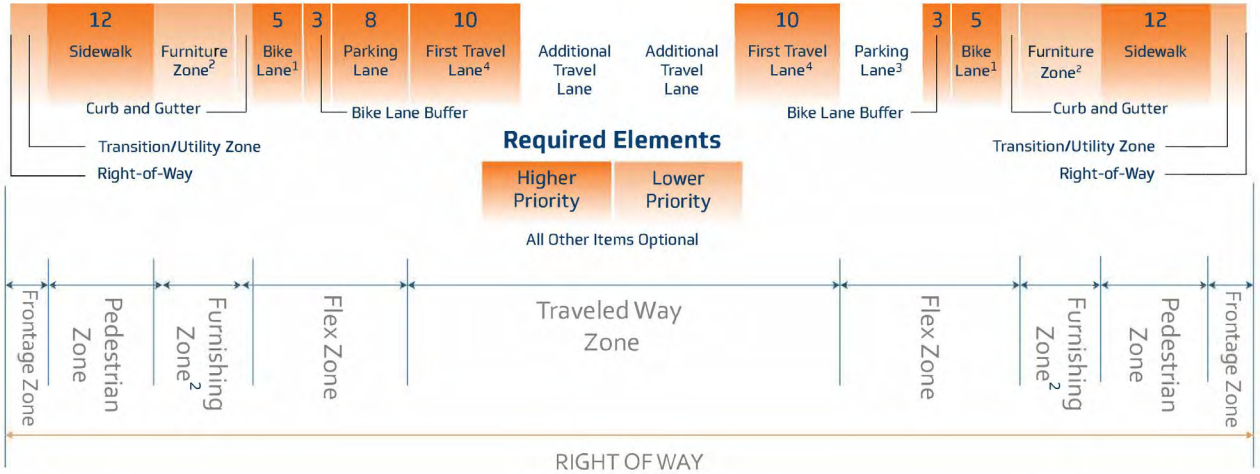
[2] When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.

Figure 3-13

Typology: Main Street, C4



Ideal Width (in feet)



Design Considerations

Expected Users

Pedestrians	Walking, Strolling, Sitting
Bicyclists	Riding, Parking
Transit	High Frequency
Auto	Traveling, On-Street Parking
Freight[4]	Traveling, Deliveries

Target Speed

20-25 MPH

Notes

1. Bicyclists may be accommodated in shared travel lanes in lieu of bike lanes if vehicle speeds and volumes meet specific thresholds.
2. When furnishing zone is reduced below 8 feet or combined with another zone, street trees should be provided in accordance with chapter 4 of this guide.
3. Parking required on at least one side of the street. Parking strongly encouraged where structures are built on the right-of-way line.
4. Loading zones will need to be accomodated in business districts.

Planning Complete Streets in Limited Rights-of-Way

Retrofitting existing roads to add or improve multimodal facilities could mean working within limited rights-of-way. Design professionals should come up with a feasible solution that best accommodates all modes of transportation that are using the road. Note that there are minimum design criteria (such as travel lane widths for each road) that need to be met for each transportation mode to function safely and efficiently. For example, if a design is located on a transit route, design professionals may want to confirm with the local transit agency that the minimum lane width requirements and design will not adversely impact transit operations.

The typologies shown in the previous section show high priority elements along with lower priority and optional elements. As most road projects will be Complete Streets retrofits, limited right-of-way may be experienced. Providing the typical section with ideal facilities for all modes, parking and medians may not always be feasible, particularly where existing streets are restricted due to limited right-of-way, environmental features, mature canopies, or hedgerows, and established building setbacks. In such cases, the corridor objectives, user needs, and community values must be further evaluated.

When faced with limited right-of-way, one or more of the following strategies can be used to make room for the needed multimodal facilities:

ELIMINATE OPTIONAL ELEMENTS

Each typology has elements prioritized according to expected users. Some of those elements, like an additional travel lane or parking lane, can be removed to ensure that the street serves all users appropriately. When eliminating these elements, care should be exercised to ensure that all users are being adequately served.

REDUCE LANE WIDTHS

Reducing lane widths provides additional space for multimodal facilities, and results in reduced crossing distances, increased visibility of vulnerable users, and slower motor vehicle travel speeds. Wider travel lanes are correlated with faster motor vehicle speeds, with each additional 3.3 feet of lane width resulting in faster travel speeds of approximately 9.4 MPH[19].

While narrower lanes can be beneficial for active transportation, careful consideration is required before reducing lane widths. When reducing lane widths, special consideration should be given to larger, heavy vehicles such as buses, trucks, and emergency vehicles. In many cases, a hybrid approach is feasible whereby inner lanes are reduced to the minimum width and wider curbside lanes are maintained for large vehicle access.

[19] K. Fitzpatrick et al., Design Factors That Affect Driver Speed on Suburban Streets (Transportation Research Record: Journal of the Transportation Research Board, 2000)

REDUCE THE NUMBER OF LANES

Reducing the number of travel lanes can free up space to create multimodal facilities but may impact motor vehicle traffic operations and transit operations. Design professionals should analyze current and projected motor vehicle volumes along the corridor prior to reducing the number of lanes and should consider the potential of motor vehicle traffic shifting to adjacent roads.

REMOVE ON-STREET PARKING

On-street parking may be repurposed as multimodal facilities. A parking assessment should be completed prior to removal. The parking assessment should analyze current parking usage and existing or potential on- and off-road parking capacity in the surrounding area. Not all the geographies in Hillsborough County have fully achieved the development contexts anticipated in the Comprehensive Plan. So, in Urban General (C4) contexts, the parking assessment should also address whether the future condition is likely to redevelop into a land use pattern that will rely on on-street parking, particularly on Main Street Typologies. The removal of on-street parking can be controversial, especially in residential and commercial areas. Alternate side parking, on a block-by-block basis, could also be considered where appropriate. By assessing parking demand and identifying alternatives, design professionals can mitigate perceived or real negative impacts.

Other items to be considered include addressing delivery vehicles, side road and off-street parking. The following example shows how a variation of a Suburban Town (C3T) Town Center or similar Urban General (C4) Main Street (Figure 3-14) can be interpreted in a constricted setting.

Figure 3-14 Comparison of an Urban General C4 Main Street in Constricted Environment

Typology: Main Street, C4

Main Street with an Ideal right-of-way.

Main Street with a limited right-of-way.

Transitions

Transitions refer to a change in context, typology, right-of-way width, number of lanes, neighborhoods, or districts. Multimodal facilities should be continuous through transitions. For example, a shared use path facility entering a Urban General (C4) Main Street will need to transition to an on-street buffered or protected bike facility, or the shared use path could be converted to a more urban protected raised bike facility adjacent to the pedestrian zone. These transitions require a lot of consideration for the safety of the user, and it must be intuitive and clearly marked.

Transitions

If the purpose of the transition is to change context, for example from Suburban Commercial (C3C) to Urban General (C4), then a transition speed zone, visual cues to changes in context or environment, and a change in the width of the traveled way or travel lanes as appropriate for the context should be provided. These visual cues can be additional traffic calming measures, more landscaping, and gateway treatments to clearly define to the driver they have entered a new area.

When transitioning to a context and/or typology with more expected vulnerable users (i.e., Suburban, C3 to Urban General, C4 or from Suburban Commercial, C3C to Suburban Town, C3T), transition zones should occur prior to arrival. Upon exiting that context and/or typology to a context and/or typology with fewer vulnerable users, the transition zone should occur beyond the higher vulnerable user context zone.

If there are multiple street typologies within a corridor, especially in a short distance, consider adapting the corridor design to the corridor context with the most vulnerable users. This allows for more treatments focused on a greater number of users, hence, keeping a uniform Complete Street look to the corridor. Similarly, when one side of a corridor can be considered one typology and the other of a second typology, design should default to the typology with the highest expected number of vulnerable users.

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Complete Streets Guide

HCFLGov.net

4 Placemaking and Health

Provide safe and convenient connections within the transportation network that support multimodal access to key destinations, such as community focal points, employment centers and services throughout the County.

Comprehensive Plan

Mobility Element Goal

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4 PLACEMAKING AND HEALTH

It is important to remember that transportation infrastructure creates important public spaces that serve and can inspire the community. The importance of placemaking reinforces the criticality of establishing multi-discipline teams of professionals with varying areas of expertise to contribute to the project from concept development to construction.

Good urban design can help create healthy neighborhoods with great streets and innovative and sustainable building forms. If a street is a healthy and inclusive environment, then we should see all members of the community out on the street sitting, standing, walking, bicycling, and using public transport.[20] There are ten indicators of a healthy street (Figure 4-1) which focus on the experience of people using streets and can be applied to urban, suburban contexts and even in Rural Neighborhoods and Rural Activity Centers.

Figure 4-1 Healthy Street Indicators

People choose to walk, bicycle, and use public transportation – Walking, cycling, and using public transportation should be the most attractive ways to travel, and making them more enjoyable will benefit everyone.

Pedestrians from all walks of life – One of the indicators of a healthy street is whether there are people reflecting the full diversity of society on the street.

Easy to cross – The types of crossing needed will vary based on context (urban, suburban, and rural), but on all streets, it should be easy for people of all ages and abilities to find a safe place to cross without having to go out of their way.

People feel safe – People should feel comfortable and safe from crime, intimidation, or injury on any street day and night.

Shade and shelter – High winds, heavy rain, high temperatures and sun exposure can have a significant effect on people's ability to travel actively and spend time in the street as well as their enjoyment.

Things to see and do - People are more likely to travel actively when there are things to do locally and will also be less dependent on cars if shops and services are within walking distance, this applies in all contexts.

Places to stop and rest - A multitude of resting places will help mobility for some people, particularly those who are ill, injured, older or very young.

[20] Guide to the Healthy Streets Indicators, Delivering the Healthy Streets Approach, Transport for London http://content.tfl.gov.uk/guide-to-the-healthy-streets-indicators.pdf

People feel relaxed - People are more likely to walk or bicycle if they feel relaxed and find it enjoyable.

Not too noisy - Motorized road traffic is a primary source of noise pollution in urban and suburban contexts.

Clean air - Improving air quality benefits everyone while also helping to reduce health inequalities.

The above healthy street indicators should be considered in typologies where pedestrian and bicycle users are high, including in Urban General (C4) contexts, Suburban (C3) contexts and Rural Activity Centers.

Connectivity

A well-connected active transportation network enables users to travel to their destinations safely and easily. Block length, street and pathway network density, number of intersections, connections to off-street pathways, and the presence of well-maintained and high-quality facilities are typical measurements of transportation network connectivity. These can impact how often an individual chooses to travel by active modes (bike, scooter, and walking). In contexts with higher proportions of expected bicycle and pedestrian users, connectivity should be encouraged. Connectivity can be broken down into four components, each of which contributes to a fully connected network:

Completeness - The active transportation network should be well-connected to let users travel virtually anywhere they need to go. They should have access to all or most of the transportation network. Any gaps identified in the active transportation network should be prioritized, especially when connecting to key destinations. A traveler encountering an unexpected gap in the network is forced to either detour to a safer route, which often requires local knowledge, or to continue through potentially hazardous conditions.

Directness - Users should not be required to go out of their way to safely access their destination. Providing direct routes that connect to key destinations will ensure that active transportation is competitive with motor vehicles in terms of convenience. Develop a network comprised of primary routes and supplemented with secondary routes providing connections between dedicated facilities.

Density and Diversity - Users should have a range of route options. Small blocks with frequent intersections contribute to more convenient networks. Where large blocks exist, cut throughs/alleys can increase permeability. Research conducted by the Cycling in Cities Program at the University of British Columbia found that while comfortable cycling facilities are important, people cycling need to be able to access these routes quickly and easily. The study found that people cycling are unlikely to detour more than approximately 1300 feet to find a route with a bicycle facility[21]. As a result, the study concluded that a bicycle network with designated facilities spaced a minimum of every 1600 feet apart should be the goal. It has also been recommended that a dense bicycle

[21] Meghan Winters et al., How Far Out of the Way Will We Travel? Built Environment Influences on Route Selection for Bicycle and Car Travel (Transportation Research Board, 2010).

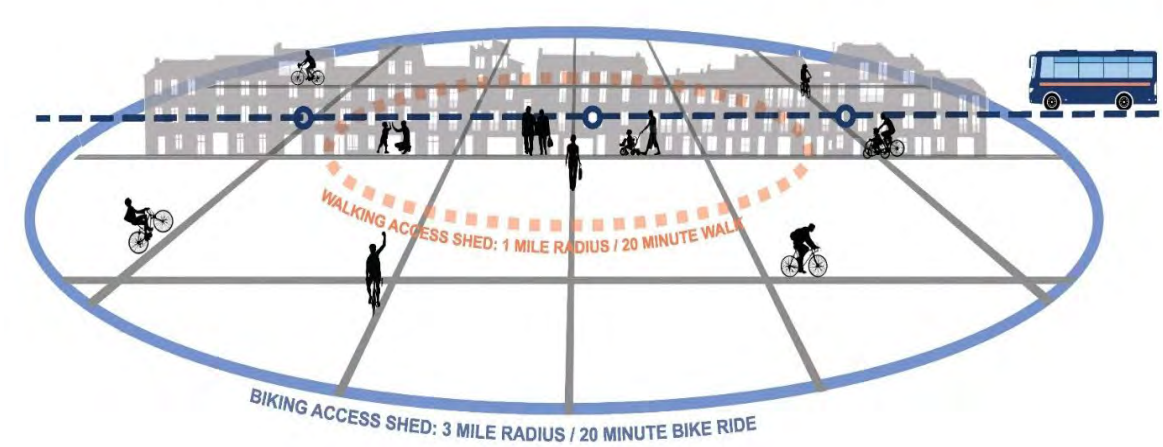
network should be located within urban centers and areas of high cycling potential. Smaller communities should ensure routes that connect neighborhoods or neighboring communities include cycling facilities.

Comfort - A comfortable and complete active transportation network includes a variety of facility types that appeal to a wide range of users, providing equitable and convenient access for all residents, commuters, and visitors. Ideally, active transportation users should be provided with a dedicated facility that is separated from motor vehicle traffic or that is located on a quiet street with low motor vehicle volumes and speeds. It should also be well maintained and provide adequate lighting and sightlines, helping to alleviate personal safety concerns.

One of the significant benefits of active transportation is the fact that most daily trips in most communities are less than two miles. These are trips to the corner store, grocery store, convenience store, park, school, or other non-employment related trip. These trips are perfect for active transportation modes and can reduce overall vehicle miles traveled on the network, reduce negative environmental effects of vehicle use, and improve user health.

The walking access shed for a pedestrian is one-mile or a 20-minute walk. The biking access shed is a three-mile radius, or a 20-minute bike ride as shown in Figure 4-2. Providing 20-minute bike or walking trips can be a significant asset in neighborhoods and activity centers. Active transportation facilities in each of the typologies are chosen to encourage a mode shift away from driving for these short trips.

Figure 4-2 – Walking and Biking Access Shed



Access Management

It has been demonstrated that good access management can reduce crashes by 50 percent or more, depending on the condition and the treatment used[22]. Access management requirements often include street intersection spacing, especially signalized intersection spacing. FDOT's access management guidelines generally restrict signalized intersection

[22] "Access Management Manual," Transportation Research Board, 2002

spacing to one every one-quarter mile (1,320 feet) on major thoroughfares with posted speeds below 45 MPH. In Suburban Town (C3T) and Urban General (C4) contexts, a grid network of streets should still intersect the major thoroughfare between signalized intersections to provide better connectivity, neighborhood access and locations for crossings.

Context Based Classification indicates the characteristics and spacing of cross-street intersection spacing and driveway connections. In general, higher intensities of use, including Suburban Town (C3T), Urban General (C4), require less restrictive access management. In these Context Based Classifications, frequent intersections, smaller blocks, and a higher degree of connectivity and access support the multimodal needs of the area.[23] Caution should be used in adapting FDOT access management guidelines to local roadway networks. While access management principles are founded on safety measures, FDOT's network priorities are for higher classified roads. Their priorities are 1) safety, 2) traffic efficiency, 3) functional integrity, and lastly 4) context classification. This priority is in direct conflict with national guidance on Complete Streets principles and the County's mobility and land use goals.

Emergency Vehicle Accommodations

Emergency vehicle operations prioritize the minimization of response times and the vehicle needs have often been a controlling element in how streets are designed. It bears repeating that a key goal of Complete Streets is to improve the safety of street users; these improvements are in-line with the goals of the emergency responders and are intended to reduce the severity and frequency of crashes on Hillsborough County streets, thus increasing the overall safety within the community.

Major roads are the primary conduits for emergency response vehicles including police, fire, and ambulance. Emergency vehicle access and operations should always be considered in traveled way design. Many factors affect emergency vehicle response time including congestion, width of street and travel lanes, geometric design of intersections, access management features, signal timing, and the presence of signal pre-emption devices.

The Traveled Way Zone must be designed with consideration for the needs of emergency response vehicles. However, design without consideration for context can have the unintended effect of increasing the number of emergency responses. The following should be considered in designing traveled ways to accommodate emergency vehicles:

- High levels of street connectivity improve emergency response time by providing alternate routes. Look for opportunities to improve overall network connectivity.
- When establishing new or reviewing existing access management configurations, care should be taken to permit direct routing capability to emergency vehicles.
- On streets with medians, traffic circles, tight corner radii, or other access management features, emergency response time may be reduced by the implementation of mountable curbs to allow emergency vehicles to cross.

[23] Florida Department of Transportation, FDOT Context Classification Guide, July 2020

- Use alternative surfaces to accommodate emergency access, such as gore-striped shoulder areas, stamped or patterned asphalt or concrete, traversable medians or truck aprons, curb and gutter, and unpaved surfaces such as gravel or stabilized turf. Alternative surfaces for this purpose should not impede other functional requirements of the street appropriate to the Context Based Classification.

Complete Streets principles in Suburban Town (C3T) and Urban General (C4) contexts call for smaller blocks and gridded street systems governed by land use policies. These street networks increase the number of people walking and bicycling and reduce vehicle miles traveled. A California study found that places with a dense, connected street network had three to four times more people walking, bicycling, or using transit to get to work. This in turn led to a 50 percent reduction in vehicle miles traveled per capita in these cities[24] A reduction in vehicle travel decreases exposure and probability of crashes.

Two primary reasons why Suburban Town (C3T) and Urban General (C4) grid street networks work better for emergency response are maximizing the number of addresses served from each station and providing a redundancy of routes. Studies in Charlotte, North Carolina, found that when one connection was added between cul-de-sac subdivisions, the local fire station increased the number of addresses served by 17 percent and increased the number of households served by 12 percent.

Streets must meet the relevant fire codes that govern emergency vehicle street criteria. This includes the minimum width necessary for vehicles to park adjacent to buildings, and parking restrictions approaching intersections to allow for safe turns. While radii and curb extensions should be designed with these needs in mind, the strategies provided in this document, including increasing the effective curb radius and recessing stop bars, can accommodate emergency response vehicles without jeopardizing the everyday safety of street users.

Greenscape/Landscape

Greenspace is a collection of street trees, shrubs, planters, and grasses that plays a key role in improving sustainability. There are many environmental benefits that greenscaping provides:

- Shade from street trees can keep buildings cooler, reducing the need for air conditioning,
- Plantings absorb greenhouse gases (carbon dioxide) and filter particulate matter which can be extremely harmful to those with asthma,
- Greenscape elements clean, remove, and stabilize contaminants that are either washed from sidewalks and streets by stormwater or are already in the soil, and
- Trees and flowers can support native natural ecosystems and help restore a balance to urban and suburban contexts.

[24] Marshall, W. and Garrick, N., "The Spatial Distribution of VMT Based upon Street Network Characteristics," (90th Meeting of the Transportation Research Board, Washington, D.C., January 2011)

With the numerous environmental benefits, practitioners should work to implement these elements properly to provide for their successful growth and anticipated impact on the street. A range of issues from soil compaction, lack of space for roots to grow, physical damage or abuse, and litter can create a hostile environment for landscaping to flourish. Elements for inclusion in greenspaces should be carefully selected and incorporated early in the design process to allow for consideration of their needs, especially in situations where right-of-way is limited.

Street Trees

Trees and other plants help cool the environment, making vegetation a simple and effective way to reduce urban heat islands. The goal of adding street trees is to increase the canopy cover on the street and parking areas, and the percentage of the street's surface either covered by or shaded by vegetation. The goal is not simply to increase the overall number of trees. The selection, placement, and management of all elements in the street should enhance the longevity of street trees and healthy, mature plantings should be retained and protected whenever possible.

The heat island effect is a major concern in warm states as higher urban temperatures drive demand for air conditioning, leading to higher energy bills during the warmer months of the year. Heat islands can contribute to poor air quality, magnify the impacts of extreme heat events, and put people's health at higher risk. Trees and vegetation lower surface and air temperatures by providing shade and through evapotranspiration. Shaded surfaces, for example, may be 20-45° F cooler than the peak temperatures of unshaded surfaces. The use of trees and vegetation in urban and suburban contexts brings benefits beyond mitigating urban heat islands including:[25]

Reduced energy use - Trees and vegetation that directly shade buildings decrease demand for air conditioning.

Improved air quality and lower greenhouse gas emissions - By reducing energy demand, trees and vegetation decrease the production of associated air pollution and greenhouse gas emissions. They also remove air pollutants and store and sequester carbon dioxide.

Enhanced stormwater management and water quality - Vegetation reduces runoff and improves water quality by absorbing and filtering rainwater.

Reduced pavement maintenance - Tree shade and proper species selection can slow deterioration of street pavement, decreasing the amount of maintenance needed.

Improved quality of life - Trees and vegetation provide aesthetic value, shade and comfort, habitat for many species, and can reduce noise.

Additional related benefits of street trees include increased property values, neighborhood beautification, and enhanced human health and well-being.

[25] Environmental Protection Agency (EPA), Using Trees and Vegetation to Reduce Heat Islands https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands

Street trees play a major role in creating a comfortable and enjoyable sidewalk experience. They provide a "wall" that mirrors the street wall, creating a pedestrian scaled space. On Main Street and Town Center Typologies, they provide shade for café seating and benches, allowing for street life to flourish even during the warmer months. Trees that overhang the street provide a sense that the traveled way is narrower than it is, helping to slow speeds and calm traffic. Streets trees also enhance safety and personal security on a street by calming traffic and by fostering a denser and more consistent human presence, also referred to as "eyes on the street".

Street trees come in different shapes and sizes and can perform different functions including providing shade, being ornamental, or used for screening incompatible land uses. Different streets and their setting in a Rural (C1 & C2), Suburban (C3), Industrial (C3C), Residential Neighborhood (C3R) or Urban General (C4) contexts have different considerations for street trees.

- In Rural (C1 & C2) or Suburban (C3) contexts for certain typologies where freight and automobile users are more prevalent, street trees can be set back near the right-of-way edge, minimizing conflict with utilities. Further benefits of trees in these positions allow the tree plantings to function as a buffer to industrial or other adjacent land uses.
- In Suburban (C3) and Urban General (C4) residential neighborhoods, commercial or town centers where the roadside area is suitable to a walkable, bikeable, transit environment, street trees are more than a casual amenity or decorative function. They are a necessity to provide environmental qualities of air purifying, shade, and comfort. Recent research points to trees as one of the single most important elements to include in sidewalks and bicycle paths. That critical element is shade, and would certainly be the case in Hillsborough County, Florida.

The purpose of the different street typologies is to demonstrate that all streets are not equal and therefore, the placement of trees within those environments is not a one-size-fits-all solution. Each solution requires special attention in planning, design, and arboriculture treatment.

Careful selection of the type of trees in different contexts needs to be considered. For example, formal patterns of tree placement are appropriate in Urban General (C4) and Suburban contexts (C3) as a contributing design element for traffic calming; while in Rural (C1&C2) contexts, tree placement may be more natural in character. In addition, trees located in tree lawns in Urban and Suburban contexts adjacent to the travel lanes or close to sidewalks need to factor a tree's root spread and how it may impact or damage nearby sidewalks and other street features. All these factors should be considered to achieve the full benefits of trees in a complete street's context.

When selecting tree plantings in the tree lawn zone along the roadside, the latest Hillsborough County Development Services Approved Tree and Hedge Materials List, should be consulted.

- Evergreen and ornamental trees have some degree of flexibility in their placement along a landscaped parkway or border including walkways that might weave between them if the trees are planted in clusters or in more naturalized conditions. Evergreen species such as the Loblolly, Longleaf, Sand, and Slash pines along with

Southern Red Cedar and Southern Wax Myrtle are excellent species but need more space away from urban street edges.

- Native trees have certain advantages to being compatible with the environment and have other benefits such as vibrant wildlife and other environmental values due to their appropriateness to the climate and region. The regionally native deciduous trees of Redbud, River Birch, Sweetgum, Sycamore, Pecan, Southern Magnolia and Ligustrum are also excellent candidates in more naturalized parkway-like conditions.
- Allow adequate soil conditions for growing and thriving for the proposed areas of tree plantings. Generous space should be allocated to tree lawns up to eight feet in width. In Urban General (C4) contexts, streetscapes should have at least six-to-eight-foot tree wells and hardscape, but also with the possibility of subsurface tree soil cells for expanded root growth area.

Wayfinding

Wayfinding Sign

Streets should be intuitive for all users. Wayfinding should be provided for all modes, in the manner that works best for them. While wayfinding for motorized users is standard and visible on most streets, wayfinding for people walking or riding a bike is often non-existent. Providing wayfinding for people walking or riding a bike near trails, parks, schools and connecting neighborhoods to community centers, must be considered more frequently. Providing relevant information when and where it is most useful can greatly improve the user experience.

On typologies with more expected pedestrian and bicycle users, digital and interactive wayfinding displays help provide information to people who may not be able to understand how to find that information via a smartphone or another internet-connected device. These large displays can provide maps and directions to different destinations, advertisements for local businesses and city events, and transit maps and bus arrival times near transit stops. Wayfinding displays can be linked to positive health encouragement by including messages about the health and wellness benefits of walking to nearby destinations. In fact, the Centers for Disease Control and Prevention's Transportation Health Impact Assessment Toolkit outlines several strategies to improve physical elements of a street network to encourage more active transportation such as children biking to school or employees walking to work. Providing wayfinding with signs, maps, and landscape cues to direct pedestrians and bicyclists to the most direct route is one of those strategies[26].

[26]Centers for Disease Control and Prevention, Strategies for Health-Oriented Transportation Projects, and Policies to Promote Active Transportation https://cdc.gov/healthyplaces/transportation/promote_strategy.htm

It is important that wayfinding information be provided in convenient locations but outside the pedestrian zone so as not to obstruct movement along the sidewalk.

A bicycle wayfinding system should also be incorporated that consists of comprehensive signage and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. Signs should be placed at decision points along bicycle routes, typically at the intersection of two or more bikeways and at other key locations. Decision signs should be provided to inform the bicyclist of the designated bike route to access key destinations such as schools, local or regional parks and trails, transit centers and stations, commercial centers, on-street bikeways, and civic/community destinations. Bicycle wayfinding signs have notable benefits including familiarizing users with the network, overcoming a "barrier to entry" for infrequent bicyclists, and visually indicating to motorists that they are driving along a bicycle route and should use caution. Signs that include mileage and travel time to destinations may help minimize the tendency to overestimate the amount of time it takes to travel by bicycle.[27]

Public Art

Street design can improve the experience for all streets users by reflecting the shared artistic, scientific, or institutional heritage of the communities they pass through. Culture is reflected in a community's streets through public art, gateways, and landmarks. These elements can be complemented by corridor branding techniques, such as landscaping, hardscaping, and/or decorative lighting and street furniture. The proper inclusion of these elements reinforces a sense of place. The County Code of Ordinances establishes not only a public art program, but a public art committee to coordinate the funding of public art through the Capital Improvement Program[28].

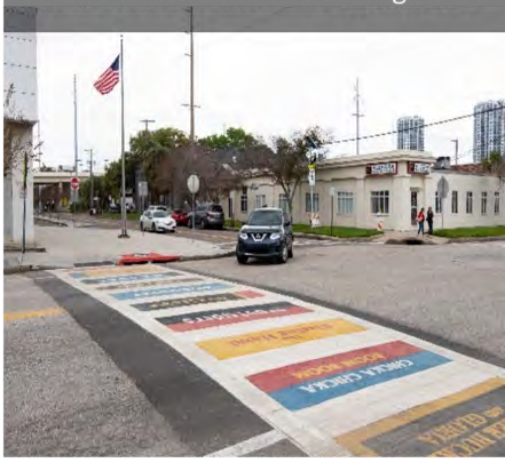
[27] National Association of City Transportation Officials, Urban Bikeway Design Guide https://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/bike-route-wayfinding-signage-and-markings-system/

[28] Hillsborough County Code of Ordinances, Ch. 20, Art. III, Sec. 20-58.

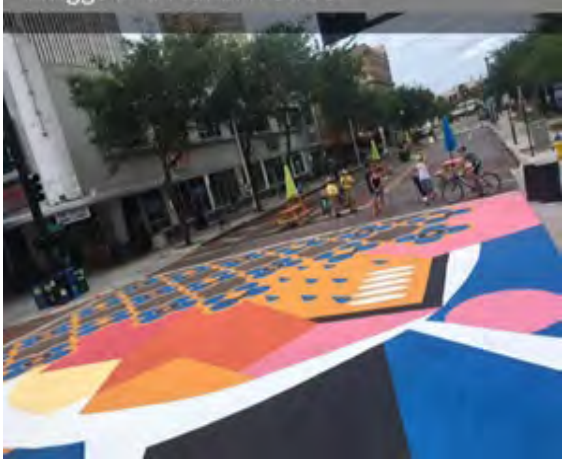
Intersections and Crosswalk Art - Public art at intersections or crosswalks can create visual interest for street users, bring a heightened attention to the crossings, allow for community or district branding, showcases local artists, and can create focal point locations for community activities. Intersection and crosswalk art also have a traffic calming effect. The following examples can be found in the City of Tampa.

Habana Ave and Tampa Bay Blvd

N Jefferson St and E Washington St

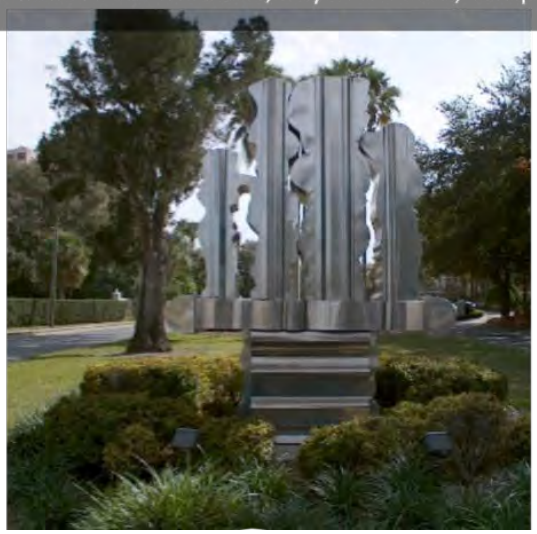


Twiggs and Franklin Street



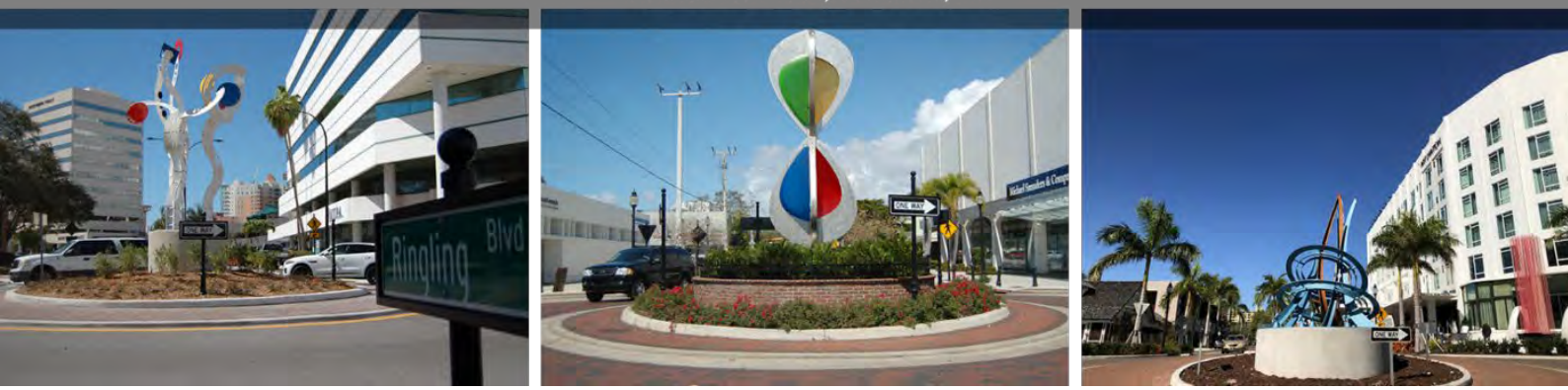
Medians - Public art in medians activates space, provides visual interest, showcases local artists, increases community identity, and adds texture to a corridor. Public art should be placed in wider medians that create a boulevard effect. If the art placement is intended to draw pedestrians, safe and visible crossing considerations must be provided.

Public Art in Medians, Bayshore Blvd, Tampa



Roundabout Art - The Board of County Commissioners established a Policy[29] to encourage public art in traffic circles and roundabouts. Requirements of sight distance and access maintenance should be considered when public art is installed at roundabouts.

Roundabout Art, Sarasota, FL



Sidewalk and Building Murals - Public art or artworks may be integrated into the sidewalk or along building facades to enhance pedestrian spaces and create a sense of place in communities. Sidewalk art can be playful and used as wayfinding to pedestrian destinations.

N Franklin St, Artist: @tararchy

William F Poe Parking Garage
Artist: Ales Bask Hostomsky & Tes One

12th Street near Duckweed
Artist: Matt Kress

[29] Board of County Commissioners Policy, Sec. 01.36.00.00

Gateways or Landmarks - Public artworks at the entrance to communities can showcase neighborhood identity, historic or environmental features of a community. In addition, gateway features can be used as visual cues for traffic calming in transitions between context classes, especially at entrances to activity centers.

Streetlights and Banners - Public art, which represents district identity, can be considered using decorative poles, flags, banners, and light installations. Banners can have multiple purposes such as permanent community identity logos, celebrations of community successes, or temporary signs for special events.

Signal Cabinet Art - Placing colorful and engaging artwork near sidewalks and crosswalks is a great way to educate and inform people walking and driving on public streets. Signal cabinet art increases pedestrian awareness and encourages crosswalk use[30].

Historical Resources

Historical resources are typically defined districts or individual sites, some of which may be protected and listed on the National Register of Historic Places (NRHP), the state historic preservation office, or may be locally designated landmarks.

At a minimum, project planners and engineers should strive to avoid direct impacts (usually demolition or destruction of what makes the site or district have a historical or cultural value), minimize impacts when necessary, or mitigate direct impacts. Specific to street design, when a street is a contributing element to a place's historic or cultural value, care is required to ensure the street's design and materials do not detract from the context. Further, adaptive reuse of existing street elements may be advantageous—preserving existing curb-lanes, sidewalks, and street trees to minimize changes in street character. Project planners and engineers should integrate historic landmark signage and potentially district branding of streetscape elements to reinforce the historical significance of the area.

Natural and Scenic Areas

Some areas of the County are particularly scenic, such as preserved natural areas. Where streets allow access to these places, there are opportunities to help visitors experience these areas by driving through them, as well as walking and biking within them. Yet, there

[30] Bike Walk Tampa Bay, www.bikewalktampabay.org/education/signal-cabinet-wraps/

are also responsibilities with providing access—ensuring the impact of the street and those traveling through do not substantially damage these resources.

Opportunities to experience natural and scenic areas are not just limited to actual wilderness. Some projects will have opportunities through design to plant or preserve native vegetation, allow for views of lakes, streams, and the Gulf of Mexico, and a change of scenery with a trip through rural areas. Project planners and engineers should consider the branding of streetscape elements to reinforce the environmental and scenic significance of the area.

Constrained Roads

The Comprehensive Plan constrains some roads that cannot be widened further due to neighborhood or business impacts, adopted community plans, policy, environmental, or right-of-way constraints. When pursuing an improvement on a constrained road, consider the factors that may have been used to constrain it. These considerations can help ensure that the street is designed with consideration to the constraint, while also being appropriate to context. The factors can be understood as follows:

Neighborhood and Business Impacts – If the widening of a road will result in the loss of significant numbers of businesses. These impacts may result in the widening project being contrary to the land use goals of the area.

Adopted Community Plans – If the road widening makes any of the goals of affected community plans unattainable. A review should be conducted to ensure that the project does not conflict with placemaking, land use, or public health goals of the affected Community Plans.

Policy – If the road widening results in detrimental impacts on major expected users, such as increased crossing distance. These impacts may result in the road widening project undermining the planned purpose of the area through which the road passes.

Environmental Impacts – If the widening of a road will result in any impacts to protected environmental land or Significant Wildlife Habitat. These impacts, regardless of whether they can be mitigated, may result in the loss of habitat diversity or in a reduction in the level of service for park and recreation facilities.

Right-of-Way Constraints – If the widening of a road will result in excessive right-of-way acquisition costs or in unavoidable impacts to important cultural assets, such as cemeteries or historical resources. These impacts indicate an inefficient allocation of limited resources or permanent impacts to irreplaceable community assets.

Chapter Three includes a section, "Planning for Complete Streets in Limited Rights-of-Way," that provides guidance on how to select elements based upon expected users of a street.

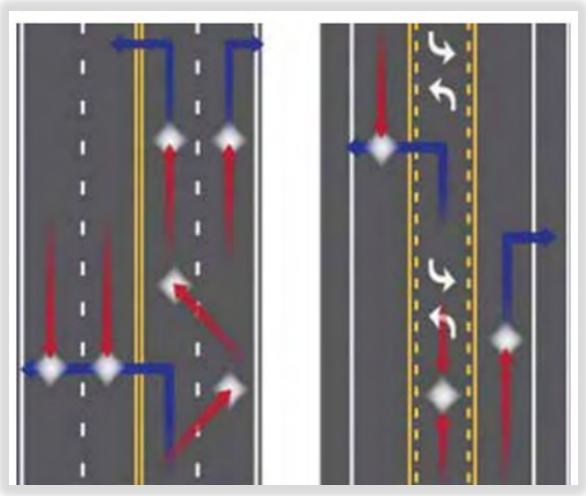
Road Diet

Road diets are an effective strategy for streets which have excess motor vehicle capacity or excessively wide travel lanes. Road diets may include narrowing wide travel lanes to provide or enhance active transportation modes, often referred to as Lane Narrowing. Or, eliminating through vehicular travel lanes, often referred to as Lane Repurposing. Either

doing a Lane Narrowing or a Lane Repurposing once identified, the resulting excess space can be reallocated to active transportation modes. A road diet can also create an opportunity to improve traffic operations for motor vehicles by introducing turn lanes at intersections.

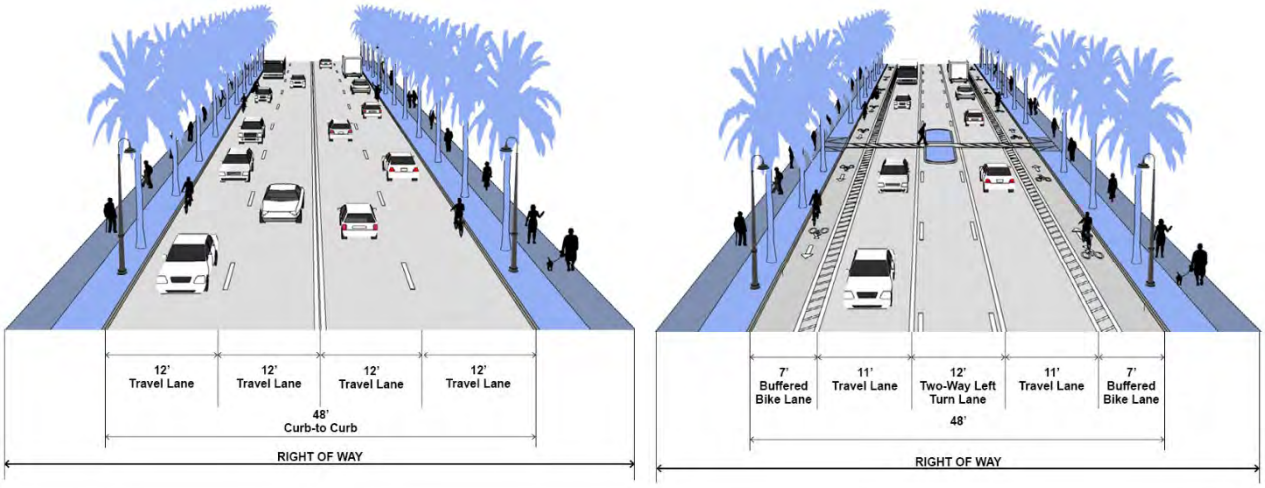
FHWA studies indicate that road diets to convert a four-lane road to a three-lane road with a continuous left turn lane reduces crash frequency by preventing left-turning vehicles from stopping in a through lane while waiting for an acceptable gap in opposing traffic. This change also limits speeding, hazardous lane changes, and creates a shorter crossing distance for pedestrians resulting in a safer street overall. Such conversions have been found to reduce crashes by an average of 29%. Reducing the number of lanes is often used to add bike lanes or buffered bike lanes on both sides of the street within the "newly found" space. A common misconception about Road Diets is that they reduce the capacity of the roadway in half, however, in most instances the impact is much less due to delays created by left turning vehicles stopped in the left travel lane of a four-lane roadway. Moreover, when left turns are regularly occurring due to adjacent development on a four-lane roadway, it actually operates like a de facto three-lane roadway but less safe due to all the lane changes needed to avoid left turning traffic. As shown in Figure 4-2, converting from four lanes to three lanes reduces conflict points[31].

Figure 4-3 Mid-block Conflict Points, FHWA



Road diets can be accomplished with simply a resurfacing and restriping project or through larger reconstruction projects which can be used to increase sidewalk width, add curb extensions, or add landscaping. Figure 4-3 shows a four-lane road repurposed through road dieting.

Figure 4-4 Lane Repurposing



[31] Federal Highway Administration https://safety.fhwa.dot.gov/road_diets/desk_ref/sa_15_046.pdf

While the Average Daily Traffic (ADT) and peak hour guidelines are good for an initial road diet screening, a detailed analysis is needed to understand the specific operating conditions within the corridor. Factors such as transit stops, local deliveries, emergency services, impacts to parallel facilities and local acceptance must also be part of the decision-making process. One more consideration is that roadways are typically designed to meet peak hour traffic flow demand while much of the day there is excess roadway capacity that leads to higher speeds. Increases in delay with a road diet can be tolerated if the overall safety of the roadway is improved all day and every day, particularly in Urban General (C4) and Suburban Town (C3T) contexts.

Quick Builds

Some projects may be suitable for an alternative project delivery approach that reduces the time associated with the implementation process. Quick builds, sometimes called Tactical Urbanism, is about small-scale actions serving a larger purpose that includes activating public space in all communities, large or small, urban, suburban, or rural. The idea focuses on improving livability on our streets and commonly starts at the street, block, or building scale. Quick build projects capitalize on opportunities to shorten project delivery timeframes by planning and designing with the expectation that the project may undergo change after installation. Quick build projects typically utilize materials that efficiently allow such changes to be made. For example, flex posts or planters can be used to create a curb extension, bike

Example Quick Builds

Tactical Urbanism Guide - Temporary Bicycle Track

Next City Design Guide – Demonstration Project

Seattle.gov – Corner Bump out with Bike Rack

lane or a roundabout in advance of a more permanent installation that may require additional funds and lead time. However, the public will gain much of the benefit of the project sooner. Quick builds can be implemented and demonstrated in urban, suburban, and even rural contexts.

Quick build projects occupy the spectrum between demonstration projects and permanent installation. Whereas demonstration projects are often implemented with temporary materials that are not meant for long-term use (such as chalk or cardboard signs that mark a weekend cycle track installation), permanent installations are built using permanent or semi-permanent traffic control materials.

Two examples of quick build project types are pilot projects and interim design projects.

- Pilot projects allow agencies to demonstrate the effectiveness of a project or test the impacts on traffic flow before finalizing the permanent design. For example, a road diet pilot project may be implemented with flexible traffic delineator posts whereas a road diet permanent design would likely be implemented by reconstructing the curb and gutter drainage infrastructure to narrow the street. Pilot projects should include a data collection component to analyze effectiveness.
- Interim design projects take advantage of opportunities to implement projects in a more cost-effective way in advance of a longer-term more permanent strategy. Interim design projects may include implementing a buffered bike lane through pavement markings in advance of curbing being built to create a barrier-separated bike lane.

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Complete Streets Guide

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5 Intersections and Midblock Crossings

Achieve Vision Zero by providing a multimodal transportation system that prioritizes the safety of all roadway users.

Comprehensive Plan

Mobility Element Goal

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5 INTERSECTIONS AND MID-BLOCK CROSSINGS

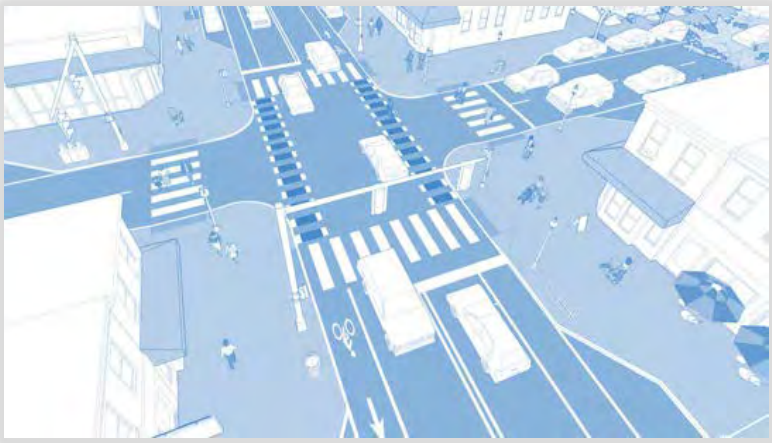
People should feel comfortable approaching and crossing streets. Every intersection should work for every person, regardless of how they choose to interact with the street. The decisions taken by pedestrians about where to cross a road usually involve trade-offs between safety and convenience (Sharples and Fletcher, 2001, Rankavat and Tiwari, 2016).[32] The option of crossing away from designated crossing facilities increases the risk of vehicle-pedestrian collision but is often chosen because it is the quickest and most direct way to reach the other side (Demiroz et al., 2015).[33] This chapter implements the Comprehensive Plan's vision for Hillsborough County regarding intersection and crossing design. Intersections should be efficient for all users.

Intersections

In urban and suburban contexts, intersections, crossings, and mid-block treatments generally represent the highest risk locations within the transportation network. On most roadways, all modes are guided to interact at intersections; therefore, the majority of vehicle to vehicle and vehicle to bike/pedestrian conflicts occur at intersections. Intersections should be designed to maximize the safety of all users and abilities.

Complete intersections do more than just accept people walking, biking, or taking transit. They facilitate these mode choices and create environments in which a child walking her bike through an intersection feels just as comfortable as the elderly man crossing the street and the commuter driving his car as shown in Figure 5-1. Each mode requires specific accommodations. A person walking or biking is not expected to pass through an intersection in the same manner as a vehicle. It is important to anticipate the needs of different users at intersections. Intersections must be sized appropriately for all users. A vehicle may pass through an intersection at 20 MPH, a person biking may pass through the same intersection at eight MPH and a person walking may pass through at two MPH. The larger the intersection, the longer it takes a user

Figure 5-1 Multimodal Intersection, NACTO



[32] Illegal road crossing behavior of pedestrians at overpass locations: Factors affecting gap acceptance, crossing times and overpass use, Accident Analysis & Prevention, 80, 220-228., Demiroz, Y. I., Onelcin, P., & Alver, Y. A.L.Ç.I.N. (2015).

Pedestrian perceptions of road crossing facilities. Edinburgh: Scottish Executive Central Research Unit., Sharples, J. M., & Fletcher, J. P. (2000).

[33] Pedestrians perceptions for utilization of pedestrian facilities–Delhi, India., Transportation research part F: traffic psychology and behaviour, 42, 495-499., Rankavat, S., & Tiwari, G. (2016).

to cross through it. This creates a longer period of exposure to dangerous conflicts and necessitates longer signal phases to provide ample time for someone who is crossing. By reducing the additional space traditionally provided for drivers at intersections, vulnerable road users can feel less exposed and safer while also helping to speed up signal cycles.

GENERAL INTERSECTION DESIGN GUIDANCE

The following guidance applies to all intersections and users:

- Good intersection designs are compact.
- Minimize conflicts between modes.
- Unusual conflicts should be avoided.
- Accommodate all modes with appropriate multimodal levels of service.
- Simple right-angle intersections are best for all users since many intersection problems are exacerbated at skewed and multi-legged intersections.
- Free-flowing movements (channelized right-turn lanes) should be avoided and eliminated in areas of higher levels of pedestrian or bicycle users.
- Avoid elimination of travel modes from the typical section due to intersection design constraints.
- Access management practices should be used to remove additional vehicular conflict points near the intersection.
- Signal timing should consider the safety and convenience of all users and should not hinder bicycle or foot traffic with overly long waits or insufficient crossing times.
- Ensure intersections are fully accessible, ADA compliant, and includes leading pedestrian intervals and audible pedestrian signals in urban and suburban contexts.
- Prioritize crossing for people walking or riding a bike at side streets and driveway crossings.

Geometric Features

The following elements are a highlight of proven safety countermeasures to be considered at intersection locations in urban and suburban contexts, as well as in Rural Activity Centers. Most of the description and guidance for these elements are per the FHWA Traffic Calming ePrimer.

CURB RADII

The curb or corner radii at intersections control the speed at which vehicles can turn and determine the distance which people must walk to cross an intersection. Corner radii should be designed as small as possible to enhance the safety and suitability of an intersection for all users.

The actual curb radius is easily seen and understood, but generally is not the governing radius for vehicles. Effective curb radius is the measure of a vehicle's path while turning

from one lane to another. It is made larger by the presence of parking and bike lanes which require vehicles to make wider turns around a corner.

In situations where a minimum actual curb radius is desired, but a larger effective radius is needed to accommodate frequent trucks or buses there are several solutions available to allow access while maintaining a safe environment. To accommodate larger turning needs with tight curb Radii, the following elements should be considered:

- Add a parking and/or bike lane to increase the effective radius.
- Recess the stop bar on the receiving street to allow vehicles to take wider turns.
- Use pavement textures or colors to create a smaller actual curb radius while allowing larger vehicles to turn through that space (note this space will not be appropriate for waiting pedestrians).

Curb Radii Retrofit, Strongtowns.org

CURB RAMPS

Curb ramps provide a transition between the sidewalk and the street. They allow people in wheelchairs, pushing strollers, wheeling bikes, and towing suitcases to easily use crosswalks. They are equally as important as making streets easier for people with less mobility, for whom stepping off a six-inch curb may be physically difficult or impossible.

Curb ramps should be aligned with the most direct path of travel to channel pedestrians crossing an intersection to the proper and most useful path. Curb ramp configuration should be selected based on the specific corner conditions and volume of pedestrians to be accommodated. On typologies where high pedestrian volumes are expected and wider sidewalks are provided, the width of the curb ramp should match the wider of the sidewalk or crossing.

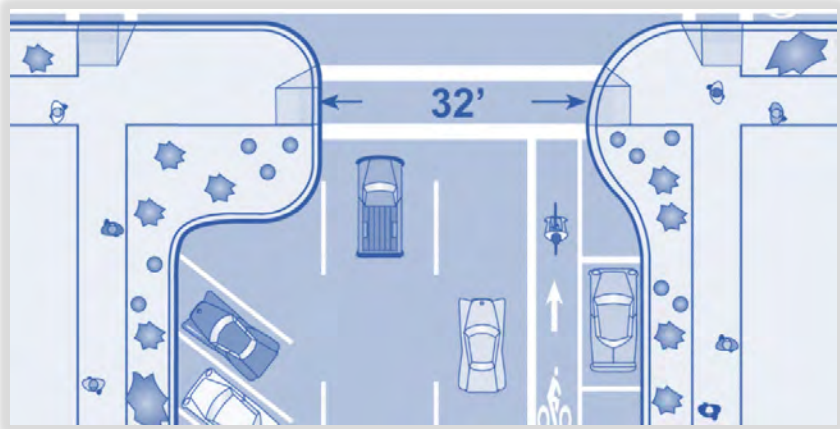
CURB EXTENSIONS

Curb extensions play a similar traffic calming role at intersections and can be used as effective means of reducing curb radii. Curb extensions as shown in Figure 5-2 can also be used as a transition element where two different typologies meet. For example, a street in a Suburban Town Center (C3T) meeting or crossing a Suburban Neighborhood Connector (C3R) would benefit from curb extensions as a gateway feature that physically alerts drivers of a different environment.

Considerations

- The typical curb extension is the width of a parked car (6') but can be reduced to accommodate turning vehicles if necessary.
- Extensions are not appropriate at intersections where traffic operates in the curb-lane.

Figure 5-2 Curb Extension Example, USDOT/FHWA



- The length should be as wide as the crosswalk, at a minimum.
- An extension can be located on one or multiple approaches depending on the intersection configuration.
- Street furniture and plantings placed on an extension should not interfere with pedestrian flow or visibility between people walking and driving.

PEDESTRIAN REFUGE ISLANDS

A pedestrian refuge island creates a protected space for people while crossing multi-lane, bi-directional traffic. Refuges are particularly valuable at unsignalized crossings to reduce the unprotected time that people spend in the intersection and allows for two-stage crossing of larger streets. Refuges resemble median cut-throughs, where pedestrians are provided a space to continue through a median at street level while the median provides protection on both the left and right of the crosswalk. The median refuge dimensions must safely accommodate a wheelchair, stroller, or bike.

Considerations

- Refuges should provide space for a person with a stroller, wheelchair, or bike.
- The cut-through space should be as wide as the marked crosswalk.
- Plantings in refuge medians should maintain intersection visibility.
- Detectable warning strips are required on both sides of the refuge, even for at-grade crossings.

Pedestrian Refuge and Offset Crosswalk, FHWA Traffic Calming ePrimer

- A "nose" should always extend from the pedestrian refuge into the intersection to protect people waiting from turning vehicles.
- Refuges are most appropriate for streets with three or more lanes.

Crosswalks – Design and Type

Intersection crosswalks and curb ramps should be placed to provide convenience and safety for pedestrians. The following recommended practices will help achieve these goals:

- Provide marked crossings on all legs of a signalized intersection.
- Provide one curb ramp per crosswalk.
- Ramps must be entirely contained within a crosswalk.
- Provide marked crosswalks at major unsignalized intersections with pedestrian refuge islands and other safety countermeasures to increase crossing frequency.

Wide Crosswalk, Tampa

- Marked crosswalks should be ten feet wide in urban and suburban contexts with medium to high pedestrian volumes.
- Markings should be perpendicular to the path of travel and be high emphasis (e.g., ladder, zebra, continental, or painted crosswalks in high pedestrian volume zones) for increased visibility.
- Crosswalks should be well lit with pedestrian level lighting.
- Crossing distances should be minimized to reduce pedestrian exposure to motor vehicles.
- Ensure adequate sight lines between pedestrians and motorists. Crosswalks should not be placed too far back from the intersection.
- When a raised median is present, extend the nose of the median past the crosswalk with a cut-through for pedestrians. FHWA refers to this treatment as center line hardening.
- Stop bars should be at least eight feet from the crosswalk to increase comfort of users and reduce the likelihood of cars pulling forward and blocking the crosswalk.

RAISED CROSSWALKS

A raised crosswalk is a variation of a flat-topped speed table. In this sense raised crosswalks define the space as pedestrian first, with cars sharing it, rather than the standard crosswalk where people step from the pedestrian realm down into the traveled way.

Raised crosswalks are appropriate for high pedestrian volume locations, particularly in locations when yielding to people in crosswalks has been problematic and has resulted in crashes. They can be placed at mid-block or at an intersection. A single raised crosswalk reduces the 85th percentile speeds to the range of 20-30 MPH when crossing the crosswalk.[34] They serve a dual purpose of enhancing the experience of people walking through an intersection and calming traffic; thus, raised crosswalks situated parallel to main roads can slow traffic turning from larger roads onto smaller side streets. Raised crosswalks work well in combination with curb extensions in transition zones.

Raised Mid-block Crosswalk, FHWA Traffic Calming ePrimer

Considerations

- Raised crosswalks should be signed and marked.
- Detectable warning strips are required at the edge of the sidewalk.
- Raised crosswalks may not be appropriate for streets with higher target speeds.
- Emergency vehicle routes should be considered when placing raised crosswalks.

Right - Turn Channelization Islands

In Urban General (C4) and Suburban Residential (C3R), Suburban Town (C3T), and Suburban Commercial (C3C) contexts, right-turn lanes should generally be avoided as they increase the size of the intersection, the pedestrian crossing distance, and the likelihood of right-turns-on-red by inattentive motorists. However, where there are heavy volumes of right-turns, a right-turn lane may be the best solution to provide additional vehicle capacity without adding additional lanes in the intersection. For turns onto roads with only one through lane and where truck turning movements are rare, providing a small corner radius at the right-turn lane often provides

Bruce B Downs Blvd, Google Image

[34] FHWA Traffic Calming ePrimer, https://safety.fhwa.dot.gov/speedmgt/ePrimer_modules/module3pt2.cfm#mod314

the best solution for pedestrians' safety and comfort. Where channelization islands are deemed necessary additional safety countermeasures such as Rectangular Rapid-Flashing Beacon's (RRFB's) and high visibility crossing markings may need to be considered.

At intersections of multi-lane roadways where trucks make frequent right turns, a raised channelization island between the through lanes and the right-turn lane is a good alternative to an overly large corner radius and enhances pedestrian safety and access. If designed correctly, a raised island can achieve the following objectives:

- Allow pedestrians to cross fewer lanes at a time.
- Allow motorists and pedestrians to judge the right-turn/pedestrian conflict separately.
- Reduce pedestrian crossing distance, which can improve signal timing for all users.
- Balance vehicle capacity and truck turning needs with pedestrian safety.
- Provide an opportunity for landscape and hardscape enhancement.

The following design practices for right-turn lane channelization islands should be used to provide safety and convenience for pedestrians, bicyclists, and motorists:

- The provision of a channelized right-turn lane is appropriate only on signalized approaches where right-turning volumes are high.
- Provide accessible islands for refuge.
- Provide a yield sign for the channelized right-turn lane.
- Tighter angles are preferred. Provide at least a 60-degree angle between vehicle flows, which reduces turning speeds and improves the yielding driver's visibility of pedestrians and vehicles.
- Place the crosswalk across the right-turn lane about one car length back from where drivers yield to traffic on the other street, allowing the yielding driver to respond to a potential pedestrian conflict first, independently of the vehicle conflict, and then move forward, with no more pedestrian conflict.
- Removing unnecessary existing channelized right-turn lanes further assists pedestrians.

Traffic Signal Control

Traffic signals allocate the time in which people can be in the intersection and strive to balance the needs of all users moving across the transportation network. Signals must also align with the complete street's principle of modal respect, which supports people walking and biking in addition to motor vehicle traffic.

Signals that are timed for high-speed traffic on major roads can contribute to unsafe driving and can cause delays. This creates significant barriers to people attempting to cross from secondary streets. These delays can decrease compliance with red lights, creating unsafe behavior from users who may experience waits of multiple minutes for their turn to use an intersection.

These problems can be addressed by focusing on the needs of all users and implementing solutions which support the most vulnerable users. A 70-second delay in a vehicle may feel long and tedious, but that same 70-second delay to a person walking or on a bike, without AC or an umbrella, may be unbearable.

General Traffic Signal Control Guidance[35]:

Shorten Signal Cycles to Increase Turnover – Short signal cycle lengths minimize delay in a complex network environment, reducing wait times in all directions and creating crossing opportunities at closer intervals.

Prioritize Walking, Bicycling and Transit – Use signal priority tools, such as leading pedestrian intervals, synchronized signals for bicycles, or transit signal priority along corridors with high levels of expected pedestrian, bicyclist, or transit users.

Keep the Number of Signal Phases to a Minimum – While separating traffic through signal phasing may have safety benefits, additional phases increase wait times for everyone by increasing the overall length of the signal cycle. Consider turn restrictions at dangerous intersections, or, where turn volumes necessitate a dedicated turn phase, introduce a protected left-turn phase.

Time Signals to the Speed you Intend Traffic to Go – Synchronize signals at or below the target speed to maintain safe vehicular travel speeds and discourage speeding,

Timed Signal Sign
E. Kennedy Blvd, City of Tampa

[35] NACTO Urban Street Design Guide

especially on one-way streets. On major bike corridors, consider synchronizing lights for bike speeds.

Adjust Timing for Peak and Off-Peak Volumes – Signal timing should be managed for both peak and off-peak volumes, timing may be adjusted to meet different levels of activity throughout the day and for special events. Peak hour signal timing and patterns are not appropriate during off-peak and may lead to higher speeds causing higher exposure and crashes.

Use Fixed-Time Signals as Opposed to Actuated Signals - Fixed-time signals can increase predictability of intersection wait times for all users.

Pedestrian Signals - Pedestrian signals are used to communicate signal timing to people walking. These familiar devices provide three indications to people on the street:

Walk - signified by the symbol of a person walking; this means that people are allowed to enter the intersection to cross the street. This phase must be a minimum of seven seconds long.

Change Interval - signified by the flashing hand (Don't Walk) symbol and a countdown display; this signifies that people should no longer enter the crosswalk and should finish crossing the street within the remaining time. All change intervals should display a countdown timer.

Don't Walk - signified by the solid hand symbol; this signifies that people should not cross the street. This symbol also indicates the buffer interval, during which people can finish crossing the street while all other movements are stopped.

Pedestrian signal timing is based on the pedestrian clearance time, the time it takes someone to completely walk across the intersection. It is usually based on a calculation of people walking at 3.5 ft/sec, although this can be reduced to 2.9 ft/sec[36] where high concentrations of seniors (over 65), disabled persons, or assisted children are present or expected. This time should be allowed through a combination of the pedestrian signal phases. A pedestrian signal should be provided at each leg of an intersection to prevent people from guessing whether they are crossing with traffic or not.

In more Urban General (C4) and suburban contexts, such as Suburban Residential (C3R), Suburban Commercial (C3C), and Suburban Town (C3T), where pedestrian volumes are higher, pedestrian signal phases should run concurrently on both sides of an intersection and pedestrian phases should be automatic and not require a push button.

LEADING PEDESTRIAN INTERVAL (LPI)

Another approach to keeping people safe from turning drivers is to provide a Leading Pedestrian Interval. In this situation, the pedestrian phase begins 3-7 seconds before the vehicles are given a green light. People crossing are thus already in the crosswalk before vehicles begin to turn, increasing their visibility to drivers and reinforcing that those in the

[36] Recommended Walking Speeds for Pedestrian Clearance Timing Based on Pedestrian Characteristics, TRB, Gates, Noyce, Bill, Van Ee, et al

crosswalk have the right-of-way. Where high levels of pedestrian users are expected, for example near schools, no right-turn on red should be considered.

AUDIBLE /ACCESSIBLE PEDESTRIAN SIGNALS (APS)

APS detectors are designed to accommodate the needs of all pedestrians, including those with vision and mobility impairments. They provide information in nonvisual formats such as audible tones, speech messages, and vibrating surfaces to indicate the appropriate time for pedestrians to cross the street. The integration of the addition or upgrades of accessible pedestrian signals should be accomplished during routine signal maintenance and/ or streetscape projects. At locations with lots of foot traffic, pedestrian phases should be timed to come up automatically and keep signal cycles short (ideally 90 seconds maximum).

BICYCLE SIGNALS

Bicycle signals and beacons facilitate bicyclist crossings of roadways. Bicycle signals make crossing intersections safer for bicyclists by clarifying when to enter an intersection and by restricting conflicting vehicle movements. Bicycle signals are traditional three lens signals with green-yellow and red bicycle stenciled lenses that can be employed at standard signalized intersections and Hybrid Signal crossings. Flashing amber warning beacons are utilized at unsignalized intersection crossings. Push buttons, signage, and pavement markings may be used to highlight these facilities for both bicyclists and motorists.

Determining which type of signal or beacon to use for a particular intersection depends on a variety of factors. These include speed limits, average daily traffic, anticipated bicycle crossing traffic, and the configuration of planned or existing bicycle facilities. Signals may be required as part of the construction of a protected bicycle facility such as a cycle track with potential turning conflicts, or to decrease vehicle or pedestrian conflicts at major crossings. An intersection with bicycle signals may reduce stress and delays for a crossing bicyclist and discourage illegal and unsafe crossing maneuvers. For more design guidance consult the NACTO Urban Bikeway Design Guide.

TRANSIT

Transit service can also be accommodated by the design of traffic signals, helping to ensure travel time reliability and provide an enhanced customer experience. The simplest form of accommodation is to focus on shorter signal cycles, similar to the accommodation for bikes and people walking. This can reduce the time that transit vehicles spend waiting for a green light. Dwelling at stop and red lights greatly affects the average running speed of transit; reducing the time spent at signals can greatly improve transit reliability.

Signal progression timed to bus operating speed is a big step in supporting transit along a corridor. Signals are timed to allow a vehicle traveling at a specified speed to continually receive green lights at intersections. With transit service, the progression is offset at intersections with transit stops to allow time for buses to dwell while passengers board or disembark. Typically, the signals will be timed to allow for a travel speed between 12-20 MPH. Short signal cycles are still preferred as they reduce the time penalty associated with missing a green phase due to congestion or a longer than average dwell.

Transit Signal Priority (TSP) is a powerful method which allows for modification of signal timing for transit vehicles. Note that this is different from preemption (commonly used for rail applications or emergency vehicles). TSP can be used to shorten a red phase or lengthen a green phase to accommodate an approaching transit vehicle. This accommodation can be applied to all approaching transit vehicles or only to those running behind schedule.

WARRANTS

The Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) provides standards and guidance for the application of all allowed traffic control devices including roadway markings, traffic signs, and signals. For example, stop signs and traffic signals are expected to meet minimum thresholds before application. A warrant is the threshold that includes the criteria such as number of vehicles, number of pedestrians or other users, distance to other devices, crash history, and more. These warrants are often viewed as preventing local transportation professionals from applying devices that, in their opinion, may improve safety. For example, trail and/or pedestrian crossings of busy, high-speed, wide arterial streets may need signals for user safety, but signals may not meet the MUTCD warrants.

The MUTCD suggests that strict adherence to the warrants is not the only factor to evaluate when considering whether a traffic control device is justified. The warrants are a component of a broader engineering investigation and are not a substitute for engineering judgment. The MUTCD lists the satisfying conditions of a warrant as "guidance" for implementing an approved traffic control device. Guidance is defined in Section 1A.13 of the 2009 MUTCD as "a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate." The MUTCD typically uses the verb "should" for guidance conditions, as differentiated from the verb "shall" for standards.

To use some desirable traffic control devices as prescribed by Complete Streets best practices, it may be necessary to establish local warrants or modify those provided in the MUTCD to suit the Context Based Classification and Typologies. In special circumstances that deviate from the warrants, reasons for the variation must be documented. For example, Hillsborough County may establish that trail crossings, school crossings, or bus stop locations qualify for certain traffic control devices (traffic signals, pedestrian hybrid beacons, crosswalks, etc.) and treatments without meeting the warrants. Another example would be the installation of additional traffic signals to break up long stretches of corridor to manage speed through better signal coordination, increasing connectivity between neighborhoods, and providing improved crossings for vulnerable users.

Bicycle Intersection Treatments

People riding bikes are particularly vulnerable at intersections. Markings and facilities for bikes can be placed in intersections to increase rider comfort and increase driver awareness and anticipation of potential conflict points. The following treatments are summarized to provide an overview of treatments available. Further guidance on the use of these treatments is available in the NACTO Urban Bikeway Design Guide, Second Edition.

BIKE BOXES

A bike box provides a space in front of stopped traffic for bikes to wait for a green phase. This allows bikes to be visible to stopped drivers, a safer situation than a bike waiting between car lanes, visible to few, if any, vehicles.

Bike boxes are an effective tool for dealing with turning conflicts. For bikes turning left, positioning in a bike box that extends across all lanes can allow them to turn ahead of traffic behind them. For bikes continuing straight, positing ahead of right-turning vehicles can reduce the likelihood of right-hook collisions with unsuspecting drivers.

Bike boxes should be 10-16 feet deep, with a stop line indicating to vehicles to stop prior to the box. Right-turns on red must also be prohibited to keep vehicles from entering the box during a red phase.

TWO-STAGE TURN BOXES

A two-stage turn box allows bikes to complete a turn through an intersection in two-stages and avoids bikes having to cross traffic lanes to position for turns. A person biking through an intersection can pull into a two-stage turn box and complete the second movement when allowed either by a traffic signal or when allowed at an unsignalized intersection.


Two Stage Box and Markings

This application is most appropriate for higher speed and higher volume streets where it may be unsafe for bikes to cross traffic lanes to turn along with vehicles. It is also an appropriate treatment for cycle tracks given that their separation generally precludes bikes from changing lanes for turns at an intersection.

MARKINGS

Markings for bikes can be provided through the intersection to continue on-street markings before and after intersections. These treatments help to make drivers aware of the presence of bike priority space, particularly aimed at conflicts with turning vehicles. Markings can also increase the comfort of riders by providing them with confidence regarding their priority within the intersection and the proper path to take.


Bicycle Lane Extension

Wider or offset intersections are particularly good candidates for intersection markings. They can reinforce the proper path for bikes and instill confidence in crossing larger intersections. Typical markings include dotted lines through the intersection with a width and position consistent with the bike facility it follows. Shared lane markings and colored pavement can be used to further highlight the bike treatments. Colored pavement can be especially useful at conflict points both through intersections and at conflict points with driveways.

BIKE PROTECTED INTERSECTIONS

Protected intersections have been implemented across North America as cities have expanded their protected bikeway networks. Also known as setback or offset intersections, this design keeps bicycles physically separate from motor vehicles up until the intersection, providing a high degree of comfort and safety for people of all ages and abilities. This design can reduce the likelihood of highspeed vehicle turns, improve sightlines, and dramatically reduce the distance and time during which people on bikes are exposed to conflicts. For example, in San Francisco, a protected intersection design resulted in 98% of drivers yielding to people on bikes, and 100% yielding to people walking. A study in New York found that protected intersections had fewer vehicle-bike conflicts than even a dedicated turn lane with a dedicated bike signal phase[37].

Transit Intersection Treatments

Transit-specific intersection treatments can elevate transit to an equal standing with other modes on Hillsborough County's streets by creating an environment supportive of reliable and efficient service. The following treatments are summarized to provide an overview of treatments available. Further guidance on the use of these treatments is available in the NACTO Transit Street Design Guide.

RIGHT-TURN LANES

The interaction of Bus Only Lanes and right-turn lanes can provide priority for buses through an intersection. For moderate right-turn volumes, turning vehicles can share a bus lane

[37] NACTO, Don't Give Up at the Intersection, Protected Intersections https://nacto.org/publication/dont-give-up-at-the-intersection/protected-intersections/

approaching an intersection. This treatment can also be used on intersections without dedicated bus lanes; in this case, a bus can still use a right-turn lane and will instead continue directly through the intersection.

QUEUE JUMP LANES

A queue jump lane creates a short, dedicated transit lane in combination with a dedicated transit priority signal. In this instance, a bus will approach an intersection in the queue jump lane and trigger an early green light, like a Leading Pedestrian Interval. This allows the bus to bypass traffic queued at the intersection and can also be used to help a bus merge back into traffic from a nearside bus stop. For congested intersections, this treatment can greatly improve on-time performance and reliability of the route.

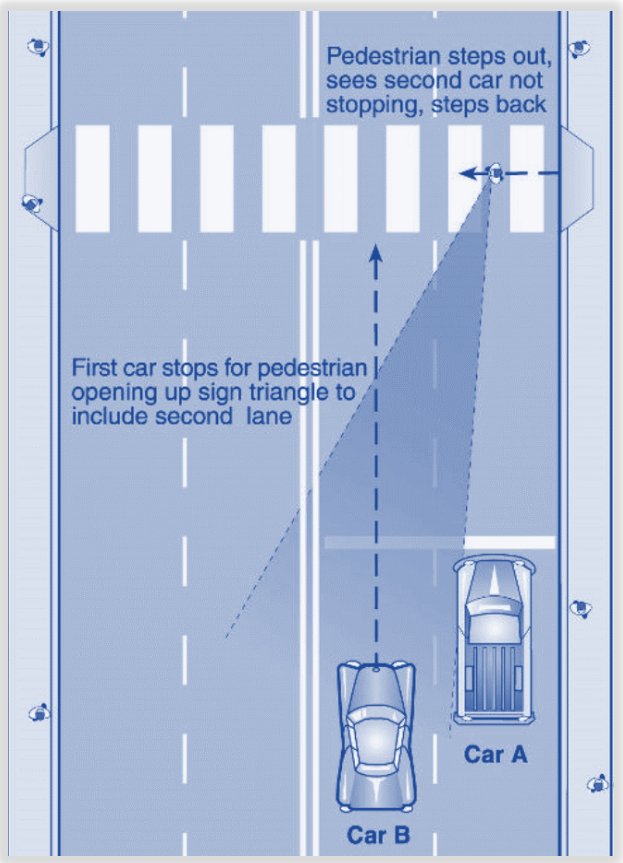
Top row: Fletcher Ave Crossings, Tampa

Center row: Rural Crossing, FHWA STAR; Denver Bike Crossing, denvergov.org

Bottom row: Mid-block Crossing, SCCRTC.org; Mid-block Crossing NACTO

Mid-block Crossings

Figure 5-3 Multiple Threat Crash Solution – Advance Yield Line, FHWA



Mid-block crosswalks provide a safe opportunity for people walking or riding to cross at locations that are not facilitated by nearby intersections. Figure 5-3 illustrates a mid-block crossing utilizing an advanced yield line to give pedestrians a wider view of oncoming traffic providing the pedestrian the opportunity to step back to safety. At mid-block locations, crosswalks only exist where marked. Mid-block crosswalks can be controlled (with traffic control devices- signals or Pedestrian Hybrid Beacons) or uncontrolled (with high visibility crossing elements and warning devices such as RRFB's). Crosswalks should be considered at mid-block locations where there is strong evidence that pedestrians want to cross there, due to origins and destinations across from each other and an overly long walking distance to the nearest controlled crossing. Marked crosswalks alert drivers to expect crossing pedestrians and direct pedestrians to desirable crossing locations. Although many motorists are unaware of their precise legal obligations at crosswalks, the Florida Uniform Traffic Control Law requires drivers to yield to pedestrians in any crosswalk, whether marked or unmarked.

Representative locations that warrant a mid-block crosswalk may include transit stops (bus or light rail), parks, plazas, schools, building entrances, mid-block passageways, trails, and bicycle facilities. Other locations for consideration of mid-block crossings may include the opportunity to break up long blocks, where shared use paths intersect the street, or where parking lots are located on the other side of the destination. The following general guidance is adapted from various sources.

- ***Traffic Volume*** – A minimum threshold for average daily traffic typically falls in the range of 1,500 to 3,000. Above the following average daily traffic and speed thresholds, mid-block crossings should be augmented with enhanced safety devices according to these thresholds.
  - ✓ ADT > 12,000 without a median
  - ✓ ADT > 15,000 with a median
  - ✓ Speeds greater than 40 MPH
- ***Stopping Sight Distance*** - Stopping sight distance should be calculated and compared to minimum sight distance criteria found in the FDOT Plans Preparation

Manual (PPM) Chapter Two or AASHTO guidance. The consideration of sight distance should account for the presence of on-street parking when applicable.

- ***Curb Extensions*** - The construction of curb extensions is recommended at mid-block crosswalks where feasible. Uses for these extensions can include transit stops, micromobility corrals, additional greenscaping, and green stormwater infrastructure.
- ***Lighting*** - When regular street lighting is not present or is inadequate to reach minimum illumination levels, separate crosswalk lighting should be installed. Crossing locations with high nighttime demand should include separate crosswalk lighting, which may include in-street lighting.
- ***Frequency of Marked Crosswalks*** - Along streets with high pedestrian levels in Urban and Suburban contexts, a well - designed crossing should be provided at least every 1/8 mile (660 feet) so the minimum distance to the nearest controlled or protected crossing is 300 feet. Marked crosswalks should be spaced so people can cross at preferred locations. If people are routinely crossing streets at nonpreferred locations, consideration should be given to installing a new crossing.
- ***Other Safety Enhancements*** - For guidance on the use of crosswalk safety enhancements including high-visibility crosswalk markings, raised crosswalks, advanced warning signs, in-street pedestrian crossing signs, curb extensions, pedestrian refuge islands, RRFBs, and pedestrian hybrid beacons, refer to the FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations[38].

[38] FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf

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Complete Streets Guide

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6 Transit Integration

Build a smart system that utilizes technology and strategies to improve safety, efficiency and reliability for all modes of transportation and to meet the needs of all users.

Comprehensive Plan

Mobility Element Goal

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6 TRANSIT INTEGRATION

For many people, public transit is their access to jobs, school, shopping, recreation, visiting friends and family, worship, and many other daily functions. This chapter provides design guidance for Complete Streets considering transit stops and transit operating in the street, including typical bus stop layout and placement and the use of bus bulbs and transit lanes. The chapter ends with a discussion of ways to accommodate Bus Rapid Transit (BRT).

Nearly every transit trip begins as a walking trip – but the disconnect between transit and road planning means transit riders are often left to wait at bus stops marked by a lone post in the grass – no sidewalk, curb ramp or bench. Crossing the street to catch the bus can even be hazardous. Even where sidewalks and safe roadway crossings exist, often the placement of driveways or other barriers force bus stops to be located some distance from the intersection, increasing walk times and encouraging unsafe crossing locations.

For transit to provide optimal service, streets must accommodate transit vehicles as well as adequate and safe access to the bus stop locations and stations. To ensure that the transit system can be planned and operated as a safe, reliable, and comfortable mode of transportation, this chapter has been developed in coordination with the Hillsborough Area Regional Transit Authority (HART). While it is expected that HART will specify transit services, shelters and other amenities for a given corridor or stop, it is the responsibility of Hillsborough County to contemplate the planning and design of the bus stop locations and provide adequate pedestrian and bicycle access to them.

General Design Guidance

Public transit should be planned and designed as part of the street system. It should interface seamlessly with other modes, recognizing that successful transit depends on customers getting to the service via walking, bicycling, car, or micromobility. When designing streets, consider the following:

- On some streets, transit vehicles should have higher priority than private vehicles.
- The busiest transit lines should have designated bus lanes.
- Where ridership justifies, some streets, called transit hubs, may permit only buses or streetcars in the traveled way. These often also allow bicycles.
- Technology should be applied to increase the average speeds of transit vehicles, where appropriate, through options such as TSP and bus queue jumpers.
- Transit stops should be easily accessible, with safe and convenient crossing opportunities.
- Transit stops should be active and appealing public spaces that attract people on a regular basis, at various times of day, and on all days of the week. They should also be visible from a distance.
- Transit stops should include infrastructure for passengers waiting to board such as real time traveler information systems, natural or artificial canopies (shelters), wayfinding signs, route maps, system maps, benches, and trash receptacles.

- Transit-stop placement and street design influences accessibility to transit and network operations, and influences travel behavior/mode choice.
- Streets that connect neighborhoods to transit facilities should be especially attractive, comfortable, inviting, and safe for pedestrians and bicyclists.

Streets with a suburban or urban context-based-classification Suburban Residential (C3R), Suburban Commercial (C3C), and Suburban Town (C3T), and Urban General (C4) should be designed to accommodate transit operations for both current and anticipated future routes. Associated improvements should be built on streets with current routes or where new routes are expected within five years.

Planning considerations for transit accommodation include stop spacing, location, and amenities, and traffic and transit operations and safety. In cases where improvements are planned along an existing route, County staff should include HART staff in the planning and design process. When streets are built or improved in conjunction with a development project, coordination is necessary with the County's Land Development Code.

Transit Stop Spacing

A bus stop's optimal placement depends on the operational characteristics of both the roadway and the transit system. The placement of bus stops at the far side of signalized intersections is generally considered to be preferable to near side or mid-block locations. Transit stops should be considered and designed for at nodes of activity, then supplemental stops should be anticipated in-between following guidance provided on Table 6-1. Nodes of activity may include:

- Intersections of streets with Context-Based Classifications to facilitate transferring between transit routes.
- Nodes of substantial commercial or employment activity such as large grocery stores or regional centers, major employers, Suburban Town (C3T) Town Centers, Urban General (C4) Main Streets, and other locations as indicated by the Land Development Code.

Table 6-1 HART Recommended Transit Stop Spacing

Contexts	Typologies	Local Service Stop Spacing	Express, Premium, or BRT Service Stop Spacing
Rural (C1 & C2)	All Typologies	N/A	N/A
Suburban Residential (C3R)	All Typologies	0.25 - 0.5 Mile	1 Mile
Suburban Commercial (C3C)	All Typologies	0.25 - 0.5 Mile	1 Mile
Suburban Town C3T	Town Neighborhood	0.25 - 0.5 Mile	1 Mile
Suburban Town C3T	Town Center	0.25 Mile	0.5 - 1 Mile
Urban General C4	All Typologies	0 - 0.25 Mile	0.5 - 1 Mile

Stop spacing decisions are influenced by several factors and may vary from the above table. Such factors can include an agency's desired transit operations, route alignments, transfer points, right-of-way constraints, pedestrian destinations, activity centers and more. Coordination with HART is recommended prior to finalizing planned stop locations.

Transit Stop Characteristics

The placement of a bus stop on a Complete Street should be an intentional decision rather than simply fitting the stop in to whatever space is unclaimed by other features of the sidewalk. Stops can be located near-side of an intersection (immediately before an intersection), far-side of an intersections (immediately after an intersections), or mid-block (between intersections).

The following considerations apply when planning transit accommodations:

- All stops are ADA compliant to those boarding and disembarking transit vehicles from both the front and rear door.
- A landing zone should be provided at each door of the bus and kept clear to allow for unobstructed boarding and disembarking. The landing zone should be exclusive of any bike facility or shared use path. ADA compliance also identifies the clear zone needed on these pads for other pedestrians to be able to get around waiting transit users.
- The minimum landing zone should be five feet in length (parallel to the curb) and eight feet deep (from the curb back toward the buildings). An 8-12 foot long land zone is preferred to allow for the variation in door location during operation. A bus bulb should be built where possible and appropriate to typology to create an eight feet deep loading zone.
- Bus stop lengths vary by vehicle type and stop location. For bus stops that require buses to pull out of and into traffic, minimum stop lengths to allow for safe stopping and merging should be provided. Bus stops with in-lane boarding, serving with a bus bulb, require less curb space and do not use valuable sidewalk space. Refer to NACTO Transit Street Design Guide for more details.
- Stops should always be located at least ten feet from a crosswalk or curb return to allow for visibility between people walking and drivers.
- Crosswalks are recommended in the immediate vicinity of transit stops given that transit users may be traveling to or from the opposite side of the street. As such, locations near planned or existing crosswalks or signalized intersections are recommended with a preference to placing the stop on the far side of a mid-block crosswalk or signalized intersection. Far side placement encourages disembarking users to cross behind the transit vehicle, reducing the risk of a crash with vehicles passing a stopped transit vehicle.
- Consolidate streetscape elements to create a clear waiting space and minimize obstructions between the sidewalk, waiting area, and boarding area.
- Consider the use of special paving treatments or curb extensions (where there is on-street parking) to distinguish transit stops from the adjacent sidewalks.

- At larger stations, consider incorporating other mobility hub amenities such as scooter and bike share, bike repair, and charging stations.
- Integrate transit stops with adjacent activity centers whenever possible to create active and safe places.

Transit Amenities

Bus stops and amenities vary in complexity and design from standardized off-the-shelf signs and furniture to specially designed elements. The design of the bus stop elements, location of the bus stop in relation to adjacent land uses or activities, and the quality of the roadway's pedestrian environment contribute to a bus stop's placemaking. Transit operators like a branded look to their stops so they are easily identified, but often there is room for customized designs to fit in with the neighborhood, with at least some of the features and amenities.

Sidewalks provide the interface between transit riders and the various origins and destinations the transit system serves. The sidewalk includes space for passengers to wait for, and transfer between, buses. The design of the transit stop has implications for bus operations and ridership and can play an integral role in the branding of an entire transit system or individual bus route. A host of amenities should be considered for all bus stops. Routes with higher numbers of people waiting at stops and premium corridors will likely receive a larger investment in amenities. Sidewalk widths and sidewalk pedestrian volumes will also inform how much space a transit stop ought to occupy. In cases where there is insufficient sidewalk width, curb extensions, "bus bulbs" in a transit context," can provide space to place transit stop amenities with a smaller impact on the existing sidewalk space. Bus bulbs can also improve rider safety and bus operations by allowing buses to stop in the travel lane rather than pull in and out of moving traffic. The following amenities may be provided depending on service levels:

- Benches
- Shelters
- Lighting
- System/ route map
- Trash cans
- Bike racks, lockers, repair station
- Bike or scooter share station
- Real-time information displays such as bus arrival times
- Local wayfinding displays for both passengers, as well as passers-by

HART Rapid Transit Stop

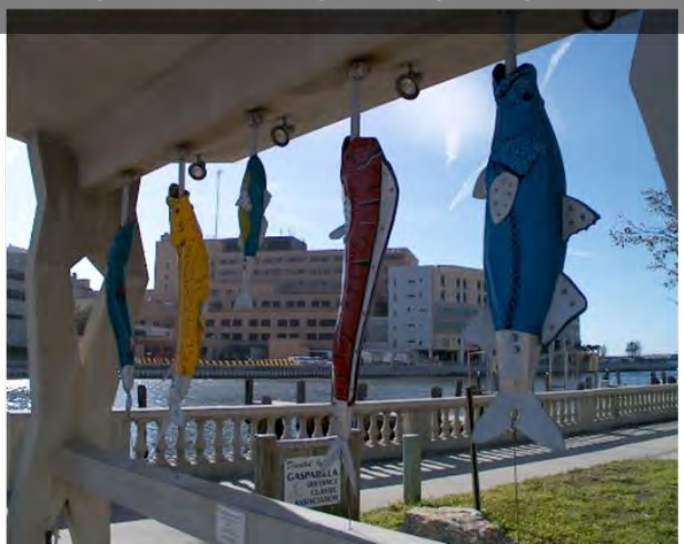
Connecting bicycle facilities to transit stations helps extend the trip length for cyclists and reduces automobile travel. Secure bicycle parking should be provided at or within close proximity to a bus stop, preferably sheltered. At a minimum, the accommodations can be

bike racks or lockers. Bike stations and automated bicycle parking can be located in areas with high levels of transit and bicycle use.

SHELTERS

Shelter placement must be ADA-compliant as well as provide appropriate clearances for transit vehicles at stops. All shelters must provide a minimum 2.5-foot by 4-foot clear space to allow space for wheelchair users underneath the shelter. A typical shelter should be four feet deep, with allowances for more narrow shelters in constricted sidewalk environments. Shelters should provide protection from the sun, rain, and wind. Wind screens should be transparent to allow visibility and a sense of safety under the shelter. Where sidewalk width is too narrow to provide a clear path between the building and the shelter and between the shelter and the curb, a shelter can be oriented toward the building face, allowing both the shelter and the buildings to share the same pedestrian through zone. Transit stop shelters should be informative, functional, provide a place to rest, and opportunities for public art to make stops a pleasant and safe place to wait.

Example Transit Stops, Tampa Bay



Bus Lanes

Bus lanes provide exclusive or semi-exclusive use for transit vehicles to improve the transit system's travel time and operating efficiency by separating transit from congested travel lanes. They can be located in an exclusive right-of-way or share a roadway right-of-way. They can be physically separated from other travel lanes or differentiated by lane markings and signs.

- Bus lanes can be located within a roadway median or along a curbside lane and are identified by lane markings and signs. Bus lanes may be 10–11 feet wide when offset,

and 11–12 feet when configured curbside or in transitway adjacent to an opposing lane of bus traffic.[39]

- On-street parking may be allowed depending on roadway design, especially with bus lanes located in the center of the street.
- A mixed-flow lane or on-street parking may be displaced; this is preferable to adding a lane to an already wide roadway, which increases the crossing distance for pedestrians and creates other problems and concerns.
- Within a mixed-flow lane, the roadway can be delineated by striping and signs.
- High-occupancy vehicles and/or bicycles may be permitted to use bus lanes.

Pedestrian access to stations becomes an issue when bus lanes are located in roadway medians.

In general, it is recommended to provide bays for buses to pull out of traffic in suburban contexts with high levels of motorized vehicles. During peak hours, it can be difficult for operators to merge back into traffic. Given that signals can create gaps in traffic, placement of stops on the far side of a signal can be an effective mitigation strategy to address this issue.

In the more urban environments Urban General (C4), Suburban Town (C3T), Suburban Residential (C3R), it is common and preferred that a transit vehicle stops in the travel lane, particularly where there are multiple travel lanes. Further, provision of a pull-off lane often will diminish greenspace and on-street parking areas. In particularly congested corridors, the provision of pull-offs at strategic locations along a corridor can be helpful to allow any queue of vehicles following a bus to pass it at select locations. If a pull-off is not desired, a similar effect can be produced by allowing transit buses to stop within right-turn lanes. In these cases, the bus would also have to get back into traffic in a potentially congested setting.

Future Fixed Route Transit

Hillsborough County's successful growth will rely on new ways of transporting the greatest number of people on the existing and new transportation networks to provide local and regional connectivity to activity centers within and beyond Hillsborough County. The following highlights a couple of transformative transit services that will need advanced planning.

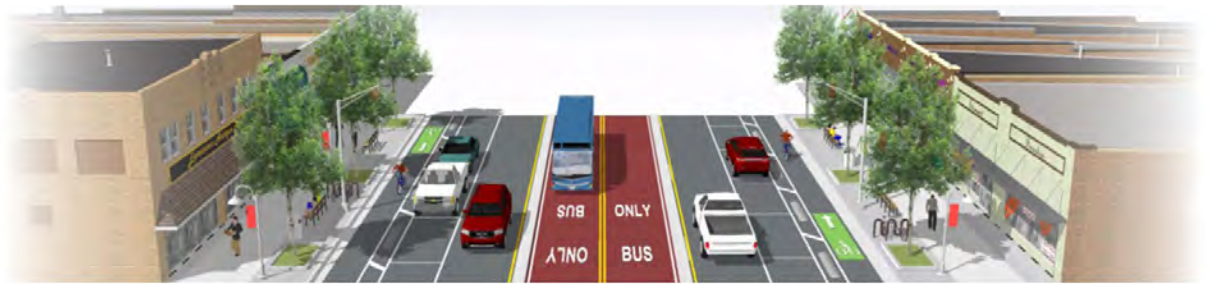
Prior to any milling, resurfacing or reconstruction of Hillsborough County streets that may ultimately be served by any of the future transit services, planners and engineers should consult and coordinate for the appropriate stops, stations, pedestrian, and bicycle connectivity needs appropriate for the corridor. As higher levels of people walking or riding to these service routes will result, the appropriate safety countermeasures will be needed.

[39] NACTO Transit Street Design Guide, https://nacto.org/publication/transit-street-design-guide/transit-lanes-transitways/lane-design-controls/vehicle-widths-buffers/

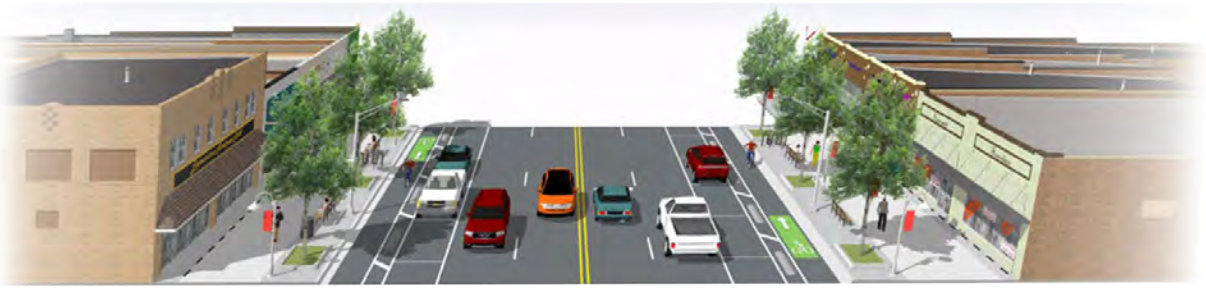
A Bus Rapid Transit system will ultimately traverse Hillsborough County in Urban General (C4) and Suburban (C3) contexts. To illustrate the adaptability of the Urban General (C4) Main Street Typology, Figure 6-1 shows how to accommodate a center median BRT line and station. The Suburban Regional Commercial C3C typology was also adapted to illustrate Right Lane Busway lanes, as shown in Figure 6-2.

Figure 6-1 – Comparison of Main Street, C4 Typology with and without Center Median BRT Lanes

Typology: Main Street, C4



Main Street, C4 with transit lanes.



Main Street, C4 without transit lanes.

Figure 6-2 – Comparison of Regional Commercial, C3C Typology with and without Transit (BAT) Lanes

Typology: Regional Commercial, C3C

Regional Commercial, C3C with transit lanes.

Regional Commercial, C3C without transit lanes.

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Complete Streets Guide

HCFLGov.NET

7 Practical Application of the Complete Streets Guide

Provide a multimodal transportation system that supports planned Future Land Use, respects historical and cultural assets, supports the identity of the surrounding community and protects the natural environment.

Comprehensive Plan

Mobility Element Goal

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7 PRACTICAL APPLICATION OF THE COMPLETE STREETS GUIDE

The purpose of this chapter is to assist street design professionals in applying the guide on actual streets in Hillsborough County. Photo-realistic corridor visualizations are used to demonstrate the application of Complete Streets principles at select locations along two corridors, illustrating multimodal and safety best practices tailored to the community and Context Based Classification. The Guide does not hold the designer to a rigid system of elements that must be installed, instead it provides a palette of choices based on the desired outcomes and right-of-way available to implement the chosen treatments.

The practical application of the Complete Streets Guide is demonstrated on two distinctly different corridors in unincorporated Hillsborough County. These corridors are:

1. **South 78th Street, Causeway Boulevard to East Adamo Drive**
   Context Based Classification: Urban General, C4
2. **Symmes Road, US 41 to I-75 Overpass**
   Context Based Classification: Suburban Residential, C3R

Corridor 1: South 78th Street - Causeway Boulevard to East Adamo Drive

Figure 7-1 Built Form: South 78th Street

The South 78th Street corridor starts at Causeway Boulevard and continues north for two miles past Palm River Road as shown in Figure 7-1. It has a posted speed of 45 MPH and annual average daily traffic (AADT) volume of 18,200 vehicles (2021). This 5-lane road is within 80 to 170 feet of the right-of-way and has sidewalks on both sides of the street. There are no bicycle accommodations, and local transit service is available to downtown Tampa.

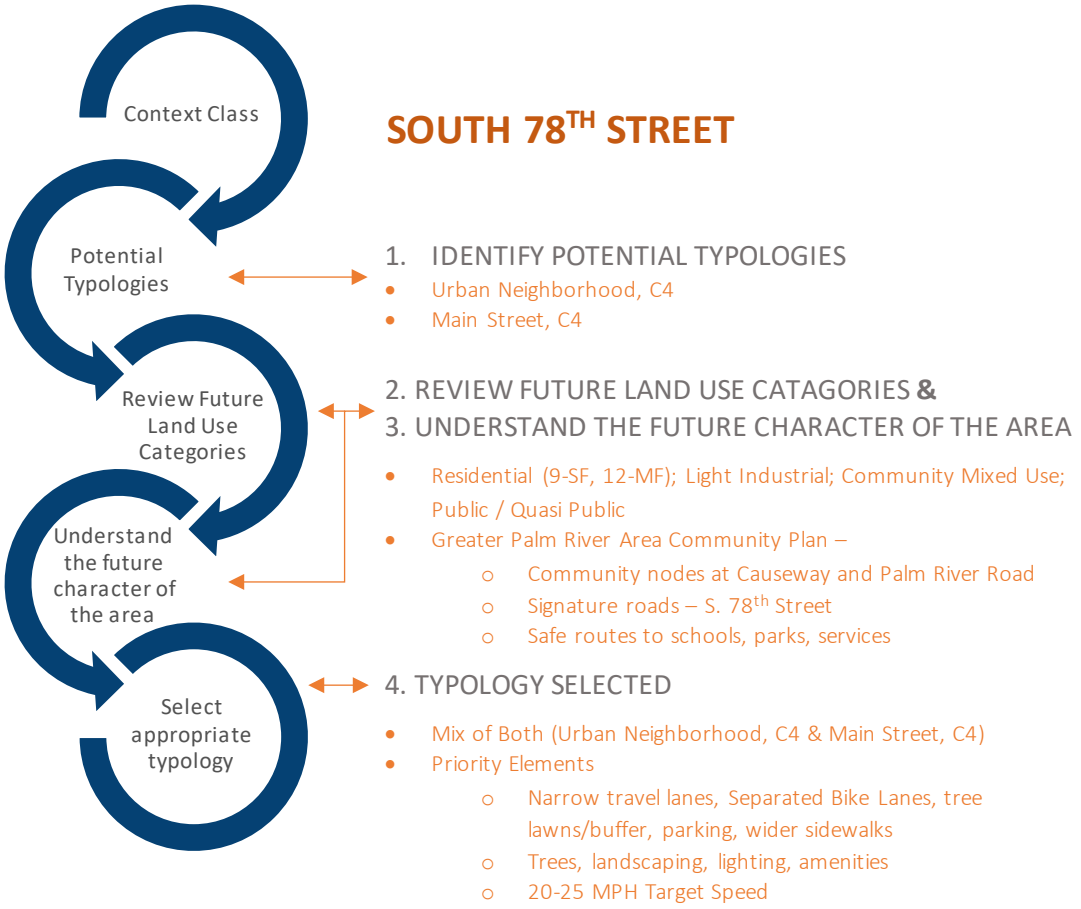
The corridor is characterized by well-connected single-family neighborhoods bookended by suburban style shopping centers at Causeway Boulevard and at Palm River Road. Along the Northwest portion of the street are Winston Park, Claire Mel Elementary School, Dowdell Magnet School, and the 78th Street Library. Residents can find most of their daily needs at this end of the corridor, including food, entertainment, medical care, and prescriptions.

Figure 7-1 shows the placement of homes and the arrangement of streets. The surrounding single-family neighborhoods were originally platted with most of the homes accessing 78th Street via connecting streets. Midway between Palm River Road and Causeway Boulevard, the neighborhood pattern shifts from one in which homes indirectly access the corridor to one in which the homes directly front the street.

Although 78th Street is the spine of the neighborhood, it is not a neighborhood friendly corridor. There are only three well defined pedestrian crossing locations and no protection or buffering for the sidewalks from the five lanes of vehicular traffic.

TYPOLOGY SELECTION: SOUTH 78TH STREET CORRIDOR

Figure 7-2 Typology Selection for South 78th Street



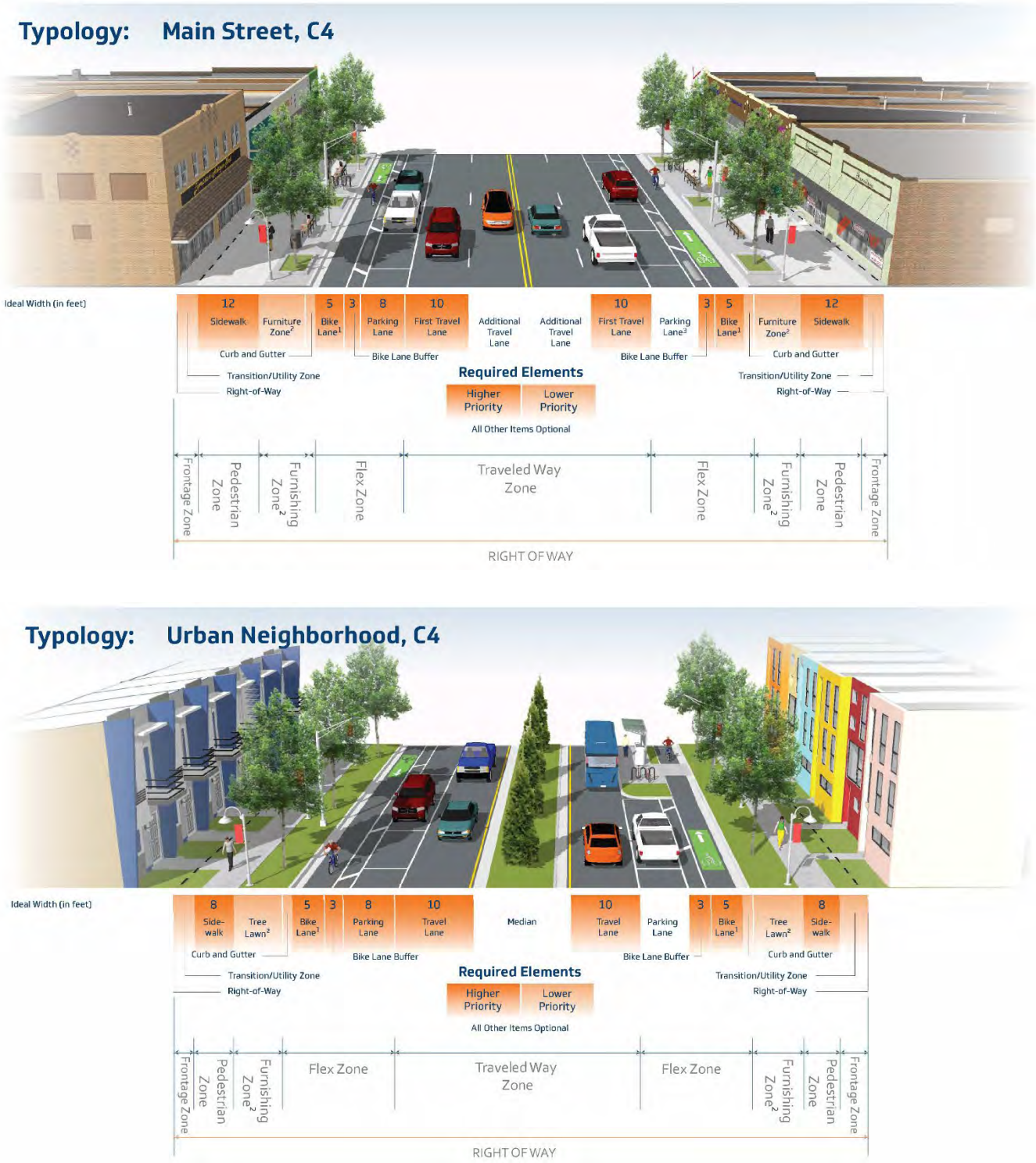
The Comprehensive Plan Mobility Section Map 3, Context Classification Network, shows that this Corridor has a Context Based Classification of Urban General (C4). As seen in Chapter Three, two potential typologies have been created for this Classification: Urban Neighborhood and Main Street.

Figure 7-2 illustrates how to choose a specific typology, first review the Future Land Use and the Greater Palm River Community Plan (located in the Livable Communities Element of the Comprehensive Plan) for direction on whether the plan for the corridor is for neighborhoods or main street as shown in Figure 7-3. The future land uses starting at Causeway Boulevard are mainly Residential-9 and, moving north, continue with Residential-9, indicating an Urban Neighborhood typology. Finally, at Palm River Road, the Future Land Uses are Community Mixed Use-12 on the southeast quadrant, Light Industrial on the northeast quadrant, Residential-9 on the northwest quadrant, and Public/Quasi Public and Residential-9 on the southwest quadrant, indicating a Main Street Typology.

The Greater Palm River Area Community plan calls for creating community nodes at Causeway Boulevard and Palm River Road. The Plan also identifies South 78th Street as a commercial street, and for safe routes to schools, parks, and services in the community. The public uses along the corridor include the library, elementary school, middle school, and

park, all of which are adjacent to each other. So, the Community Plan indicates that the ends of the corridor are intended to develop towards a Main Street typology. Together, the Future Land Use and Community Plan point to the Urban Neighborhood typology along the center of the corridor flanked on either end with the Main Street typology.

Figure 7-3 – Main Street & Urban Neighborhood Typologies



STREET CHARACTERISTICS: SOUTH 78TH STREET CORRIDOR

Figure 7-4 South 78th Street Corridor

For this application of the Complete Streets Guide, three locations selected along South 78th Street include a bus stop location near Tidewater Trail, a school crossing at Claire Mel School, and the Palm River Road intersection as illustrated in Figure 7-4.

Each context described in Chapter Three begins with a summary considerations table that identifies aspects of street designs appropriate for each typology within the context. The priority elements of both typologies Urban Neighborhood and Main Street are very similar. The designer should choose the higher priority treatments over the lower priority and optional treatments and apply them to the segment in a way that fits the community.

Table 7-1 summarizes the recommended improvements that create the future Urban General (C4) environment for both the Urban Neighborhood and Main Street Typologies which serve a higher number of pedestrian and bicycle users than any other. They include narrow travel lanes, separated bike lanes, tree lawns, parking where needed, and wider sidewalks, especially where business/ mixed land uses are shown.

Considering the context of the corridor, as well as the vision described in the Greater Palm River Community Plan, the street's current condition does not include the facilities necessary to serve the typology's expected user mix. It also does not include the facilities necessary to fulfill the vision described in the Greater Palm River Community Plan. To provide the safer routes to schools, parks, and services in the community that the plan anticipates, a lane elimination (Discussed in Chapter Four) is utilized along the entire corridor. With an 80-foot Right-of-Way (ROW), most of the priority elements can be provided along the Corridor. With the repurposing of two travel lanes, the high and low priority treatments of the typologies can be implemented. This will transform this auto-oriented, high-speed corridor into a signature street for this community that meets current demands and moves the community toward achieving its community plan. The following sections will illustrate treatments applied at each of the three nodes.

Table 7-1 – Corridor Summary – Current Conditions and Recommended Improvements

Table 7-1 Corridor Summary	78th Street Current Conditions 2 Mile Area – Causeway Boulevard to East Adamo Drive	Recommended Improvements Potential Typologies: Urban Neighborhood C4, Main Street C4
User Features		
Pedestrian and Bicycle	Sidewalk, Transit Stops	Separated Bike Lanes, Buffer Zones, Wider Sidewalks, Raised Crossings, Pedestrian Refuges
Volumes	18,200 AADT (2021)	Intend to reduce vehicular speed and encourage greater pedestrian volume
Traffic Speeds	Posted Speed of 45 mph	Target Speed of 20-25 mph
Traveled Way		
Travel Lanes	5 Travel Lanes	Reduce to 3 Travel Lanes with separated bike lanes, and on-street parking
Lane Width	12-foot Lane Width	11-foot Lane Width
Vehicular ROW	Fluctuating from 80 – 170 feet	Fluctuating from 22 – 40 feet
Median	None	Yes, in areas without center turn lane
Pedestrian Facilities		
Pedestrian Zone - Total	6-foot Total, only sidewalk on both sides of the road	20-25-foot Total
Sidewalk Width	6 feet	9.5-foot Sidewalk & Buffer
Bicycle Facilities		
Bicycle Accommodations	There are no bicycle facilities, lanes, or accommodations	6-foot Separated bike lanes with 5-foot Buffer Zones
Transit		
Transit Stops	Local Hart Bus Service Stops on Sidewalk	9-foot Transit boarding Island to contain stops
Vision Zero		
Vision Zero (VZ)	Top 20 High Injury Corridor	These improvements to the pedestrian experience intend to significantly reduce the crash rate and high injuries
Plans / Studies	Vision Zero 78th Street Corridor Study (TPO)	
Placemaking		
Green Infrastructure	None	5-foot Designated Green Buffer Zone with Street trees, landscaping, and lawns
Street Lighting	None	Street lighting, and Pedestrian scale lighting
Parking Management		
On-Street Parking	None	Yes, within designated Flex Zone
Community Planning		
Community Planning Area	Greater Palm River	All improvements suggested must support the vision of the Greater Palm River Community Plan

NODE 1 – TIDEWATER TRAIL - SOUTH 78TH STREET CORRIDOR

Figure 7-5 Current Conditions: Tidewater Trail

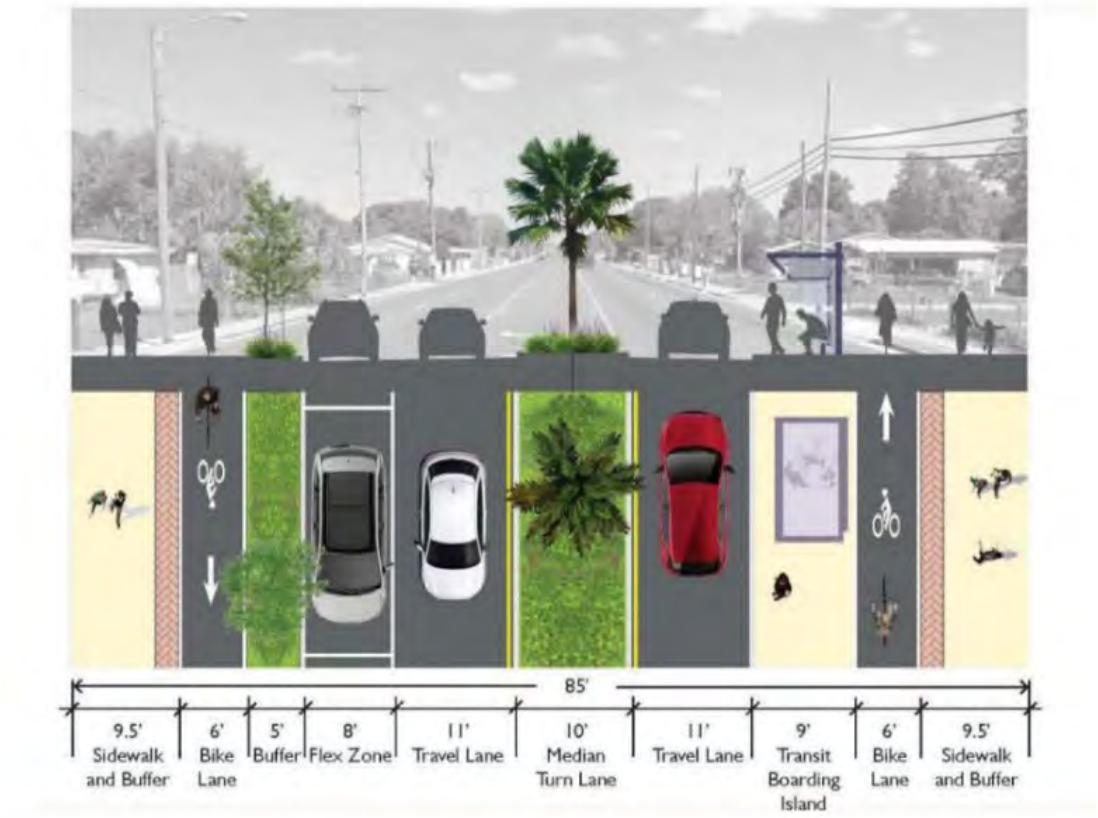
At Tidewater Trail, the current conditions are typical of the corridor. The majority of the right-of-way has been dedicated to the automobile, while pedestrians and bicyclists use a narrow sidewalk that has no buffer to protect them from flying debris such as pebbles or noise and pollution from the moving traffic of trucks and large vehicles as illustrated in Figure 7-5.

Homes here generally front on streets running perpendicular to 78th Street, but more than twenty of the homes front directly on the Street with driveway or sidewalk access. 78th street is planned to evolve into a mixed use, pedestrian-oriented street per the Community Plan, but the land use in this area is primarily Residential-9, so an Urban Neighborhood Typology is applied.

The recommended plan and section for the corridor is shown in Figures 7-6 and 7-7. The arrangement of the travel lanes, turn lanes, flex zones, and parking lanes, all meet those expectations expressed in the plans as shown below. The repurposed travel lanes accommodate the expected user mix identified in the Urban Neighborhood C4 typology and all the optional and required elements of the typology. With high numbers of expected pedestrian and bicycle users, excess right-of-way is given to sidewalks that are wider than normally called for in the Urban Neighborhood Typology, and on-street parking is provided on one side only. Raised crosswalks (discussed in Chapter Five) are used at intersections to indicate areas where high pedestrian volume is expected. Two additional pedestrian

crossings are provided in the vicinity of the Tidewater Trail intersection. Finally, transit facilities are upgraded with context appropriate amenities consistent with Chapter Six

Figure 7-6 Proposed Design Elements: Tidewater Trail



COMPLETE STREET DESIGN ELEMENTS

PEDESTRIANS
High Visibility Crossings
Accessible Walkways and Crossings
Pedestrian Refuge
Smaller Curb Radii
Crossing Beacon (RRFB)
Raised Crossing (Side Street)

BICYCLISTS
Separated Bike Lane

TRANSIT PATRONS
Bus Shelter
Accessible Bus Boarding Island

ALL USERS
Road Diet
Narrowed Travel Lanes
Landscaped Buffer
Ped/Street Lighting

Figure 7-7 Proposed Conditions Plan view: Tidewater Trail

The Proposed Conditions visualization above in Figure 7-8 is the result of the enhancements meant to create a space that is safe and inviting for all users. It reflects the residential nature of this segment. Separated bike lanes and a pedestrian oriented South 78th Street provide a safe environment for all users. The well-connected neighborhoods surrounding the street now have safe and comfortable bicycle and pedestrian access to the nodes described in the community plan, and the street provides a foundation upon which the community can become what it envisioned for itself.

NODE 2 – CLAIR MEL SCHOOL - SOUTH 78TH STREET CORRIDOR

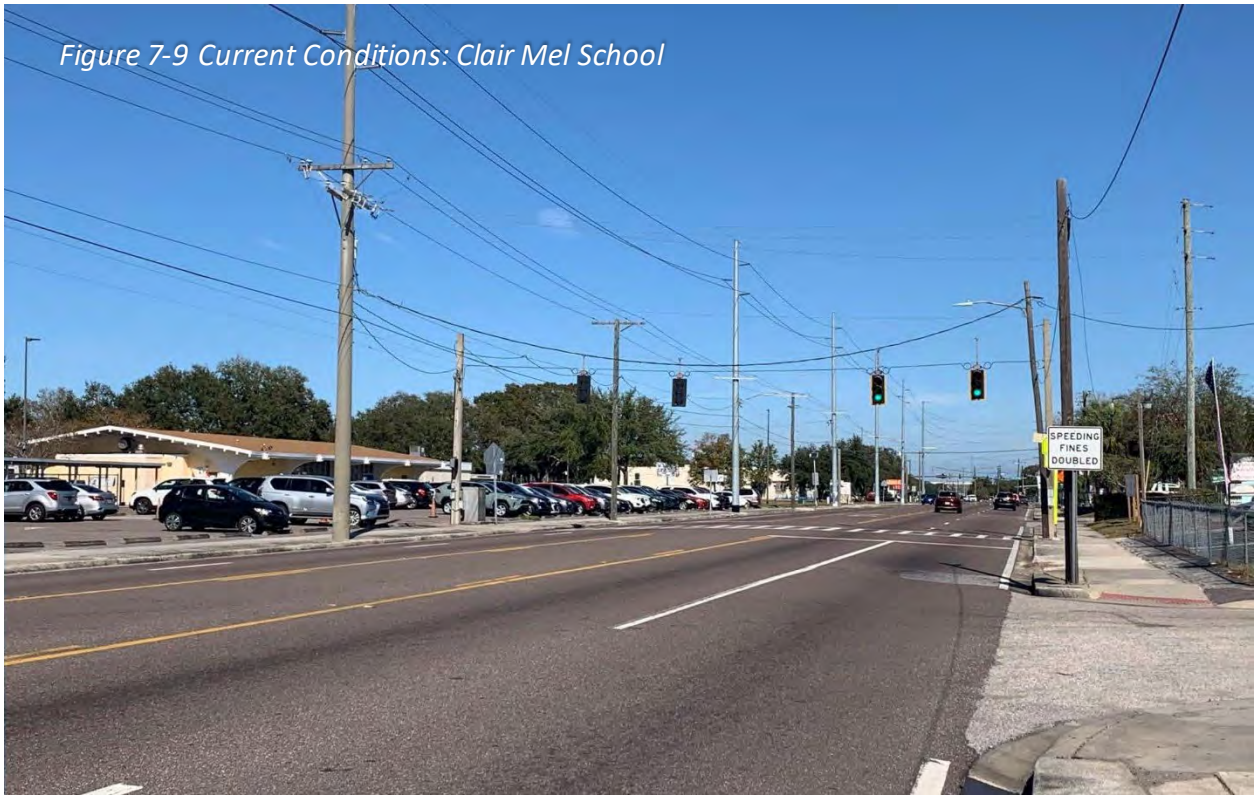


Figure 7-9 Current Conditions: Clair Mel School

North of Tidewater Trail are Clair Mel Elementary School and Dowdell Magnet School, and surrounding public uses that anchor the mid-to-northern end of the corridor. The schools are surrounded by churches and retail establishments. Pictured above, Figure 7-9, is the only mid-block crossing between Causeway Boulevard to Palm River Road, connecting Clair Mel Elementary School with neighborhoods east of 78th Street. Wide turning radii and unnecessarily wide lanes encourage increased speeds as there is no enclosure of the space on either side of the street. Finally, the area is completely devoid of trees or greenery of any kind which exacerbates the heat island effect created by the asphalt streets and concrete sidewalks.

The lane elimination illustrated in Figure 7-10 and 7-11 follows a similar approach to the Tidewater Trail node with raised crossings on connecting streets, context appropriate transit facilities, excess right-of-way allocated to pedestrian users, and a pedestrian refuge island in the mid-block crossing. Mid-block crossings and pedestrian refuge islands are discussed in Chapter Five. The visualization shows the Complete Streets elements incorporated into the area surrounding the schools, selected for their appropriateness for a location near a school expected to generate high levels of pedestrian users.

Figure 7-10 Proposed Design Elements: Clair Mel School

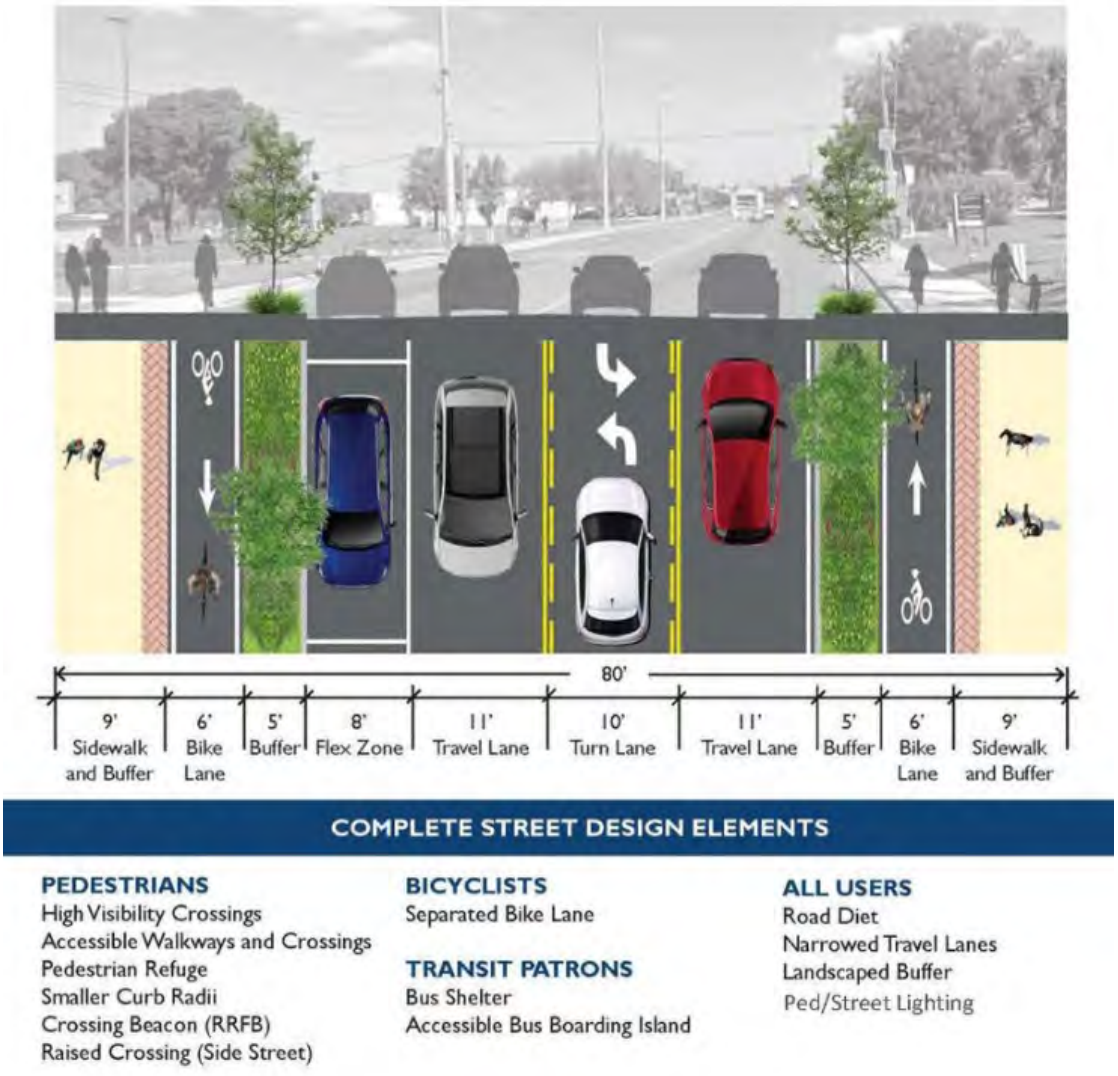


Figure 7-11 Proposed Conditions Plan view: Clair Mel School

Figure 7-12 Proposed Conditions Rendering: Clair Mel School

The Proposed Conditions visualization above, Figure 7-12, is the result of the enhancements meant to create a space that is safe and inviting for all users. It connects the civic uses on the west side of the street to the neighborhoods on the east with safe routes to the nodes described in the community plan, and the street continues to provide a foundation upon which the community can become what it envisioned for itself.

NODE 3 – PALM RIVER ROAD - SOUTH 78TH STREET CORRIDOR

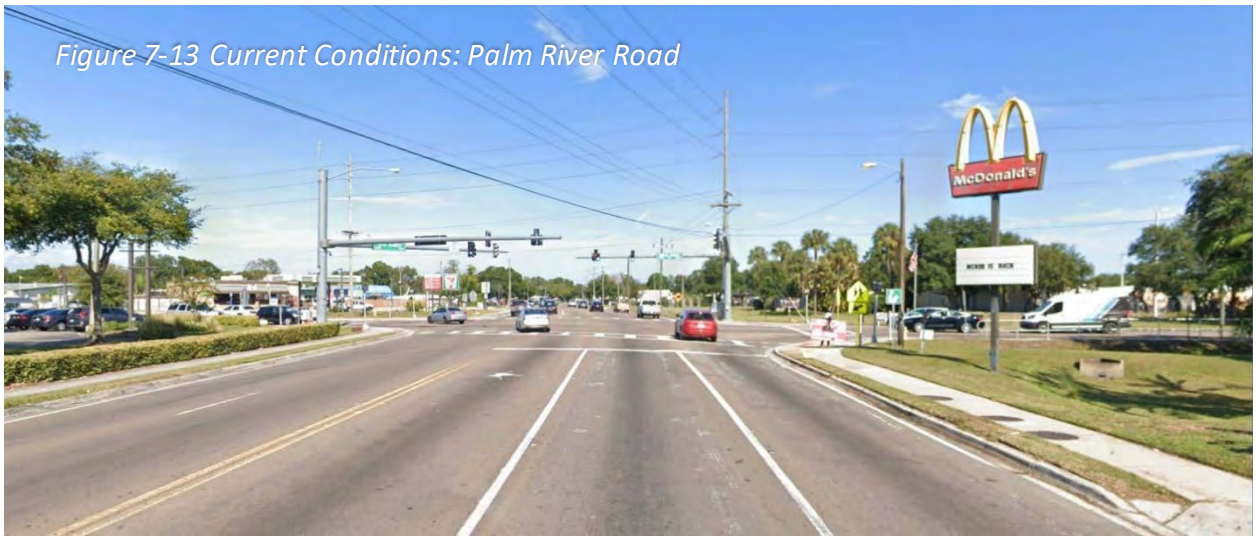


Figure 7-13 Current Conditions: Palm River Road

The third node selected for the South 78th Street Corridor is located at Palm River Road as shown in Figure 7-13. The Community Plan identifies this location as a community node and gateway. Therefore, in addition to continuing the features associated with the road diet at nodes one and two, a roundabout is proposed here. The South Coast Greenway, part of the regional trail network, is also expected to pass through this area. The figure on the following page demonstrates how a roundabout would fit into the existing right-of-way and incorporate the planned South Coast Greenway on the south side of Palm River Road.

Figure 7-14 Proposed Design Elements: Palm River Road

Roundabouts are discussed in Chapter Two of the Complete Streets Guide. The addition of a roundabout as shown in Figure 7-14 establishes a gateway to the Greater Palm River Community that slows incoming traffic to appropriate speeds for the contexts and still moves vehicles safely and efficiently at the intersection. It has the added benefit of providing a location for public art (discussed in Chapter Four) that can enhance the definition of this gateway. The roundabout provides a slower speed environment, with landscaping, trees and the elimination of the traffic signal poles as shown in Figure 7-15.

Figure 7-15 Proposed Conditions Rendering: Palm River Road

Corridor 2: Symmes Road - US 41 to I-75

The Symmes Road corridor is an east-west corridor in the Gibsonton Community Plan area. The study section is almost two miles long, starting at US Highway 41 and continuing west to Interstate 75 as illustrated by Figure 7-16. The two-lane roadway has a volume of 6,600 AADT (2021) with a right-of-way width that ranges from 60 to 98 feet. There are sidewalks on the north side of the roadway, but sidewalks on the south side of the roadway have major gaps. No bicycle facilities are provided. There is limited local transit service on US Highway 41, but no transit service is available on Symmes Road.

The corridor is characterized by suburban scale single family neighborhoods served by a small commercial node at the US Highway 41 intersection. The neighborhoods access Symmes Road via sparsely spaced connections, with very few homes having direct access to the street.

Figure 7-16 Built Form: Symmes Road

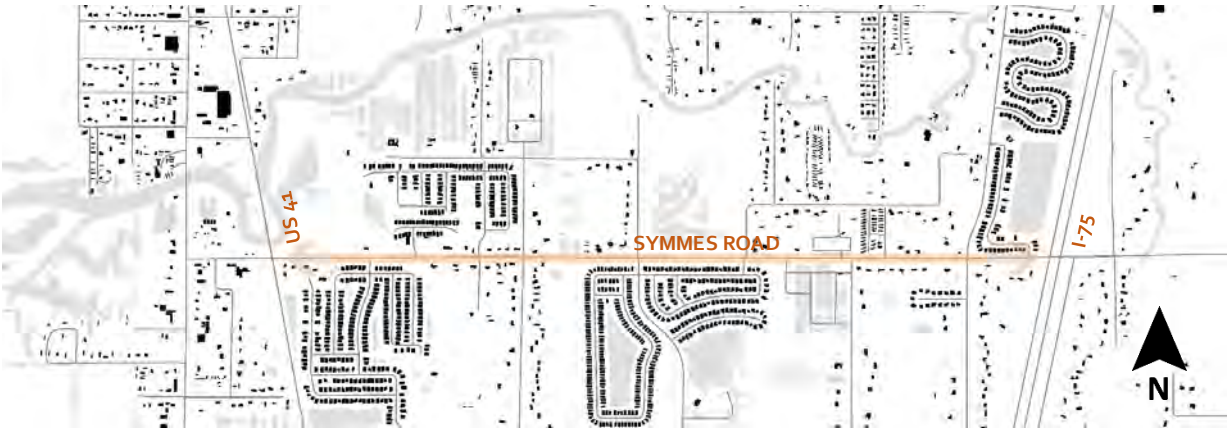
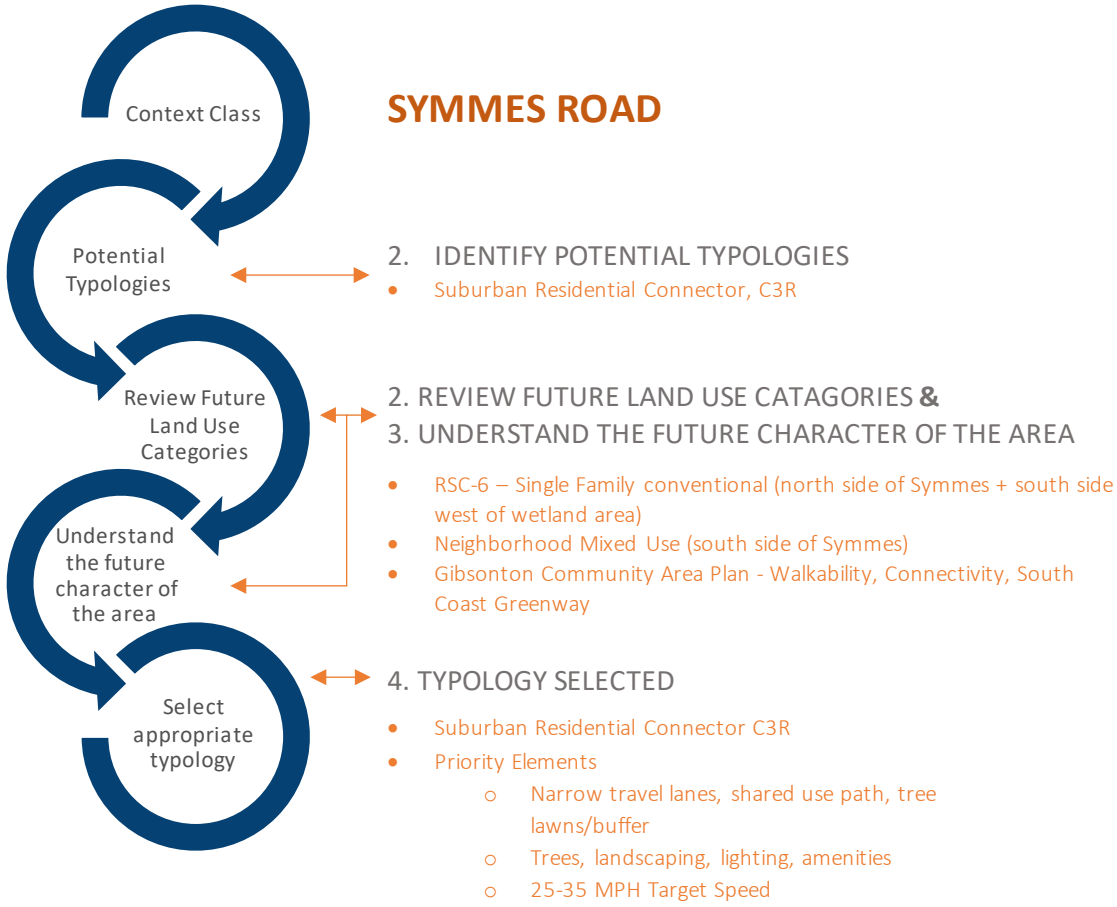


Figure 7-17 Typology Selection Process for Symmes Road



The Comprehensive Plan Mobility Section Map 3, Context Classification Network, shows that this Corridor has a Context Based Classification of Suburban Residential (C3R). As seen in Chapter Three, two potential typologies have been created for this Classification: Suburban Neighborhood and Suburban Neighborhood Connector.

Figure 7-17 illustrates the process to choose a specific typology, first review the Future Land Use and the Gibsonton Community Plan (located in the Livable Communities Element of the Comprehensive Plan) for direction on the plan for the corridor. The Future Land Uses in the area are mainly Residential- and Suburban Mixed Use-6. The Gibsonton Community plan calls for sidewalks and landscaping along Symmes Road. The Plan also calls for the revitalization of the Gardenville Recreation Center, which is located on the west end of the corridor. According to the Greenways and Trails Master Plan, the South Coast Greenway will pass Symmes Road and connect north through Palm River. Given the Future Land Use and Gibsonton Community Plan, along with the fact that the area is predominantly developed with single family homes without direct access to the street, the proper typology selection is Suburban Neighborhood Connector. Table 3-1 in Chapter Three provides direction on how to review the existing and planned land uses to select a typology. This typology allows travel through neighborhoods and connects neighborhoods to other activity areas. Separation is considered between vehicles and pedestrians or bicyclists for safety and comfort.

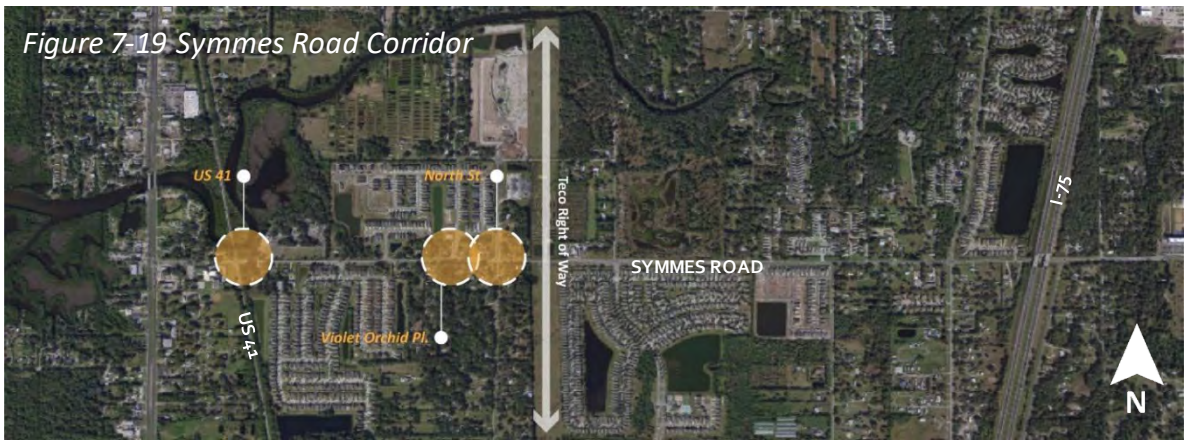
Based on priority elements shown below in Figure 7-18, the typology calls for narrower travel lanes, a shared use path on both sides (preferred) and buffered/landscaped separation of pedestrian and bicycle facilities from the travel lanes. It also calls for a target speed of 25-35 MPH.

Figure 7-18 Typology Suburban Neighborhood Connector

STREET CHARACTERISTICS: SYMMES ROAD CORRIDOR

For this application of the Complete Streets Guide, three locations were selected along Symmes Road: the intersection with US 41, the intersection with Violet Orchid Place, and the intersection with North Street as shown in Figure 7-19. These locations on the Symmes Road corridor were selected because they exhibit right-of-way restrictions, environmental, and utility conflicts.

Figure 7-19 Symmes Road Corridor



Each context described in Chapter Three begins with a summary considerations table that identifies aspects of street design appropriate for each typology within the context. With a

constrained right-of-way, all the priority elements of a Suburban Neighborhood Connector cannot be provided. For the Symmes Road example, we will assume that the project has no funds available for right-of-way acquisition. The designer should choose the higher priority treatments over the lower priority and optional treatments and apply them to the segment in a way that fits the community. Planning for streets in limited right-of-way is discussed in Chapter Four.

Table 7-2 summarizes the recommended improvements that create the future environment for Suburban Neighborhood Connector Street. They include a separated shared use path, and a 10-12-foot Designated Buffer Zone with street trees, landscaping, and lawns.

Table 7-2 – Corridor Summary – Current Conditions and Recommended Improvements

Table 7-2 Corridor Summary	Symmes Road Current Conditions	Recommended Improvements
	2 Mile Area – US 41 to I-75	Potential Typologies: Suburban Residential Connector, C3R
User Features		
Pedestrian and Bicycle	Sidewalk, Transit Stops	Separated Shared Use Path, Boardwalks, Buffer Zones, Closed Sidewalk gaps, Pedestrian Refuges, Greenway Connection
Volumes	6,600 AADT (2021)	Intent to reduce vehicular volume and encourage greater pedestrian volume
Traffic Speeds	Posted Speed of 35 mph – 45 mph	Target Speed of 20 – 25 mph
Traveled Way		
Travel Lanes	2 Travel Lanes	2 Travel Lanes, and a separated Shared Use Path
Lane Width	11-foot Lane Width	10-foot Lane Width
Vehicular ROW	Fluctuating from 60 – 98 feet	Fluctuating from 20 – 30 feet
Median	None	Yes, on crossroads where appropriate to provide pedestrian refuge
Pedestrian Facilities		
Pedestrian Zone - Total	6-foot total, however the Sidewalk is only consistent on one side of the road	6-12-foot total
Sidewalk Width	6 feet	6-foot Sidewalk, 12-foot Shared Use Path
Bicycle Facilities		
Bicycle Accommodations	There are no bicycle facilities, lanes, or accommodations	12-foot Shared Use Path for Pedestrians and Bikes, with 10 – 12-foot Buffer Zones
Transit		
Transit Stops	Local Hart Bus Service only on crossroad US 41	N.A.
Placemaking		
Green Infrastructure	None	10 – 12-foot Designated Buffer Zone with Street trees, landscaping, and lawns
Street Lighting	None	Street lighting, and Pedestrian scale lighting
Parking Management		
On-Street Parking	None	N.A.
Community Planning		
Community Planning Area	Gibsonton	All improvements suggested support the vision of the Gibsonton Community Plan

NODE 1 – SYMMES ROAD AT US 41

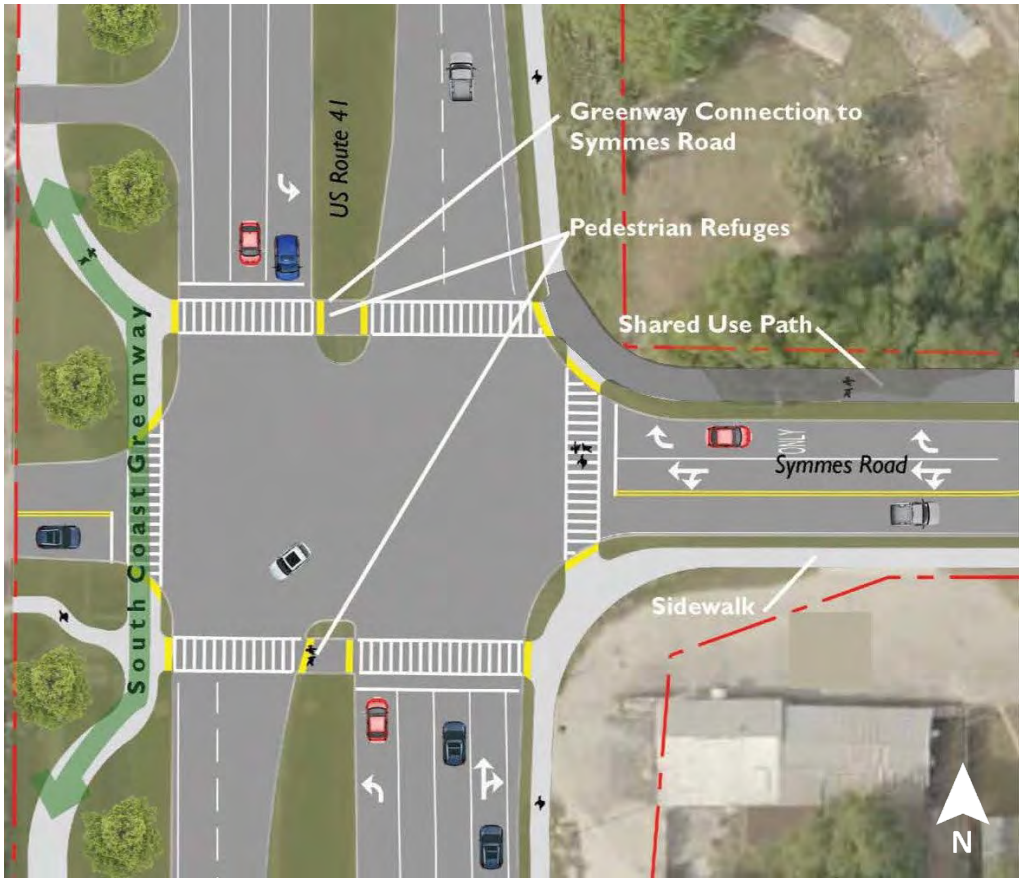
Figure 7-20 Current Conditions: Highway 41

At US 41, the current conditions are typical of the corridor as shown in Figure 7-20. The right-of-way has been dedicated to the automobile, with a dedicated right-turn lane and a through lane in each direction. There are no pedestrian or bicycle facilities. The South Coast Greenway alignment is unknown at the time of this study, but for demonstration purposes an alignment on the west side of US 41 is assumed.

The intersection is zoned for neighborhood-scale commercial fronting US 41 and suburban scale townhomes with limited connectivity to Symmes Road. There are also neighborhood scale commercial businesses on the west side of US 41.

The improvements for this intersection include high visibility crossings provided at all four approaches of the intersection at Symmes Road and US Highway 41 as shown in Figure 7-21, not only to connect the potential Greenway, but also to the businesses in the area. The plan also includes extending the center median further into the intersection to provide protected refuge islands on both north and south approaches, as discussed in Chapter Five. On Symmes Road, a shared use path (darker gray shading) is shown on the north side of the road where there is available right-of-way and can connect to the Greenway. With a 60' ROW, shared use paths are not possible on both sides of Symmes Road. This path provides for pedestrian and bicycle facilities separated from vehicular traffic, improving comfort level for the "interested but concerned" cyclist discussed in Chapter Two. The reduction of required elements should be thoroughly investigated, including a review of the project budget, and consider increases to the budget. For this example, no funds can be made available to acquire the right-of-way needed to provide the facility, so a continuous sidewalk is provided on the south side of Symmes Road and is shaded light grey in the image below. The furniture zone is reduced to provide separation without further sacrificing pedestrian and bicycle facilities.

Figure 7-21 Proposed Design Elements: US Highway 41



The incorporation of pedestrian walkways, bicycle accommodations, pedestrian refuge islands, high-visibility crossings, narrowed travel lanes and a landscaped buffer provide a more comfortable environment with safer connections for full connectivity and walkability as seen in Figure 7-22. The visualization shows how the addition of the Greenway, pedestrian refuge areas, high-visibility crossings and the addition of more landscaping and trees provide a clear delineation of space for all users, while making the intersection safer and more comfortable for vulnerable users even in a project with limited funding to overcome physical constraints. Not every retrofit will result in an ideal complete street, however, following this guide and providing facilities for all expected users, each retrofit can bring the street closer to completeness.

Figure 7-22 Proposed Conditions Rendering: US Highway 41

NODE 2 - SYMMES ROAD: VIOLET ORCHARD PLACE

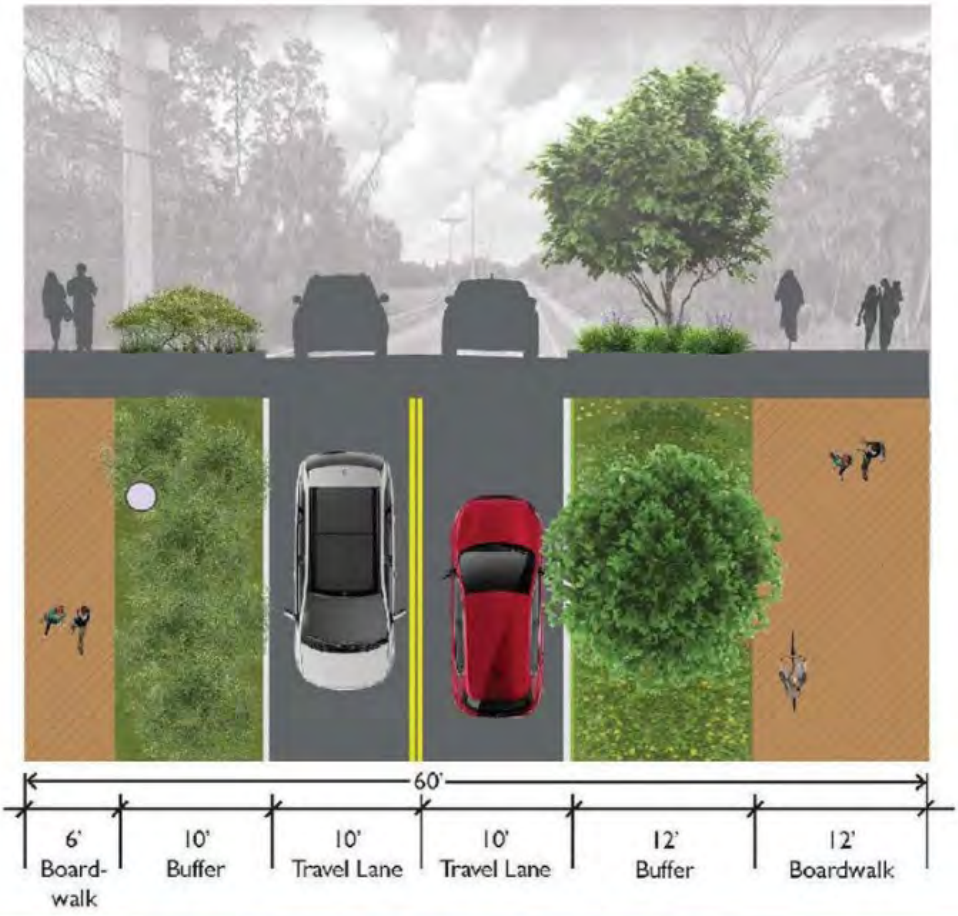
Figure 7-23 Current Conditions: Violet Orchard Place

The current conditions as shown in Figure 7-23 of Symmes Road at the intersection of Violet Orchid Place is characterized by 60-foot right-of-way, with a two-lane roadway, sidewalks located on the north side, and guiderail/fencing along the southern edge of the roadway adjacent to a wetland area. Acquisition of additional right-of-way for all the required street elements is limited by this environmental constraint.

Figure 7-24 Proposed Conditions Plan view: Violet Orchard Place

The provision of the shared use path on the north side of the street is continued into this node. The Symmes Road at Violet Orchard Place aerial plan view, Figure 7-24, identifies the locations of the shared use path at the intersection on the north side of Symmes Road within the right-of-way. The red lines are the right-of-way limits in this segment. The use of boardwalks on both sides of the road minimizes road widening and possible culvert extensions as shown in Figure 7-25. The boardwalks also identify the wetlands as an area of interest and an opportunity to educate the public on the wildlife habitat and its importance to the ecosystem, i.e., *"where streets allow access to (natural) places, there are opportunities to help visitors experience these areas..."*

Figure 7-25 Proposed Design Elements: Violet Orchard Place



COMPLETE STREET DESIGN ELEMENTS

PEDESTRIANS
Boardwalks on Both Sides of Symmes Road
Accessible Walkway

BICYCLISTS
Shared-Use Path

ALL USERS
Narrowed Travel Lanes
Landscaped Buffer
Wayfinding Signage
Ped/Street Lighting

A mid-block crossing is proposed east of the Violet Orchid Place intersection with a Rectangular Rapid Flashing Beacon (RRFB). The nearest pedestrian crossing opportunities are located 500 feet in either direction so the inclusion of a protected mid-block crossing in this area ensures that pedestrian crossings are provided at least every 1/8 mile, as discussed in Chapter Five. This location also allows the pedestrian to fully enjoy the wetland, which is used as a placemaking element.

An ample furnishing zone in the form of 10-12-foot buffers is provided. At this location, opportunities to integrate green infrastructure techniques into the furniture zone should be considered. Separation of the sidewalk from the travel lanes on the south side of Symmes road in this area is not possible to the west due to the extra road width providing a left turn lane at a subdivision entrance. A buffer could be possible if the travel lanes were shifted to the north. The lack of separation may not be ideal where a physical restriction (left-turn lane) is present, but the inclusion of a sidewalk in residential areas is a better outcome than not having the sidewalk at all.

The proposed conditions visualization in Figure 7-26 demonstrates the proposed improvements in a dramatically improved setting. There are two travel lanes, a shared use path on the north side of the street and a sidewalk on the south, a mid-block crossing with RRFB to the east of the intersection, and boardwalks on the north and south side of Symmes Road adjacent to the wetlands. The current 35 MPH posted speed has been reduced to 25 MPH creating a much more accessible, comfortable, and safer environment for all users.

Figure 7-26 Proposed Conditions Rendering: Violet Orchid Place

NODE 3 - SYMMES ROAD AT NORTH STREET

Figure 7-27 Current Conditions: North Street

Symmes Road at North Street is the final node without the minimum right-of-way to include all the required elements of a complete street as illustrated in Figure 7-27. There are two travel lanes and a sidewalk on the north side of Symmes Road that crosses to the south side of the street at the intersection.

Figure 7-28 Proposed Conditions Plan view: North Street

The aerial plan view above in Figure 7-28 shows the continuation of the shared use path along the northern right-of-way then crossing to the south side of the intersection to the east of North Street. The right-of-way at the North Street intersection shifts southward to the east of the intersection.

A sidewalk is proposed on the north side of Symmes Road (opposite that of the shared use path) east of North Street, providing more complete pedestrian access. Switching the shared use path from the north to south side of the street will result in more pedestrian crossings at this location, so care should be taken to provide for enhanced crossing facilities, as discussed in Chapter Four.

In the remainder of the corridor as shown in Figure 7-29, where the right-of-way varies up to 100 feet in width, shared use paths on both sides of the road can and should be provided per the typology's higher priority elements.

Figure 7-29 Design Elements: North Street

COMPLETE STREET DESIGN ELEMENTS

PEDESTRIANS
Walkways on Both Sides of Symmes Road
High Visibility Crossings
Accessible Walkways and Crossings
Smaller Curb Radii
Crossing Beacon at Symmes Road (RRFB)
Raised Crossing (Side Streets)

BICYCLISTS
Shared-Use Path

ALL USERS
Narrowed Travel Lanes
Landscaped Buffer
Wayfinding Signage
Ped/Street Lighting

The improved conditions of the North Street and Symmes Road intersection highlight the residential nature of this segment of roadway and address the inadequate pedestrian facilities. While the expectation for pedestrian and bicycle users is at a moderate level of activity given the suburban location of the segment, the minimum facilities are being provided without changing the character of the suburban environment.

New elements such as the addition of a sidewalk on the south side of Symmes Road, a shared use path to the north, and a high visibility crossing with RRFB ensure a much higher level of safety and comfort as can be seen in Figure 7-30. It should also be noted that the utilities are not impacted and remain in the same location. Additional landscaping, grass and trees are planted for additional traffic calming.

Figure 7-30 Proposed Conditions Rendering: North Street

Conclusion

The intent of this chapter is to show the application of the Complete Streets Guide in an urban corridor in need of a road diet and in a suburban corridor with limited right-of-way. The unique characteristics of these corridors, along with the community desires expressed in community plans, help to identify what elements of the street to prioritize. The resulting streets can be safe for all users and contribute to unique placemaking opportunities inherent in the neighbors they traverse. The chosen locations effectively demonstrate that even in a 60-foot right-of-way, a multimodal network is not only feasible, but realistic, given the engineer or designer employs techniques that have been used throughout the country through best practices highlighted in this Guide.

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Complete Streets Guide

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Appendices

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APPENDICES

Appendix A - Mobility Element

Appendix B - Related Document's Summary

Appendix C - Bicycle Facility Selection Toolkit

Appendix D - Speed Management Countermeasure Toolkit

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Appendix A
Mobility Element

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Mobility

Introduction

This Section of the Comprehensive Plan was formerly called the Transportation Element. It incorporates new themes and policies to promote:

Working Towards Equity
Past discriminatory policies and practices have marginalized racial or ethnic minorities and excluded them from planning and decision-making. The effects are still felt to this day; equity and fairness require proactive steps to rectify them. The Mobility Section seeks to identify and overcome barriers to full participation, alleviate disproportionate burdens and ensure that underserved communities receive a fair share of benefits.

Focusing on Safety
Vision Zero is an international movement aimed at ending roadway deaths. At its core is the belief that death and serious injury on our streets are preventable. The Mobility Section establishes policies to focus on high-crash corridors, manage speeds, design more forgiving roadways, promote better behavior and observance of traffic laws.

Preserving the System
Maintaining the County's multimodal transportation system in good repair, improving its evacuation capability and enhancing its resiliency to withstand and recover from a disaster are also addressed by the Mobility Section.

Promoting Connectivity
To achieve a truly connected system, the Mobility Section addresses safe and convenient connections for multimodal access to community focal points and other destinations.

Putting People First
Streets are recognized as part of a public realm that should accommodate people of all ages and abilities, including transit riders, walkers, bicyclists, wheelchair users, motorists, freight handlers and even electric scooter riders. This approach is known as Complete Streets and can help achieve a safer system, higher quality of life and greater economic development. Enabling people who cannot drive or choose not to own an automobile is another priority of the Mobility Section.

Preparing for New Technology
The transportation landscape is changing rapidly because of the onset of technology such as connected or self-driving vehicles and smart infrastructure. These have been facilitated by the convergence of communication, computer and vehicular technologies. Likewise, shared mobility enables the short-term use of transit, ride-hailing services, shared cars, bicycles and even scooters to get around. The Mobility Section contains policies to evaluate, prepare for and leverage new technology for the greatest public benefit.

Respecting the Context
Context means the area traversed by a transportation corridor. Context-sensitive roads respect the natural environment, the planned land uses and development patterns adjacent to the public right-of-way. Context-based planning and design is a flexible approach to address multimodal needs in different contexts. The Mobility Section classifies the road network into several contexts appropriate for rural, suburban or urban settings.

GOAL 1

Build and maintain a transportation system that supports the needs of all users with respect to ability, resources, identity and mode preference.

Objective 1.1

Engage the public to ensure that all individuals or groups have opportunities to collaborate with the County and provide input in all aspects of transportation planning and implementation.

Policies

1.1.1 Encourage community organizations and representatives, especially those who have been traditionally underrepresented, to participate in developing community plans and transportation strategies for their area and act as liaisons between government and citizens in representing area interests.

1.1.2 As resources are available, utilize a proactive pre-project public engagement process to determine needs in neighborhoods and to provide guidance for future projects, especially within underserved communities.

1.1.3 Expand efforts to involve members of underserved communities in planning activities and decisions by hosting meetings and conducting public outreach in those communities.

1.1.4 Use appropriate field outreach techniques, such as door-to-door or street canvassing, that will most effectively maximize participation in the communities affected before, during and after transportation planning and project implementation.

1.1.5 Build positive rapport with the public by ensuring and demonstrating that their comments are heard, analyzed and followed up on.

Objective 1.2

Consider both positive and negative socio-economic, physical and mental health impacts of transportation projects, especially on underserved communities including people with disabilities, chronic diseases and limited resources.

Policies

1.2.1 Support projects and strategies that lead to lower vehicle emissions, improved air quality, lower rates of asthma and other chronic diseases, or promote active transportation such as walking and bicycling.

1.2.2 When prioritizing projects, support routine roadway maintenance and infrastructure improvements benefiting underserved communities.

1.2.3 Prioritize projects that enhance multimodal access to parks, recreation, health care, healthy food, better jobs, schools and other community elements.

1.2.4 Consider the effect of tolls and managed lanes on low-income households and ensure that there are alternative facilities for those who aren't able to pay the toll, or that they have other ways to access such facilities, such as transit and high-occupancy vehicles.

1.2.5 Any potential tolling strategy should mitigate induced demand and support the County's growth management approach.

Objective 1.3

Recognize and avoid repeating past injustices, strive to alleviate or mitigate disproportionate burdens on underserved communities and ensure that they receive a fair share of benefits.

Policies

1.3.1 Prioritize transportation projects in underserved communities, especially low-income and minority communities, that increase access to community services and employment opportunities.

1.3.2 Ensure projects serving a larger need are aligned to avoid, minimize or mitigate impacts, particularly those resulting from expanded right-of-way, to neighborhoods and underserved communities.

1.3.3 Increase access to convenient and affordable transportation options, such as frequent bus service, prioritizing those communities that have historically been underserved, underrepresented or have borne unequal burdens.

1.3.4 Engage business stakeholders to assess workforce mobility needs, ensuring companies and employment centers have access to the full range of the labor force, including those without personal transportation.

1.3.5 Encourage private transportation network company (TNC) operators to share data that supports ongoing transportation planning and implementation with a focus on equity and access for all.

GOAL 2

Achieve Vision Zero by providing a multimodal transportation system that prioritizes the safety of all roadway users.

Objective 2.1

Use an integrated Safe Systems Approach to develop and design improvements.

Policies

2.1.1 Utilize speed management, re-evaluating design and posted speeds to achieve target speeds based on context classification and other applicable best practices.

2.1.2 When prioritizing transportation projects, consider increased funding for safety and speed management projects.

2.1.3 Employ context-sensitive and user appropriate complete streets guidelines and standards to implement strategies such as buffered bike lanes, sidewalks on both sides, appropriately spaced crosswalks, safety lighting, trees and separation of modes traveling at different speeds to calm traffic.

2.1.4 Implement travel lane width reductions appropriate to the context to provide space for sidewalks, bike facilities and other multimodal enhancements.

2.1.5 Ensure that funding for context-sensitive street lighting is provided to enhance the safety of collector and arterial roadways.

2.1.6 Pursue improvements to retrofit existing roadways that require little capital outlay (i.e., signage, re-striping, shared-use lanes and appropriate traffic control measures), but will integrate multimodal facilities and improve safety, comfort and access of bicyclists and pedestrians.

2.1.7 Where bike facilities or sidewalks are not currently part of the road, include these facilities in maintenance, resurfacing or restriping projects when feasible.

Objective 2.2

Protect vulnerable users, such as bicyclists, pedestrians, children, seniors and people with disabilities, through a Safe Systems Approach, speed management techniques and context-sensitive multimodal facility design.

Policies

2.2.1 Employ context-sensitive and user appropriate complete streets guidelines and standards for the design of streets that inform and provide for pedestrian crossings, target speeds, modal separation and visibility appropriate to ensure that vulnerable users are prioritized, and fatal and severe crashes are eliminated.

2.2.2 Provide safe, convenient, signalized or unsignalized roadway crossings that are easily identifiable by pedestrians and motorists, spaced at appropriate intervals given the context of the roadway.

2.2.3 Utilize techniques such as extended crossing times, audible pedestrian signals, leading pedestrian intervals and other assistive devices to enable all users to cross streets safely.

2.2.4 Utilize innovative materials for pedestrian facilities where feasible, especially if they improve mobility and safety for people with disabilities.

2.2.5 Design driveway crossings of sidewalks, pathways and bike facilities so that motorists have adequate visibility to react and yield to approaching users.

2.2.6 Minimize driveways near intersections and lessen their entry speed to reduce conflict with vulnerable users and prevent serious injuries or fatalities.

2.2.7 Implement Safe Routes to Schools improvements and other walk and bike education programs to increase safety and to reduce school-related vehicle trips.

Objective 2.3

Assist in the equitable education of road users and the fair enforcement and administration of traffic laws, consistent with established Vision Zero principles.

Policies

2.3.1 Support measures to implement consistent, equitable and fair enforcement of traffic safety laws, reduce violations and ensure vulnerable users' rights to share the roadway.

2.3.2 Support law enforcement strategies that aim to reduce traffic violations that contribute to severe injuries and fatalities, using a data-driven approach.

2.3.3 Support education programs for the proper use of multimodal facilities by all users.

2.3.4 Consider technologies such as red-light cameras, near-miss detection and vehicle to infrastructure (V2I) technology.

2.3.5 Consider technological applications, such as radar feedback signs and messaging, to emphasize that the speed limit is the maximum allowable speed.

Objective 2.4

Use a Safe Systems Approach to identify current and potential future high-injury corridors and make improvements to them.

Policies

2.4.1 Improve transportation system safety for all modes by reducing the Countywide crash rate, adhering to Vision Zero principles and using the Transportation Planning Organization's (TPO) adopted performance measures, targets and monitoring to track progress on reducing fatalities and serious injuries.

2.4.2 Collaborate with the TPO, Florida Department of Transportation (FDOT), the Sheriff's Department, the School Board, the Community Traffic Safety Team (CTST) and other related agencies to implement Vision Zero strategies.

2.4.3 Program improvements, such as design features, improved traffic controls, and increased public awareness and enforcement, on high-injury corridors to address factors contributing to those injuries.

2.4.4 Establish pre- and post-project evaluation measures with qualitative and quantitative techniques, such as measuring injury/fatality reduction, capturing user observations and gathering input from user surveys to refine and update the Safe Systems Approach to high-injury corridors.

GOAL 3

Maintain the system in good repair, preserve assets and improve resiliency to climate change.

Objective 3.1

Maintain existing transportation infrastructure while repairing or replacing deficient facilities.

Policies

3.1.1 Maintain existing transportation infrastructure to ensure safe operating conditions and avoid costly and premature reconstruction or replacement.

3.1.2 Maintain roadway markings and visibility, especially at intersections, by providing streetlights, well-maintained signals and signage, and appropriately spaced and preserved landscape.

3.1.3 Monitor sidewalks, on-road bikeways and trails to keep them clean, free of debris and overgrowth, and in good repair to accommodate adequate and safe bicycling and walking.

3.1.4 Prior to full replacement of deficient or underutilized facilities, evaluate the need to continue operating those facilities.

3.1.5 Repair or replace deficient transportation infrastructure, including but not limited to bridges, pavement, sidewalks, trails and traffic control devices.

3.1.6 Ensure transportation system design and construction is consistent with adopted County or State design standards and the Context-Based Classification Plan.

3.1.7 Prioritize non-mobility fee transportation improvement funds to ensure that ongoing maintenance needs are balanced with those that increase capacity.

3.1.8 Explore installation of underground utilities where appropriate to the context and feasible to protect them from extreme weather, remove roadside obstacles and reduce the need to prune trees.

Objective 3.2

Support the maintenance of public transportation assets.

Policies

3.2.1 Prioritize roadway maintenance along Hillsborough Area Regional Transit Authority (HART) corridors to ensure reliability of the transit service, with special consideration for resurfacing projects.

3.2.2 Prioritize sidewalk repairs and maintenance of connections to HART bus stops, including crosswalk improvements, signals and streetlights as necessary and feasible to enhance pedestrian safety and access.

3.2.3 Where feasible, support transit by providing County-owned property for park and ride lots and maintenance facilities, as requested by HART.

3.2.4 Support Sunshine Line in maintaining their vehicles, equipment and facilities in a state of good repair and replacing them when they reach the end of their service life.

Objective 3.3

Maintain or improve the capability of the multimodal system to evacuate vulnerable populations and enhance the system's resiliency to withstand and recover from a disaster.

Policies

3.3.1 Coordinate with public and private sector organizations on the provision of infrastructure such as evacuation routes and shelter capacity, on the preparedness of target populations such as those who are historically marginalized or have mobility challenges, and on post-disaster recovery.

3.3.2 Coordinate with the TPO to prioritize transportation improvements for evacuation routes.

3.3.3 Mitigate or avoid disruption and damage to roads, bridges, terminals, transit fleet, facilities and equipment from inundation and storm surge.

3.3.4 Support diversified modes of transportation to aid in evacuation and resiliency.

3.3.5 Continue to educate the public about who needs to evacuate and who can shelter in place under given circumstances, as well as the nearest safe locations and shelters, to minimize traffic and reserve road capacity for other emergency purposes.

3.3.6 Evaluate, harden, repair or relocate critical facilities that are most vulnerable to flooding.

3.3.7 Implement technologies, strategies and improvements that ensure that facilities are operational after a disaster.

GOAL 4

Provide safe and convenient connections within the transportation network that support multimodal access to key destinations, such as community focal points, employment centers and services throughout the County.

Objective 4.1

In urban and suburban contexts, design communities around a grid network of streets, or a modified grid, which will improve interconnections between neighborhoods and surrounding neighborhood-serving uses.

Policies

4.1.1 Update standards and guidelines for the context-sensitive spacing of arterial, collector and local roads to create a grid or network that supports the safety and mobility of expected users.

4.1.2 Require pedestrian and bicycle interconnections between adjacent, compatible development, and where appropriate, require vehicular interconnections.

4.1.3 Incorporate context-sensitive subdivision and access management standards that provide for multiple connections for modes and routes.

4.1.4 Ensure that roadways accepted by the County for ownership and/or maintenance serve a public purpose by:

A. Completing the connection between two or more roadways defined as arterial, collector, or major local roads; or

B. Stubbing out to adjacent properties that can reasonably provide opportunities to complete connections between two or more roadways defined as arterial, collector, or major local road; or

C. Providing a significant public health benefit through enhanced multimodal connectivity and/or improved safety; or

D. Connecting community facilities to the surrounding population.

4.1.5 Identify and communicate to residents where multimodal connections exist or are planned.

Objective 4.2

Update the Corridor Preservation Plan to protect future right-of-way from encroachment, provide connectivity and ensure multimodal transportation corridors are adequate to serve planned growth and to support development patterns as defined in the Future Land Use Element.

Policies

4.2.1 Collaborate with FDOT, the TPO, HART, Plant City, Tampa and Temple Terrace to develop and maintain a Corridor Preservation Plan Map (Map 1). This map will identify the number of lanes, general right-of-way needs, alignments and multimodal facilities for all transportation corridors, including transit and multi-use trails, primarily within the Urban Service Area.

4.2.2 Review and update the Corridor Preservation Plan to address the growth and mobility needs of the County prior to each update of the TPO's Long Range Transportation Plan (LRTP).

4.2.3 Ensure that new developments are consistent with the adopted Corridor Preservation Plan by reviewing them during the site and subdivision plan review process.

4.2.4 Coordinate the design of roadway improvements with the jurisdictions in which those roadways are located. The preservation of right-of-way will be based on the Corridor Preservation Plan or policies of the relevant jurisdiction.

4.2.5 Collaborate with FDOT, HART, the TPO, Plant City, Tampa and Temple Terrace to integrate the Future Transit Corridors Plan with the Corridor Preservation Plan to address the growth and mobility needs of the County. Continue to preserve transit right-of-way consistent with the Transit Right-of-Way Preservation Corridors Map (Map 2).

GOAL 5

Create a sustainable transportation system that allows people to take their mode of choice to access necessities, opportunities, recreation and each other.

Objective 5.1

Balance the need for single-occupant vehicle capacity on the multimodal transportation network with sustainable fiscal, environmental, social or economic outcomes by prioritizing investments in Transportation Systems Management and Operations (TSM&O) and alternative forms of transportation.

Policies

5.1.1 Maintain the listing of deficient roads within the transportation system. Deficient roadways, found in Table 3 of the Capital Improvements Element (CIE), are those roadways that, based on the Level or Quality of Service Report, do not meet the adopted standards.

5.1.2 With each update of the Capital Improvements Program (CIP), prioritize funding parallel facilities to constrained roads. Where this action impacts non-County owned roads, it will be coordinated with FDOT and respective jurisdictions.

5.1.3 State and County roadways that cannot be widened further due to neighborhood or business impacts, adopted community plans, policy, environmental or other right-of-way constraints, have been identified and designated as constrained. The Constrained Roadway List can be found in Table 4 of the CIE.

5.1.4 Prior to each update of the TPO's LRTP, reevaluate the Constrained Roadway List to fairly balance community preservation, safety and the protection of established communities with reducing growing traffic congestion.

5.1.5 Reduce existing multimodal deficiencies by completing the projects listed in the CIE.

5.1.6 Prioritize improvements supporting transit and other multimodal investments on constrained and deficient roads to reduce vehicular demand and support sustainable modes of transportation.

Objective 5.2

To provide an interconnected system of safe and convenient multimodal facilities for all travel purposes, establish and maintain quality or level of service standards within the CIE for bicycle, pedestrian, transit and vehicular mobility on the multimodal transportation network.

Policies

5.2.1 Establish the multimodal levels or quality of service standards for all State and County roads on the multimodal transportation network within the CIE.

5.2.2 On a periodic basis, update the Level or Quality of Service Report to include existing and anticipated capacities, multimodal levels or quality of service and other relevant metrics and publish it for public review and use.

Objective 5.3

New development shall mitigate its impact on the multimodal transportation network.

Policies

5.3.1 Use mobility fees to help maintain the multimodal level or quality of service standards on the multimodal transportation network, pursuant to the Mobility Fee Ordinance.

5.3.2 Provide funding, as established in the County's Transportation Mobility Fee Program ordinance, to assist the FDOT with projects within the County.

5.3.3 Implement measures to reduce average trip distance, such as additional street connectivity, fostering more local retail and service business to support a mix of land uses.

5.3.4 Consider existing and future development allowed under adopted Future Land Use Element categories in projecting future multimodal transportation needs.

5.3.5 Evaluate the availability of multimodal transportation infrastructure when considering Future Land Use Map changes that increase density and intensity. Factors to consider include, but are not limited to, connections to transit, proximity to employment or affordable housing, internal trip capture, support of multimodal system, and increasing connectivity.

5.3.6 Discourage sprawl, which disproportionately increases the cost of providing and maintaining multimodal facilities and services.

Objective 5.4

Support HART in efforts to identify and increase frequency of service to higher density and intensity areas, bus emphasis corridors, transportation disadvantaged communities, Neighborhood Revitalization Strategy Areas and Low-Moderate Income Areas as defined by the Department of Housing and Urban Development (HUD).

Policies

5.4.1 Serve lower-density areas with alternatives such as flexible routes, on-demand service, carpools, vanpools and mobility hubs.

5.4.2 Collaborate with HART to work toward achieving the appropriate transit quality of service based on the density and intensity of the surrounding land use, as shown in Table 6 in the CIE.

5.4.3 Prioritize redevelopment areas and infill job centers for investment to ensure modern infrastructure for movement of vehicles, services and the workforce so that these areas can reach their full potential as marketable locations for office and industrial development.

Objective 5.5

Collaborate with HART and other providers to support the needs of the community through increased efficiency and competitiveness of the transit system.

Policies

5.5.1 Collaborate with HART to implement technologies and traffic management strategies that support the efficiency and reliability of the transit system, such as queue jumps at key intersections and transit signal prioritization.

5.5.2 Collaborate with HART in the development review process to identify opportunities for design and facility improvements to encourage transit use.

5.5.3 Coordinate with HART to design designated new roadways and roadway improvements with transit lanes, pull-off areas and/or comfortable and well-lit bus stops, where appropriate.

5.5.4 As requested by HART, require bus stop facilities and appropriate access to those facilities to be designed as part of new private development projects.

5.5.5 Promote access to transit via a safe multimodal network through street and site design guidelines and capital improvements that complete the network in the vicinity of existing and planned transit stops and encourage bicycle, pedestrian and public transit use.

Objective 5.6

Work with HART, the Florida Commission for the Transportation Disadvantaged and other providers to improve the mobility of transportation disadvantaged populations through paratransit and other services.

Policies

5.6.1 Continue to work as the designated Community Transportation Coordinator (CTC) to coordinate, plan for and expand services to the transportation disadvantaged.

5.6.2 In consultation with affected stakeholders, develop strategies to incentivize the location of new facilities that have a high percentage of clients who are transportation disadvantaged (e.g., new nursing homes, group homes and Community Residential Homes) within HART's Americans with Disabilities Act (ADA) service area.

5.6.3 Identify capacity within the coordinated system and fund expanded service to work, school, healthcare, shopping and social destinations for the transportation disadvantaged population. Prioritize transportation disadvantaged trips in areas outside of the HART service area.

5.6.4 Continue to implement the County's ADA Transition Plan for the construction of sidewalks, crosswalks, wheelchair ramps and improved access to bus stops on all County-maintained facilities.

Objective 5.7

Build a comprehensive bicycle/pedestrian system, including multi-use trails or side paths, sidewalks, pedestrian crossings and on-road bicycle facilities, to attract more people to walk and bicycle for all trip purposes.

Policies

5.7.1 Incorporate a bicycle and pedestrian network adequate to support population growth at adopted levels of service into the Corridor Preservation Plan.

5.7.2 Seek opportunities to construct multi-use trails or side paths adjacent or parallel to limited access highways, along drainage channels, shorelines, and various utility and railroad right-of-way.

5.7.3 Use trails and shared-use paths to connect schools, neighborhoods, parks, greenways, and civic, residential, and commercial districts, excluding paths through preserves and conservation parks. Use techniques such as cooperative agreements, easements, public right-of-way and Land Development Code standards.

5.7.4 Connect or accommodate future connections to planned and/or existing trails within new development.

5.7.5 Encourage the creation of nonmotorized connections in areas where roads are unlikely to be added, including large residential developments.

5.7.6 Provide access to trailheads, especially those serving coastal resources, lakes and other natural areas for residents and “ecotourism.”

5.7.7 Coordinate trail planning among neighboring jurisdictions to enhance the trail network and linkages.

5.7.8 Evaluate ways to fund trails and shared-use paths used for mobility (including, but not limited to, developer contributions) and implement those initiatives supported by the BOCC.

5.7.9 In cooperation with state, regional and local entities, ensure no actions are taken that impair the access to or use of trails and shared-use paths used for mobility.

GOAL 6

Build a smart system that utilizes technology and strategies to improve safety, efficiency and reliability for all modes of transportation and to meet the needs of all users.

Objective 6.1

Address roads that are deficient regarding level of travel time reliability, user delay cost and safety of all users.

Policies

6.1.1 Monitor effectiveness of strategies to reduce deficiencies, maximize existing roadway capacity and improve travel time reliability. Adjust or further implement them as CIPs are updated.

6.1.2 Establish an ongoing program to evaluate intersection capacity and traffic signals to determine if context-sensitive improvements can be made to safely enhance traffic flow and improve crossings for non-motorized travelers.

6.1.3 Cooperate with FDOT on the issuance of permits for driveway curb cuts and median openings on the State Highway System during development site plan review prior to the issuance of permits.

6.1.4 Encourage consolidation of site access points on the multimodal transportation network during the site and subdivision plan review process.

6.1.5 Consistently implement standards for providing cross-access among parcels fronting arterial roads, consistent with access management policies and the need for safe, consolidated access points.

Objective 6.2

Modernize the County's traffic management center to monitor and optimize the performance of pedestrian, bicycle, transit and vehicle travel, expand the Intelligent Transportation System (ITS) network and leverage "big data" for improved real-time monitoring of system and assessment of multimodal needs.

Policies

6.2.1 Monitor roadway conditions, minimize disruptions, provide predictable travel times, respond to emergencies and inform road users.

6.2.2 Implement TSM&O and ITS strategies to enhance traffic flow, manage access, improve safety, support multiple modes and increase the throughput of people and vehicles.

6.2.3 In conjunction with FDOT and municipalities, update or replace existing traffic control devices as needed to ensure that they are compatible with ITS, interoperable with legacy systems and devices owned by other jurisdictions, provide transit signal priority and take advantage of advances in technology.

6.2.4 Implement an arterial surveillance program to detect and manage incidents, establish protocols with first responders to clear lane blockages and achieve improved reliability and operations.

6.2.5 Collaborate with neighboring jurisdictions, technology providers and the private sector to ensure coordination across City and County lines for leveraging new technologies.

6.2.6 Include bicycle-sensitive traffic control signals, appropriately identified with road markings and signs, in all intersection improvement projects and new construction.

Objective 6.3

Increase person-trips and reduce vehicle miles traveled (VMT), especially in peak periods, by supporting sustainable transportation alternatives, off-peak travel, closer destinations and other Transportation Demand Management (TDM) strategies.

Policies

6.3.1 Continue to support ridesharing and transit usage by encouraging County employees to enroll in ridesharing programs, such as providing discounted vanpool and bus passes to employees for commute trips, and by developing flex-time and telecommuting programs.

6.3.2 Continue to support public/private partnerships such as micromobility opportunities and Transportation Management Organizations (TMOs to promote TDM strategies and programs in regional activity centers and other densely developed areas.

6.3.3 Coordinate with TMOs to encourage employers to adopt strategies such as flexible work hours, compressed work weeks, staggered start times and telecommuting to reduce peak period congestion.

6.3.4 Develop strategies to reduce vehicular travel on deficient roadways, including specific timeframes and measurable goals for reducing VMT, and monitor their performance.

6.3.5 Utilize standards and guidelines to ensure that new development and redevelopment provide onsite bicycle and pedestrian facilities that connect to adjacent, offsite facilities.

6.3.6 Create incentives supportive of transit, vanpool and carpool usage, such as requiring transit amenities and facilities in development projects, and promoting pedestrian-friendly, disability-friendly environments in development and redevelopment.

6.3.7 Encourage mode shift through the provision of pedestrian and bicycle commuting amenities such as secure bicycle storage, showers, lockers and curbside amenities such as weather protection, benches and canopies/shading at County facilities and within private commercial and office developments.

Objective 6.4

Develop and implement comprehensive multimodal parking and curb space management programs.

Policies

6.4.1 Work with the private sector to provide incentives for trip reduction through strategies such as pricing and preferential parking and drop-off for carpool, vanpool and other shared vehicles in mixed-use developments and major employment centers.

6.4.2 Update the Land Development Code to provide context-sensitive standards and incentives for private development to integrate transit connections and facilities identified in the Transit Development Plan.

6.4.3 Encourage private development to provide pedestrian, bicycle and transit facilities onsite through context-sensitive regulatory changes including but not limited to reducing parking requirements.

6.4.4 Encourage new development and redevelopment to provide bike parking facilities.

6.4.5 Manage curb space to meet the dynamic demands for space, support food and package deliveries, and facilitate TNC drop offs in appropriate locations.

Objective 6.5

Pursue corridor widening strategically, maximizing existing roadway capacity and increasing capacity for vehicular and transit movement while considering lower-cost alternatives, such as increased frequency on existing transit routes.

Policies

6.5.1 Evaluate corridors with frequent transit service for improvements to increase reliability, such as dedicated transit lanes and signal prioritization, especially in cases where transit compares favorably with the cost and convenience of driving and parking.

6.5.2 Develop plans to provide cross access for developments that front on collector or arterial roadways. FDOT participation shall be requested in the planning process for projects fronting on the State highway system.

Objective 6.6

Improve multimodal surface transportation connections to major military installations, tourist destinations, airport, port, ferry, rail and intermodal terminals for passengers and freight.

Policies

6.6.1 Coordinate with MacDill Air Force Base on mobility and transit improvements that impact the base, including but not limited to, express bus, vanpool and ferry connections.

6.6.2 Encourage the development and implementation of transportation and wayfinding programs that further enhance the connectedness of tourism assets, including hospitality, local businesses, event centers, conservation parks and preserves, and other destinations.

6.6.3 Collaborate with Port Tampa Bay (PTB), the Hillsborough County Aviation Authority (HCAA), the TPO and FDOT to assess the need to provide or improve intermodal links to airports, seaports and rail/trucking facilities when Master Plans are updated.

6.6.4 Work with the PTB, HCAA, HART, TBARTA and other transportation agencies in the pursuit of efficient passenger and freight connections between Tampa International Airport (TIA), regional transit, the cruise ship terminals on the Garrison Channel and other port facilities.

6.6.5 Coordinate with HART, TBARTA, FDOT and other agencies to ensure that rail terminals, whether for light rail, commuter rail or inter-city rail, are accessible by bus transit.

6.6.6 Manage and maintain a safe, efficient and reliable freight street network to provide freight access to and from intermodal freight facilities, industrial and commercial districts, and the regional transportation system.

6.6.7 Invest to accommodate growth of freight volumes and ensure designated routes and facilities are adequate for over-dimensional trucks and emergency equipment.

6.6.8 Every five years, review and, as necessary, update the Truck Route Plan, ordinance and associated map to balance the efficiency of goods movement with neighborhood traffic concerns associated with truck traffic.

6.6.9 In collaboration with the TPO and FDOT, maintain and update the inventory (including maps) of the major commercial truck and railroad terminals, freight activity centers and intermodal logistics centers within Hillsborough County documented in the Tampa Bay Regional Strategic Freight Plan.

Objective 6.7

Monitor and support emerging technologies and strategies that improve safety, sustainability, efficiency and access for all modes of travel on existing and planned transportation facilities, as appropriate for the context.

Policies

6.7.1 Examine evidence-based practices and methods for implementation of autonomous and connected vehicle technology and shared mobility and micromobility solutions, such as electric scooters and bicycles.

6.7.2 Create a more connected traffic network through emerging technologies.

6.7.3 Consider context, equitable access, maintenance needs and necessary storage space when considering where and how particular technologies will be implemented.

6.7.4 Consider how new technologies and emerging alternative transportation options will impact vehicle trips, pedestrian and bicycle networks, parking and curb space demand, and the safety of vulnerable users.

6.7.5 Prioritize safety where different modes of transportation, particularly electric-powered options, share the same facility.

6.7.6 Work with transportation providers, such as car and bike share providers, to provide access and maintain affordability of their services throughout the County where feasible.

6.7.7 Incentivize the use of electric vehicles through the implementation and expansion of electric vehicle charging stations.

GOAL 7

Provide a multimodal transportation system that supports planned Future Land Use, respects historical and cultural assets, supports the identity of the surrounding community and protects the natural environment.

Objective 7.1

Design roadways appropriate to the Future Land Use category that they traverse.

Policies

7.1.1 The Context-Based Classification Plan for County roads in the multimodal transportation network, with context classifications defined in Table 1 (page 34) and depicted on Map 3 is hereby established.

7.1.2 Follow the complete street guidelines that refine the Context-Based Classification Plan and prioritize vulnerable users, informs standards for on-street parking provision and management, access management, interactions among modes, street design and curbside management.

7.1.3 Consider the scale and character of surrounding land use and complete streets concepts in the design and construction of new roadways and the widening of existing roadways.

7.1.4 Set speeds based on context classification and expected users of roadways. Within urban and developed rural areas, the criteria that applies to all public roadways includes the consideration of the character of surrounding land uses, existing and potential pedestrian and bicycle traffic, and recent crash history.

7.1.5 Examine freight activity centers to understand the type of traffic activity and context of the areas surrounding them when implementing transportation projects.

7.1.6 Where applicable, the County will implement standards like building placements, building volumes, architectural features, and landscaping features using Context-Based Classification to link mobility and land use plans.

Objective 7.2

Minimize adverse impacts to residential and commercial neighborhoods and environmentally sensitive land.

Policies

7.2.1 Conduct corridor studies, including an environmental justice analysis, prior to any right-of-way acquisition for new road construction or major road widening to assess the impacts to adjacent areas and provide avoidance, minimization or mitigation mechanisms for adverse impacts.

7.2.2 Require the location and design of public roads and bridges to avoid, minimize or mitigate adverse impacts to wildlife habitats and vegetative communities.

7.2.3 Wildlife underpasses and overpasses shall be used to address transportation infrastructure's potential impact on wildlife corridors and habitats.

7.2.4 Coordinate mobility improvements with natural resource agencies and County environmental staff to avoid, minimize or mitigate adverse impacts on wetlands, wildlife habitats and corridors, and other environmentally sensitive lands.

7.2.5 In coordination with the One Water Chapter, integrate green infrastructure into capital improvements planning and transportation infrastructure projects when feasible, including but not limited to roadways, sidewalks, medians and transit stations.

7.2.6 Coordinate with the Tampa Regional Office of the Division of Historical Resources, Florida Department of State, natural resource and environmental agencies to provide for the consideration of the area's historic, cultural, tribal and natural resources when new and expanded roadways are proposed.

7.2.7 Preserve existing stands of trees and/or provide new tree plantings associated with any roadway expansion or new construction.

Objective 7.3

Protect neighborhoods from adverse impacts of through traffic and travel speeds while providing reasonable access to and from residential areas.

Policies

7.3.1 Future roadway construction and reconstruction shall be designed and planned to mitigate adverse impacts on adjacent residential neighborhoods through such techniques as, but not limited to, landscaping to buffer visual effects and the use of sound walls.

7.3.2 Continue to utilize appropriate traffic calming devices and roadway design principles to ensure speed is managed based on context.

7.3.3 Continue to provide support to community and civic groups that undertake voluntary roadway landscape programs in their local communities through education and assistance in addressing requirements.

Objective 7.4

Construct complete streets to achieve safety, comfort and aesthetics for appropriate users and modes.

Policies

7.4.1 Implement complete streets typologies based on the Context-Based Classification Plan.

7.4.2 Evaluate retrofitting roads with mid-block crossings, consistent with context classifications and surrounding land uses that attract non-motorized travelers.

7.4.3 Implement regulations to improve the appearance of roadway corridors, including but not limited to, adding plantings to medians and regulating the number of billboards along a corridor.

7.4.4 Provide design features to emphasize the gateway character of designated roadways at the entrances to the County and to local communities.

7.4.5 Where appropriate, include art, creative design, cultural and historical markers, and other similar enhancements within the public right-of-way.

Table 1
Context-Based Classification Matrix

Context-Based Classification		Characteristics	Future Land Use Typically Surrounding the Corridor	Note
Rural (C1&C2)		Preserved land in a natural or wilderness condition, sparsely settled lands, may include agricultural land, grassland and wetlands	Natural preservation, agriculture, mining, planned environmental community, low density residential	Includes all areas outside the Urban Service Area. Excludes areas that can be designated Suburban Town.
Suburban	**Residential** (C3R)	Most residential uses within a disconnected or sparse roadway network	Residential	Includes land uses that constitute the Suburban Development Area and Non-Residential Development Area, as well as land uses within the Urban Development Area that are expected to grow to suburban population or employment densities.
	Commercial (C3C)	Mostly non-residential uses with large building footprints and large parking lots within a disconnected or sparse roadway network	Suburban mixed-use, neighborhood mixed-use, research/corporate park, light industrial, heavy industrial, energy industrial park	
Suburban Town (C3T)		Small concentrations of mixed-use areas or town centers, or developed areas which are immediately surrounded by low to medium density residential areas	Suburban mixed-use, neighborhood mixed-use, low to medium density residential	Areas with planned development forms where lower speed is required, including: 1) Areas described in the Livable Communities Element as walkable centers, walkable Overlay Districts identified in the Land Development Code and developed town centers in Mixed-Use Developments of Regional Impact (DRI); 2) The top 20 Severe Crash Corridors involving people walking or biking identified in the Vision Zero Plan that are not otherwise designated C4.
Urban General (C4)		Mixed-use set within a well-connected roadway network, highest densities within Urbanized Areas	Community mixed-use, urban mixed-use, office commercial, regional mixed-used, innovation corridor mixed-use, higher density of residential	Includes the land uses that constitute the Urban Development Area and are expected to reach urban population and employment densities or are described in the Livable Communities Element as walkable centers

*These will be added to the **Definitions** section in the final version of the Comprehensive Plan.*

Built Environment
Definitions

Bicycle and Pedestrian Network

Context-appropriate facilities designed for pedestrian and bicycle use, including facilities such as sidewalks, crosswalks, on-street bike facilities, multi-use trails and shared-use paths, whether independently aligned or side paths that parallel roadways.

Hillsborough County Transportation Planning Organization (TPO)

An agency created under federal and state law, to provide a forum for cooperative decision making, concerning regional transportation issues. Membership includes elected and appointed officials representing all local jurisdictions and transportation agencies in Hillsborough County. The TPO is staffed by the Hillsborough County City-County Planning Commission.

Long Range Transportation Plan (LRTP) or Needs Assessment

The official long range transportation (20 year) plan of the TPO, which serves as a blueprint for a comprehensive transportation system in Hillsborough County. This plan defines the major thoroughfares, mass transit system, bicycle and pedestrian system, and surface connections to seaports and airports needed to provide an acceptable level of service through the horizon year. The "Needs Assessment" is unconstrained by funding. The "Cost Feasible" plan contains prioritized projects for which there is anticipated funding.

Mobility Hubs

Facilities that connect transportation modes, including but not limited to public transit, on-demand ridesharing, bike- and car-sharing services, pedestrian and bike connections, and paratransit. Mobility hubs are often located at bus stops to enable convenient transfers to first/last mile connections.

*These will be added to the **Definitions** section in the final version of the Comprehensive Plan.*

Built Environment
Definitions

Multimodal Transportation Network

Major roads including limited access, arterial, and collector roads; bicycle and pedestrian networks; transit routes and facilities; transportation disadvantaged services; freight and passenger rail systems, Intelligent Transportation Systems (ITS); Transportation Demand Management (TDM) programs; and surface connections to military installations, airports, ports, seaports, and water transit.

Safe Systems Approach

A holistic approach to the transportation system that aims to eliminate fatal and serious injuries for all users by anticipating human mistakes and keeping impact energy on the human body at tolerable levels.

Smart System

The application of advanced technologies, robust planning, improved preparedness, and extensive interagency and intra-agency coordination to improve safety for all users, traffic flow, reliability and throughput of the surface transportation network. Examples include but are not limited to access management, real-time traffic management, smart streetlights, incident detection and response, transportation demand management, transit signal prioritization, driver information, wayfinding and navigation assistance, electric vehicle charging infrastructure, Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication.

Transportation Demand Management (TDM)

Any action or set of actions intended to influence the intensity, timing, and spatial distribution of travel demand for the purpose of reducing the impact of traffic, managing parking needs, reducing greenhouse gases, and enhancing mobility options. Strategies include but are not limited to shifting solo drives to bicycle, pedestrian, vanpool, carpool or transit trips, flexible work hours or days, and telework.

*These will be added to the **Definitions** section in the final version of the Comprehensive Plan.*

Built Environment
Definitions

Transportation Network Company (TNC)

An entity that uses a digital network to connect riders to drivers affiliated with the entity to transport the rider, typically by ordering and paying for prearranged rides.

Transportation Systems Management & Operations (TSM&O)

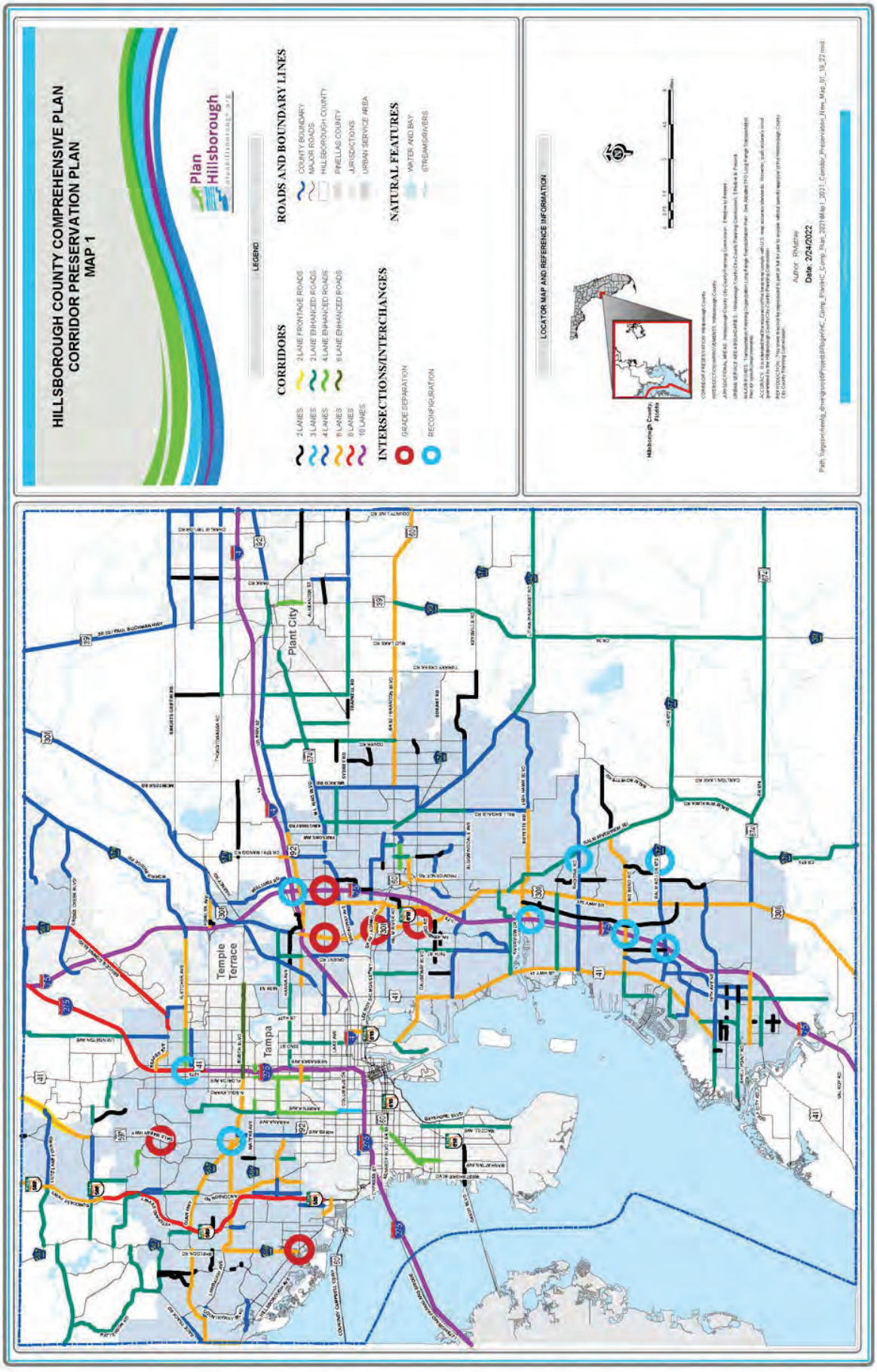
An integrated set of strategies to optimize the performance of existing transportation infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system. TSM&O activities focus on a set of well-known strategies such as incident management, traffic signal timing, ramp metering, road weather management, and others.

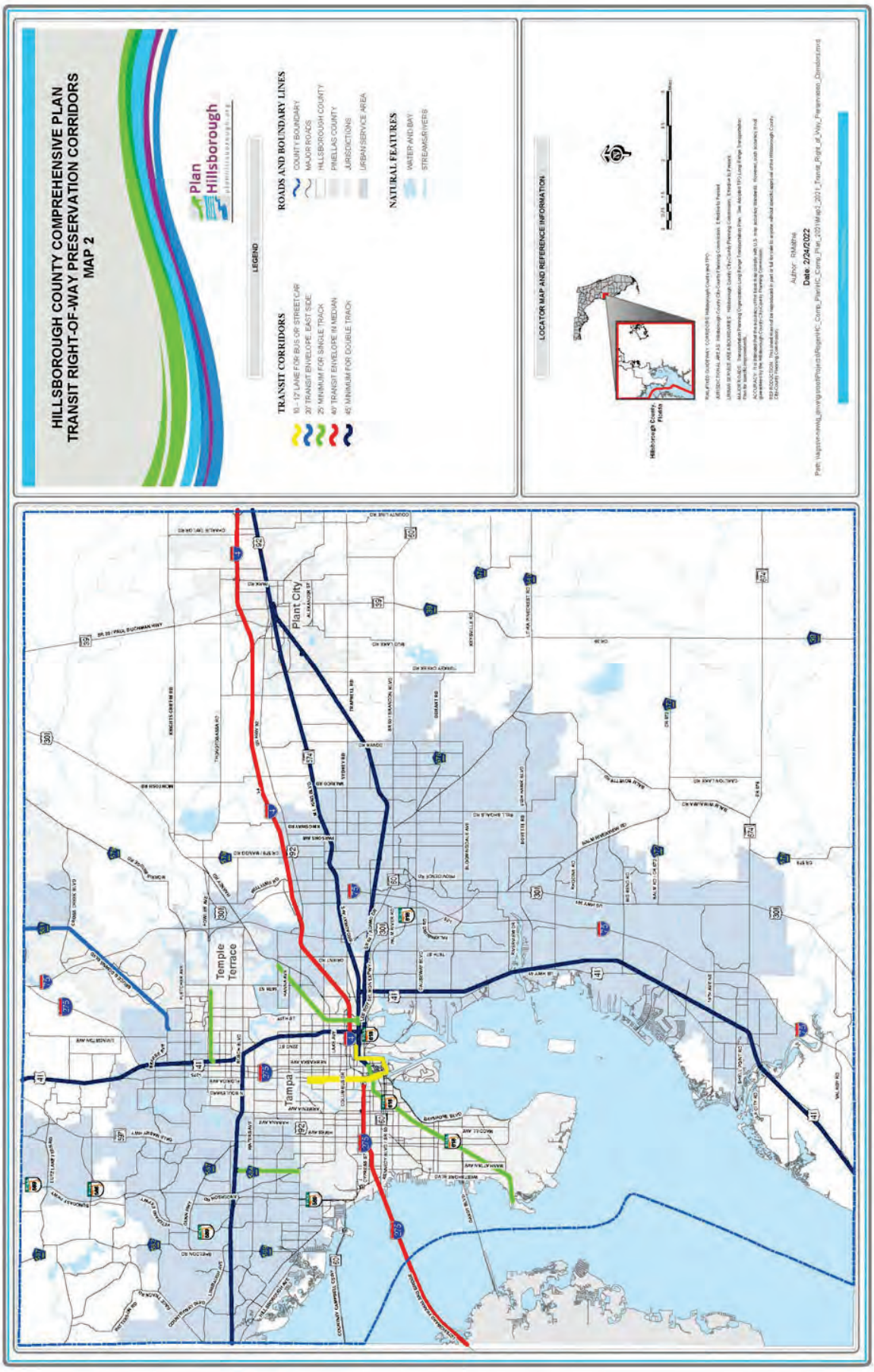
Underserved Communities

Communities that have historically lacked sufficient access to the planning process and community resources, and that are disproportionately affected by negative planning outcomes. These may be designated based on age, income, ethnicity/race, disability, language proficiency, access to a vehicle, and education level, among other considerations. Map 4 of the Mobility Section shows the areas with the highest concentrations populations with these characteristics, as identified in the Plan Hillsborough Nondiscrimination and Equity Plan.

Vision Zero

An international movement to eliminate all traffic fatalities and severe injuries through a combination of intervention, outreach, enforcement, and design practices. At the core of Vision Zero is the belief that traffic deaths and injuries are preventable – in other words, that traffic crashes aren't accidents, but are the result of poor behavior combined with unforgiving roadway designs.


HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
CORRIDOR PRESERVATION PLAN
MAP 1
Plan Hillsborough
LEGEND
CORRIDORS
2 LANE FRONTAGE ROADS
2 LANES
3 LANE ENHANCED ROADS
3 LANES
4 LANE ENHANCED ROADS
4 LANES
6 LANE ENHANCED ROADS
6 LANES
8 LANES
10 LANES
ROADS AND BOUNDARY LINES
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
INTERSECTIONS/INTERCHANGES
GRADE SEPARATION
RECONFIGURATION
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County Florida
Author: RMatthe
Date: 2/24/2022
Plant City
Temple Terrace
Tampa


HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
TRANSIT RIGHT-OF-WAY PRESERVATION CORRIDORS
MAP 2
Plan Hillsborough
LEGEND
TRANSIT CORRIDORS
10 - 12' LANE FOR BUS OR STREETCAR
20' TRANSIT ENVELOPE: EAST SIDE
25' MINIMUM FOR SINGLE TRACK
40' TRANSIT ENVELOPE IN MEDIAN
45' MINIMUM FOR DOUBLE TRACK
ROADS AND BOUNDARY LINES
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN/SERVICE AREA
NATURAL FEATURES
WATER AND BAY
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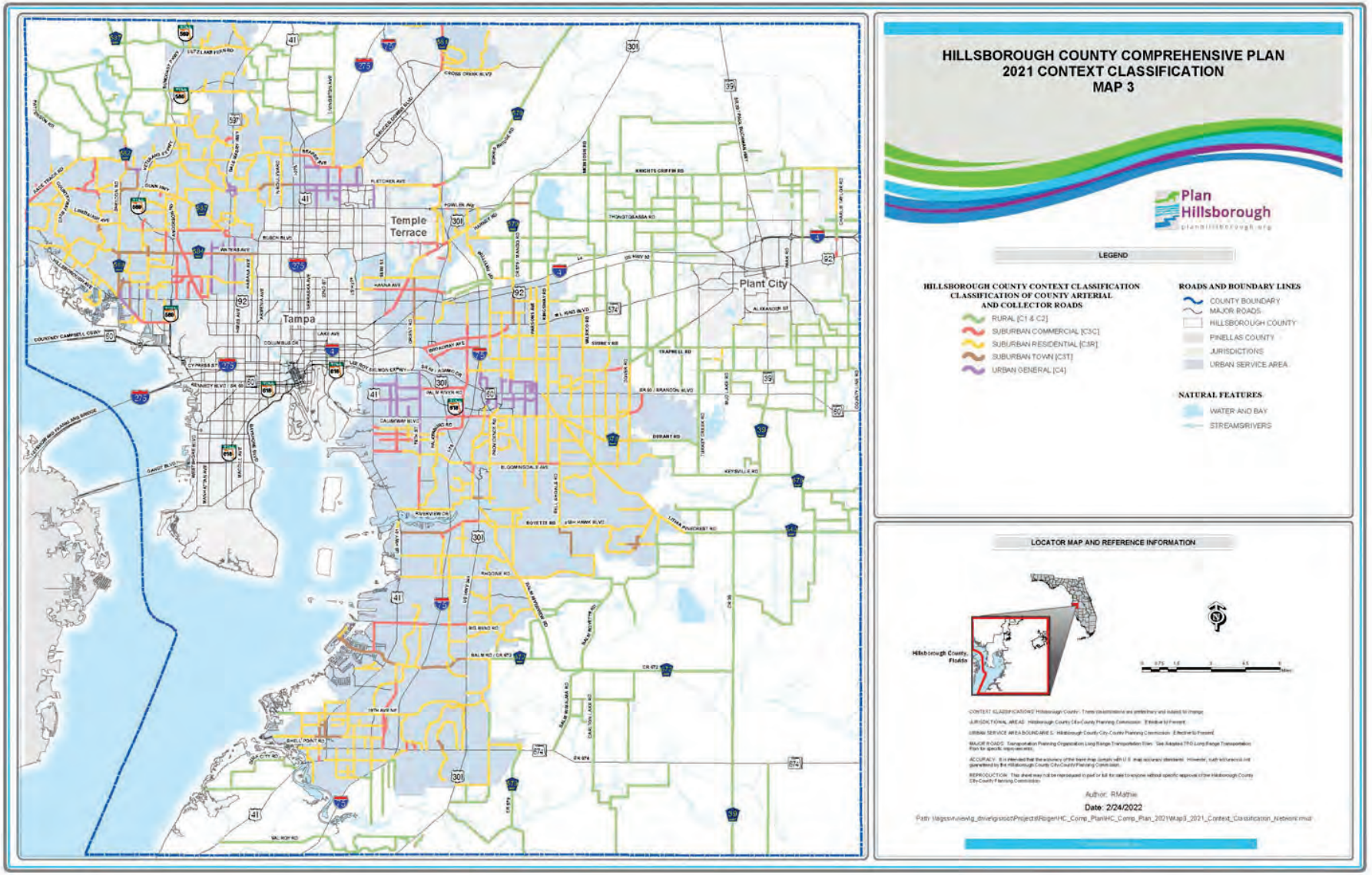
Temple Terrace
Tampa
Plant City
HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
2021 CONTEXT CLASSIFICATION
MAP 3
Plan Hillsborough
planhillsborough.org
LEGEND
HILLSBOROUGH COUNTY CONTEXT CLASSIFICATION
CLASSIFICATION OF COUNTY ARTERIAL AND COLLECTOR ROADS
RURAL [C1 & C2]
SUBURBAN COMMERCIAL [C3C]
SUBURBAN RESIDENTIAL [C3R]
SUBURBAN TOWN [C3T]
URBAN GENERAL [C4]
ROADS AND BOUNDARY LINES
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
NATURAL FEATURES
WATER AND BAY
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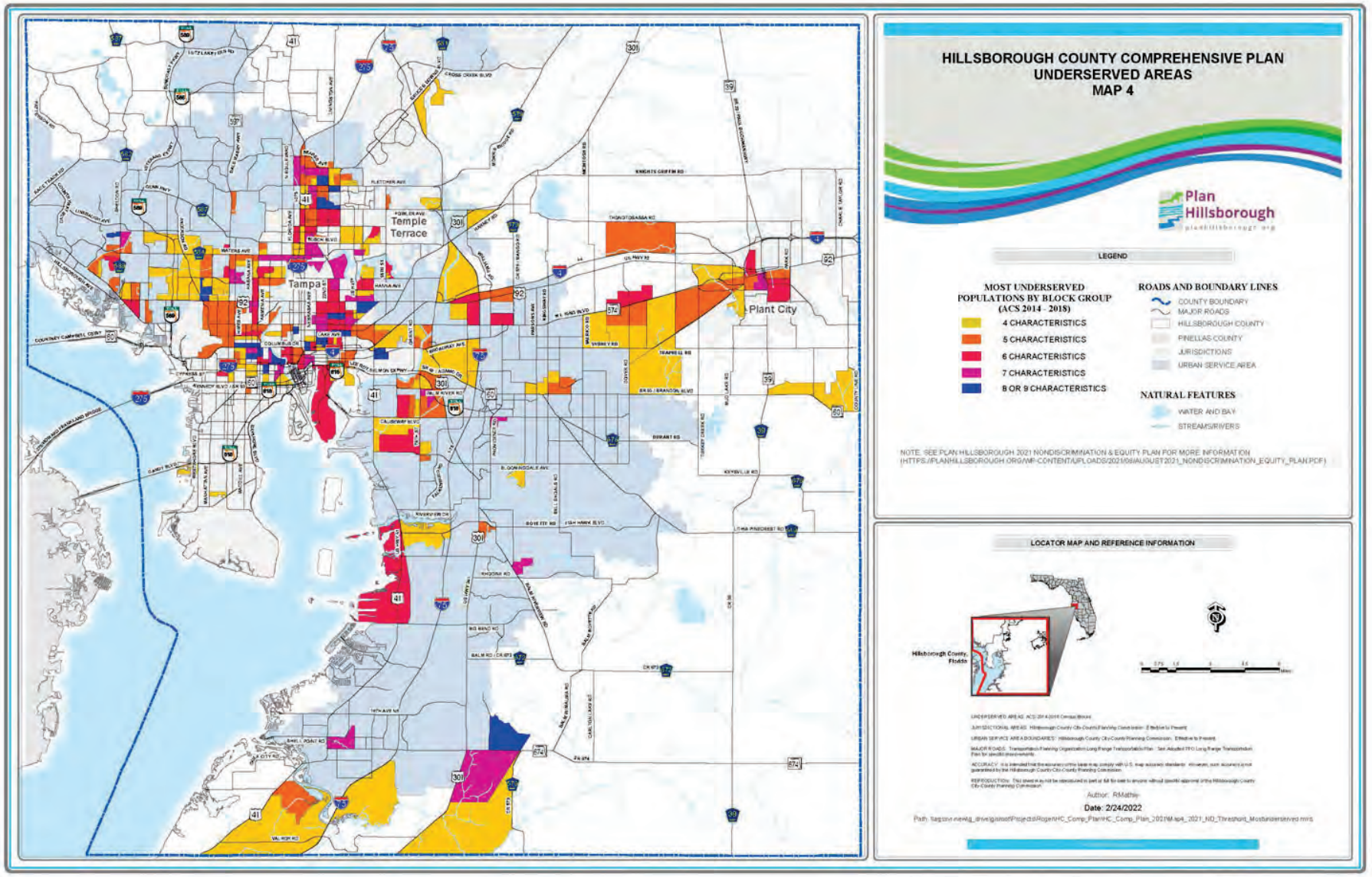
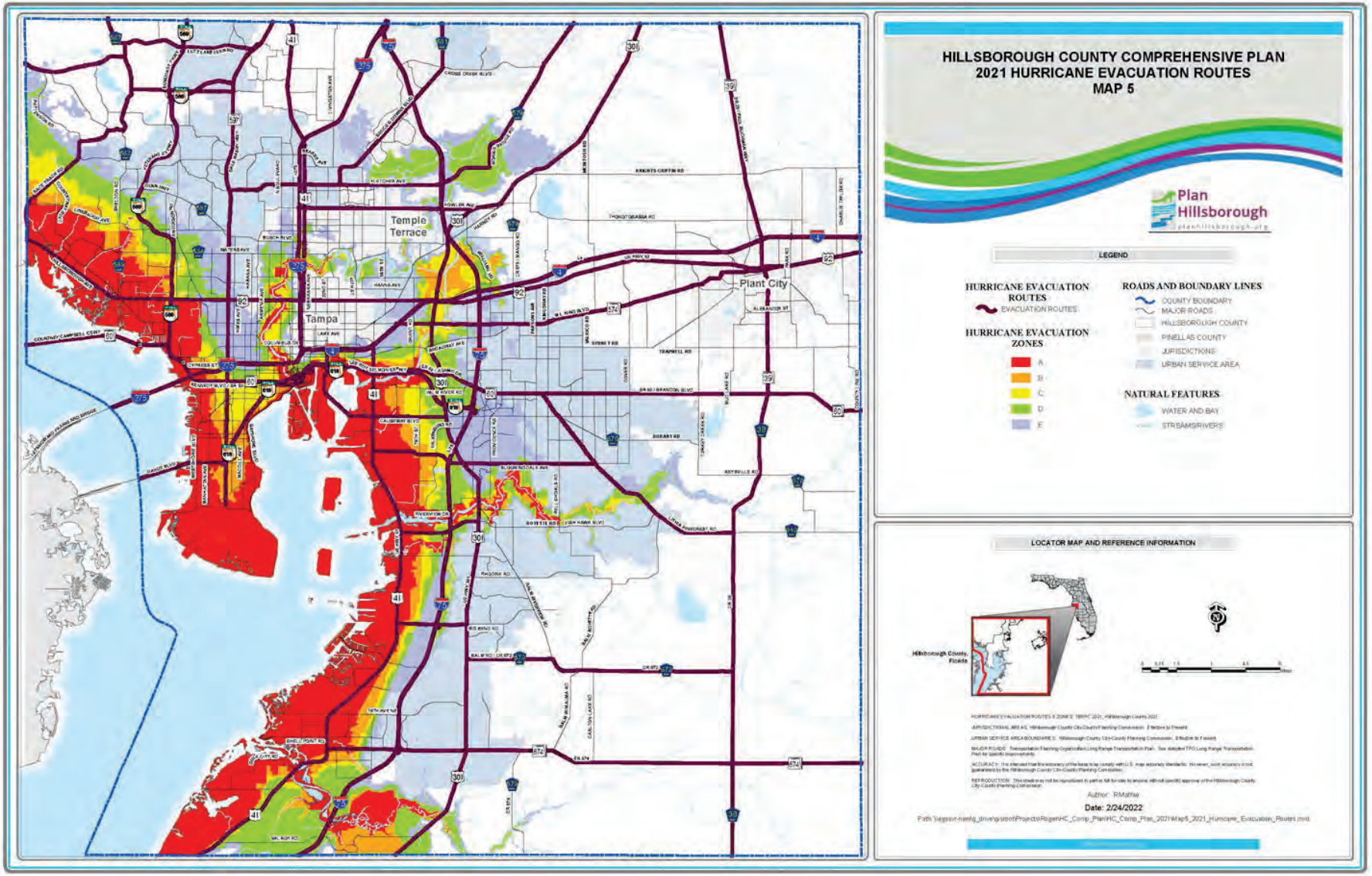
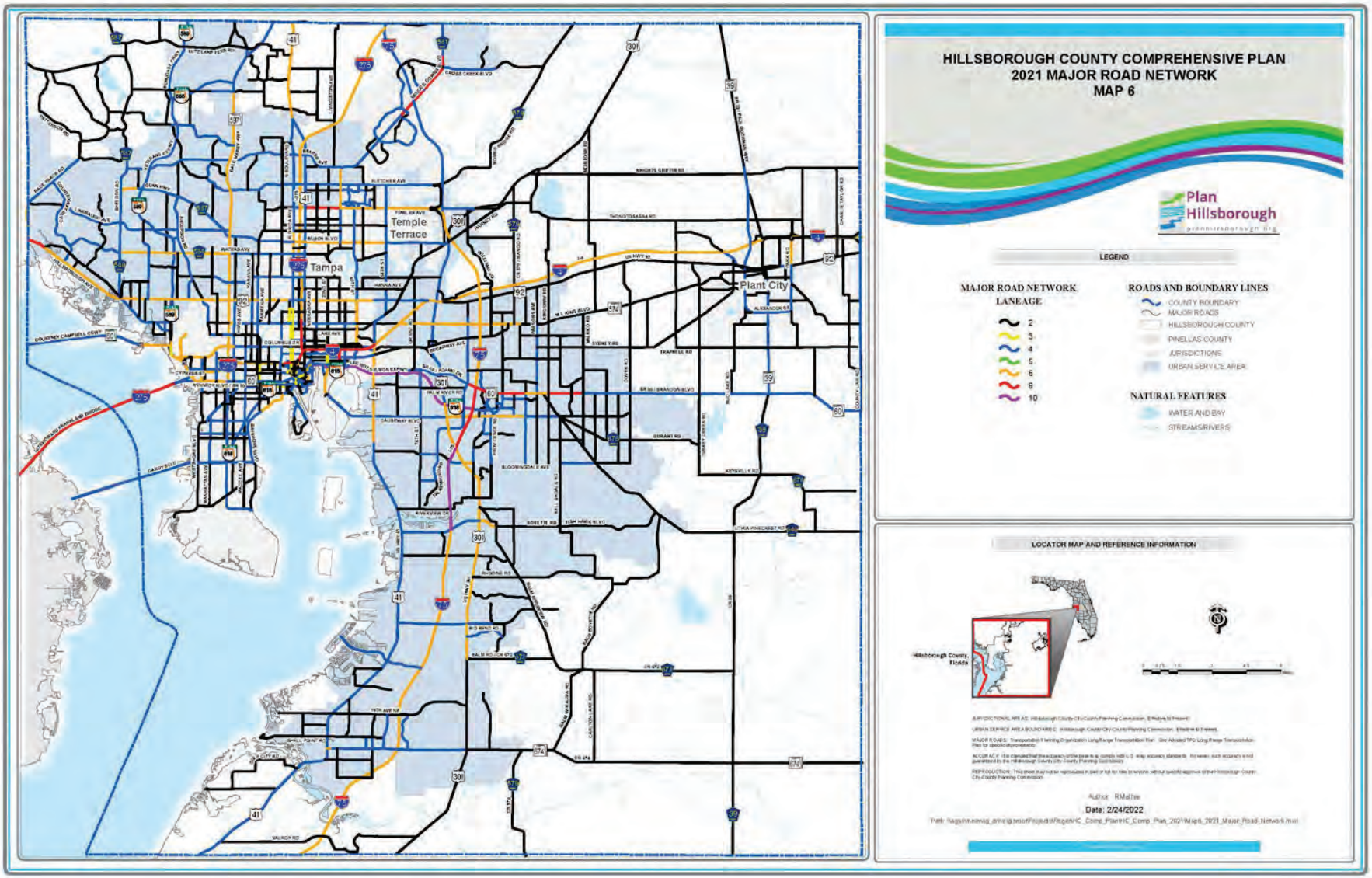

Temple Terrace
Tampa
Plant City
HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
UNDERSERVED AREAS
MAP 4
Plan Hillsborough
LEGEND
MOST UNDERSERVED POPULATIONS BY BLOCK GROUP (ACS 2014 - 2018)
4 CHARACTERISTICS
5 CHARACTERISTICS
6 CHARACTERISTICS
7 CHARACTERISTICS
8 OR 9 CHARACTERISTICS
ROADS AND BOUNDARY LINES
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
NOTE: SEE PLAN HILLSBOROUGH 2021 NONDISCRIMINATION & EQUITY PLAN FOR MORE INFORMATION (HTTPS://PLANHILLSBOROUGH.ORG/WP-CONTENT/UPLOADS/2021/08/AUGUST2021_NONDISCRIMINATION_EQUITY_PLAN.PDF)
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
Author: RMathis
Date: 2/24/2022


Temple Terrace
Tampa
Plant City
HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
2021 HURRICANE EVACUATION ROUTES
MAP 5
Plan Hillsborough
LEGEND
HURRICANE EVACUATION ROUTES
EVACUATION ROUTES
HURRICANE EVACUATION ZONES
A
B
C
D
E
ROADS AND BOUNDARY LINES
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
Author: RMathe
Date: 2/24/2022


HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
2021 MAJOR ROAD NETWORK
MAP 6
Plan Hillsborough
LEGEND
MAJOR ROAD NETWORK
LANEAGE
2
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10
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COUNTY BOUNDARY
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URBAN SERVICE AREA
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STREAMS/RIVERS
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
Author: RMathe
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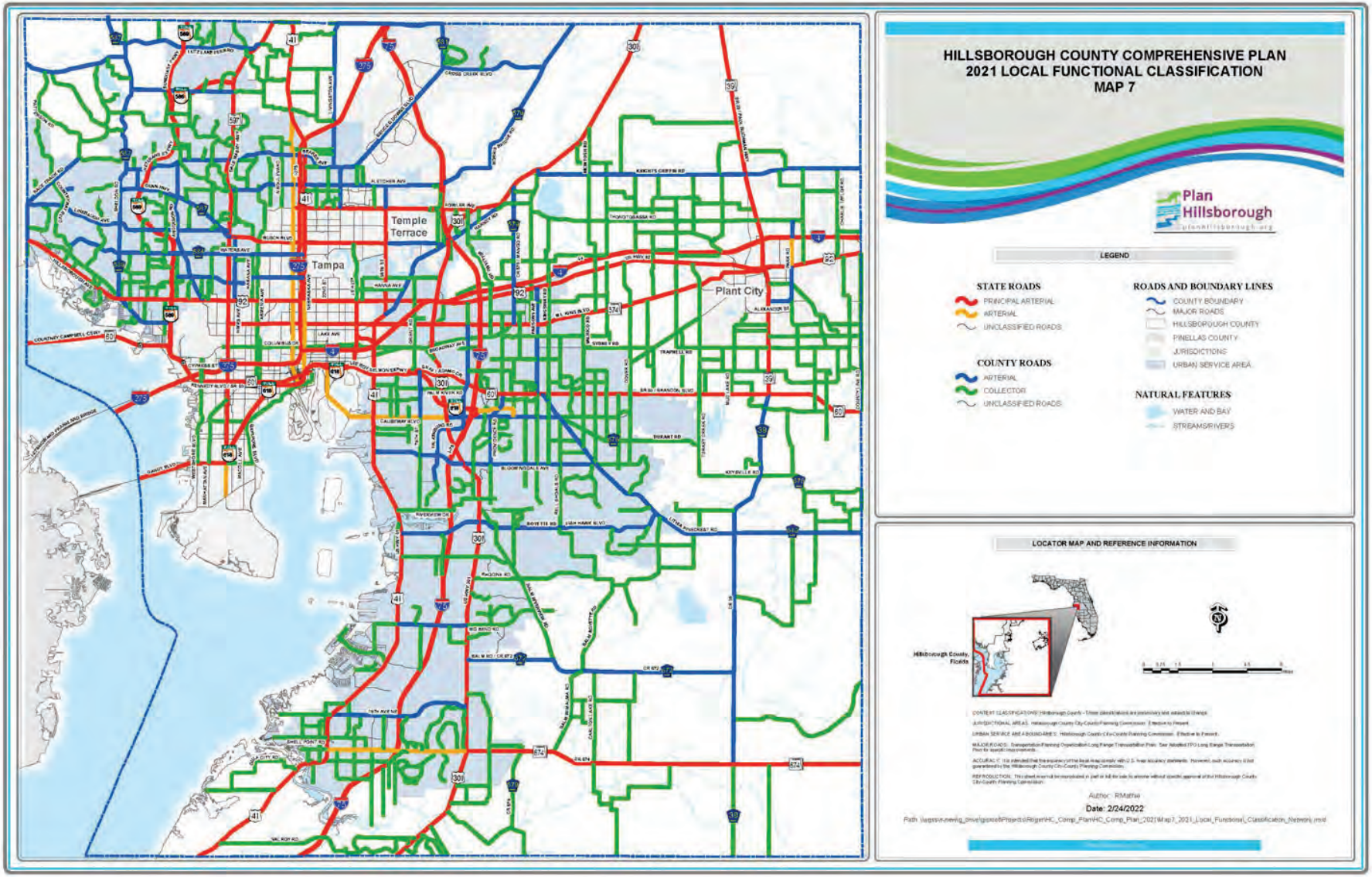
Plant City


Temple Terrace
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HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
2021 LOCAL FUNCTIONAL CLASSIFICATION
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Plan Hillsborough
LEGEND
STATE ROADS
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COUNTY ROADS
ARTERIAL
COLLECTOR
UNCLASSIFIED ROADS
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WATER AND BAY
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LOCATOR MAP AND REFERENCE INFORMATION
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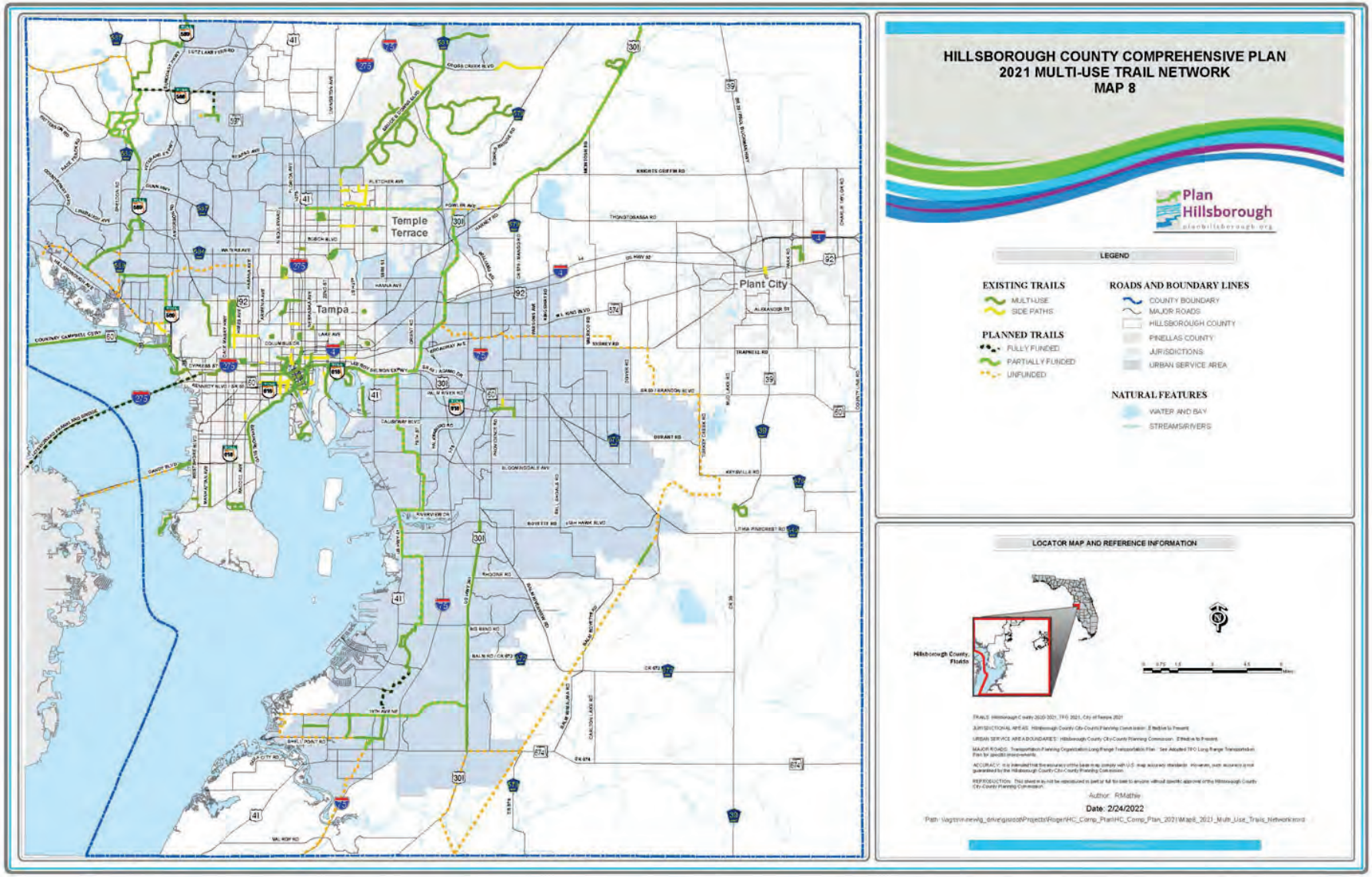
Temple Terrace
Tampa
Plant City
HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
2021 MULTI-USE TRAIL NETWORK
MAP 8
Plan Hillsborough
planhillsborough.org
LEGEND
EXISTING TRAILS
MULTI-USE
SIDE PATHS
PLANNED TRAILS
FULLY FUNDED
PARTIALLY FUNDED
UNFUNDED
ROADS AND BOUNDARY LINES
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
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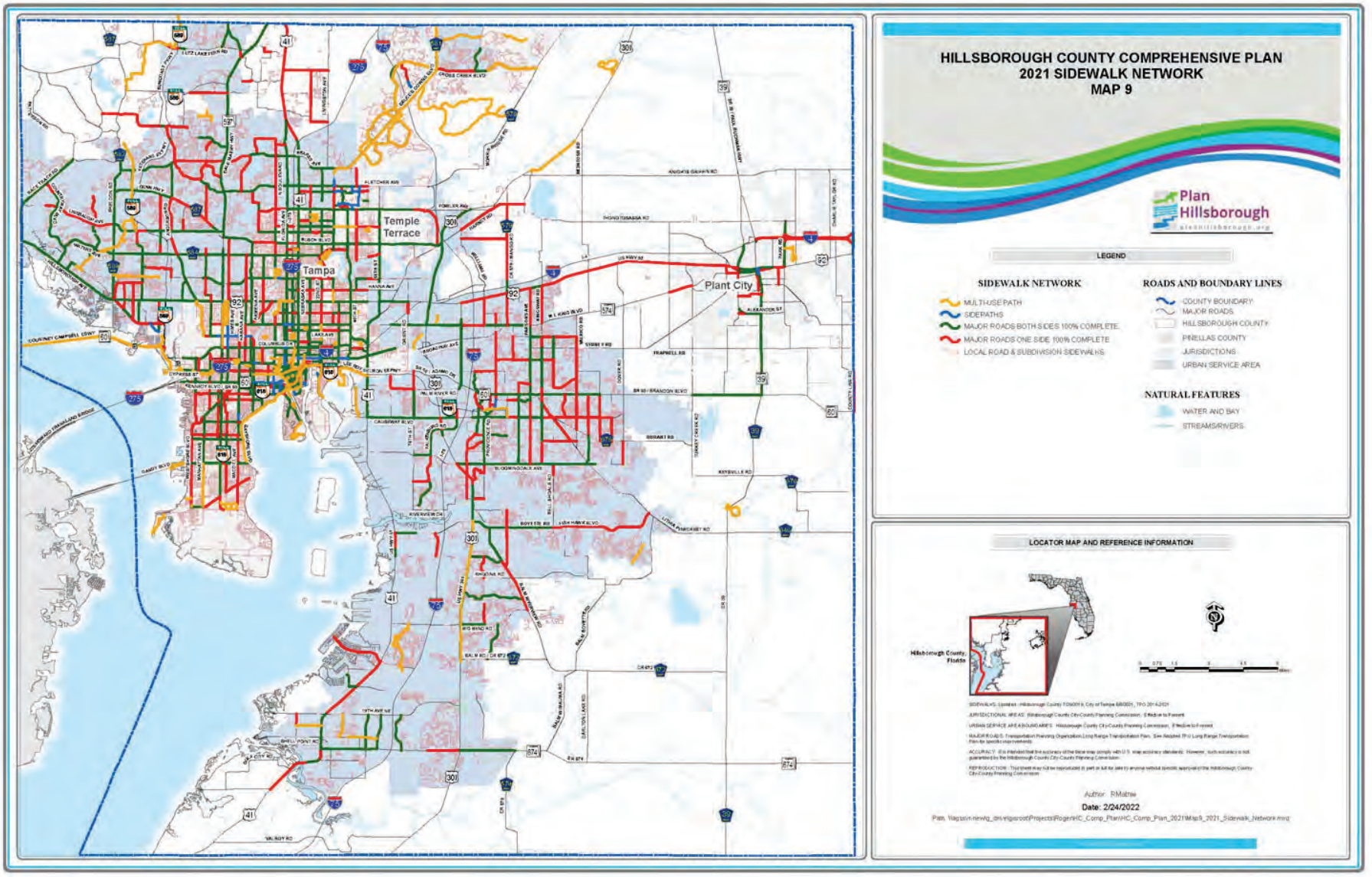
HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
2021 SIDEWALK NETWORK
MAP 9
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LEGEND
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MULTI-USE PATH
SIDEPATHS
MAJOR ROADS BOTH SIDES 100% COMPLETE
MAJOR ROADS ONE SIDE 100% COMPLETE
LOCAL ROAD & SUBDIVISION SIDEWALKS
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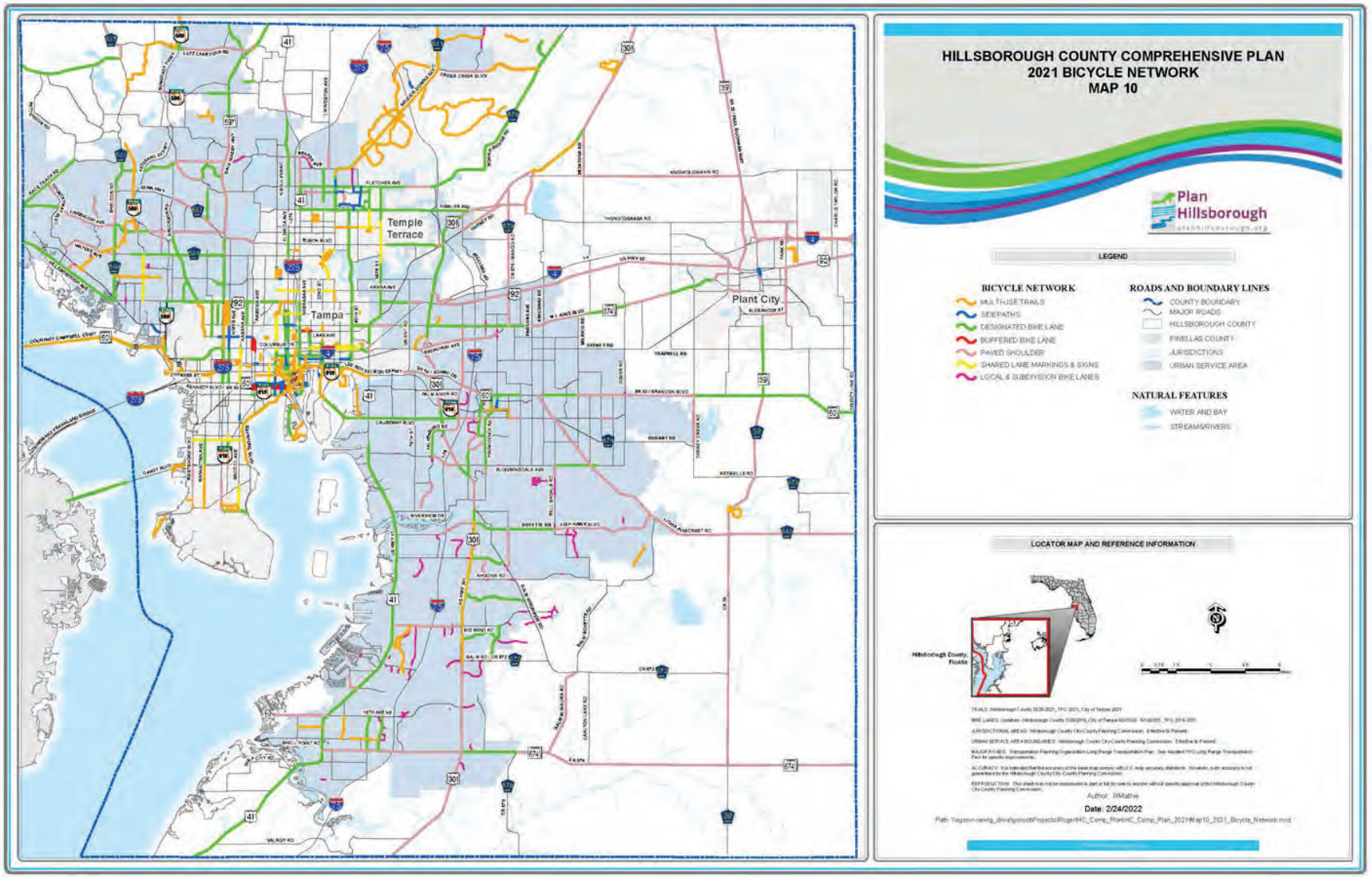
Hillsborough County, Florida
Author: RMaltw
Date: 2/24/2022
Temple Terrace
Tampa
Plant City


HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
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DESIGNATED BIKE LANE
BUFFERED BIKE LANE
PAVED SHOULDER
SHARED LANE MARKINGS & SIGNS
LOCAL & SUBDIVISION BIKE LANES
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LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
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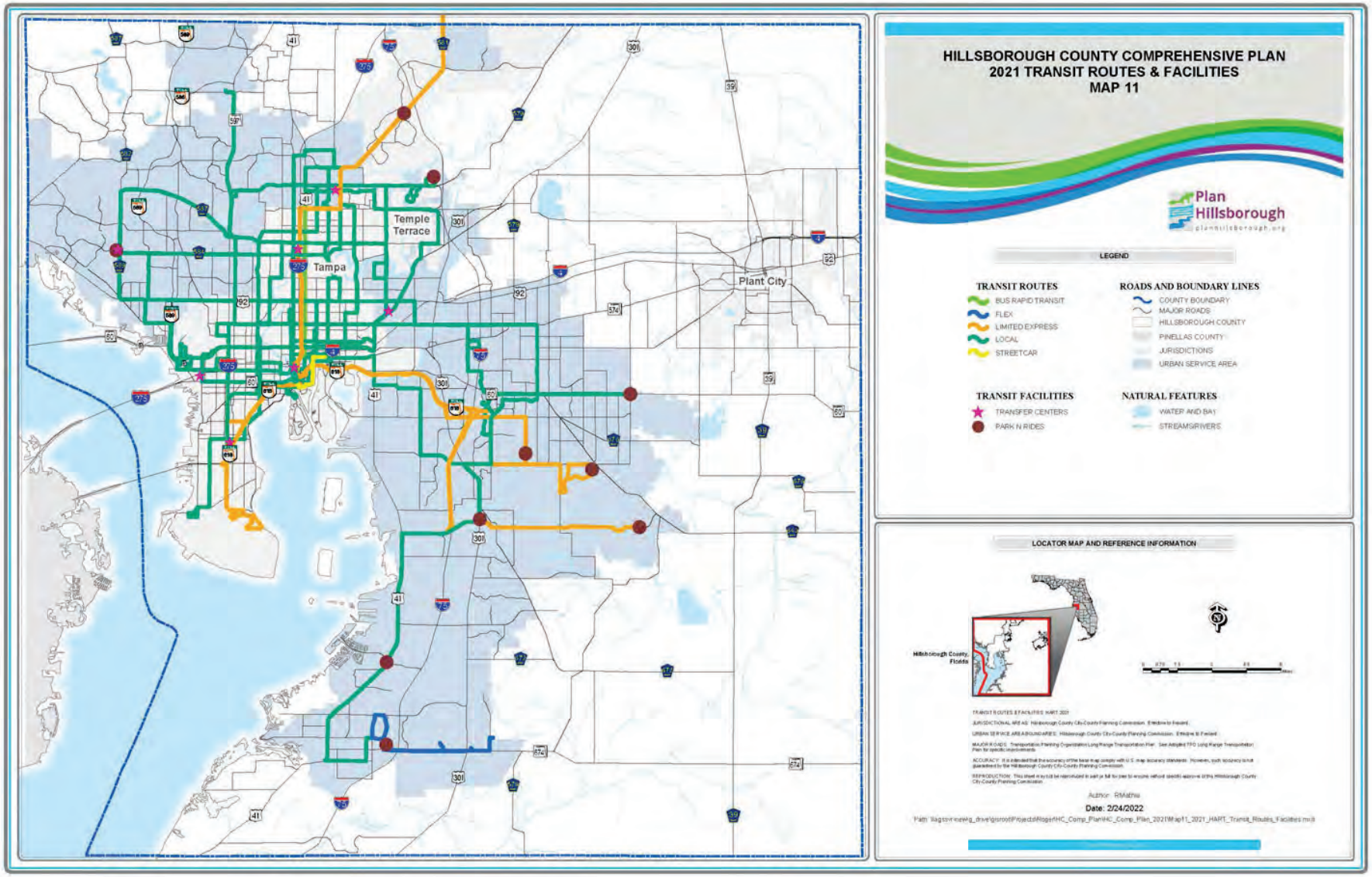
Temple Terrace
Tampa
Plant City


Temple Terrace
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HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
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planhillsborough.org
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FLEX
LIMITED EXPRESS
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COUNTY BOUNDARY
MAJOR ROADS
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PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
TRANSIT FACILITIES
TRANSFER CENTERS
PARK N RIDES
NATURAL FEATURES
WATER AND BAY
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Author: RMathis
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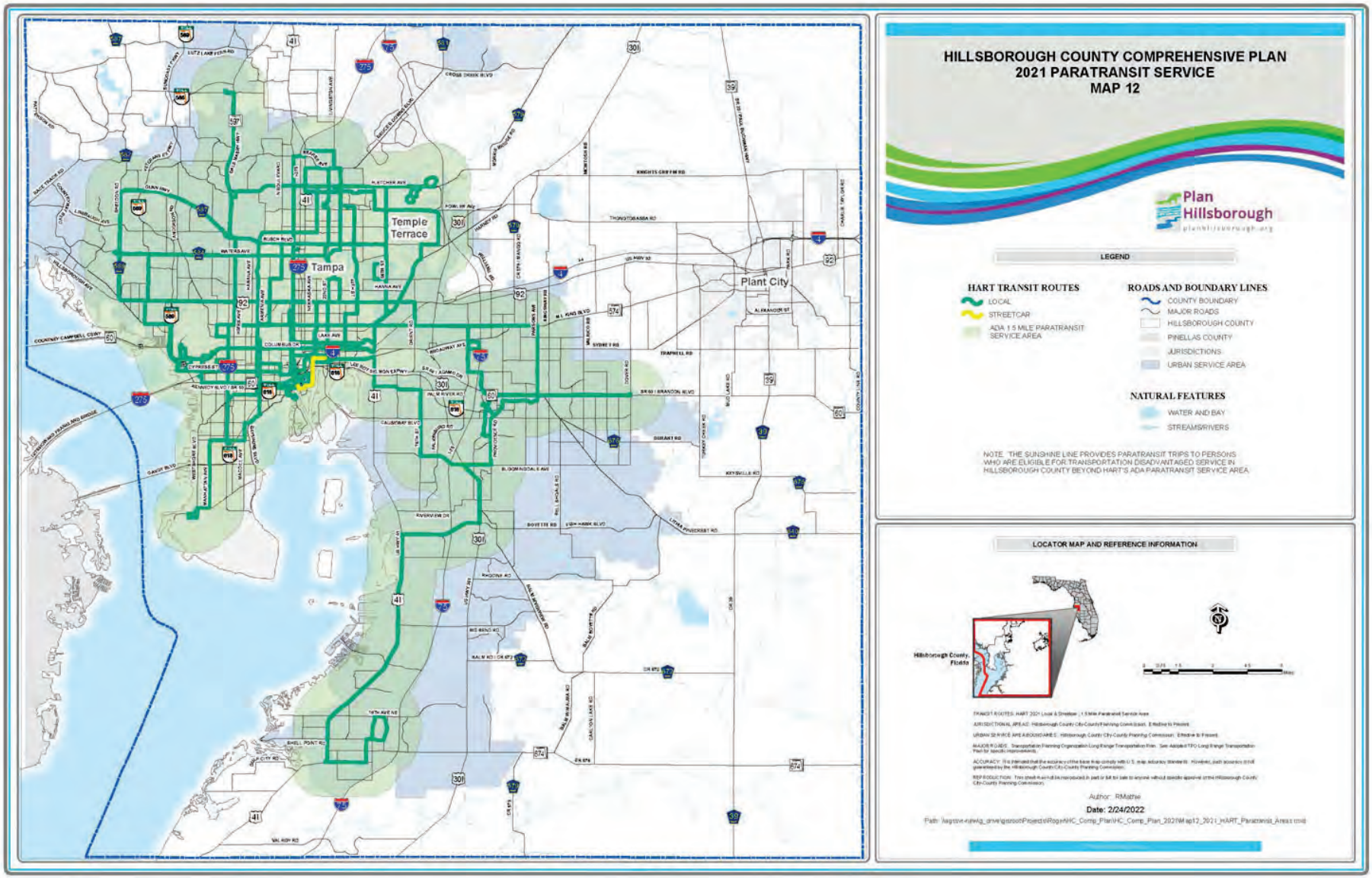
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Plant City
HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
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HART TRANSIT ROUTES
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ADA 1.5 MILE PARATRANSIT SERVICE AREA
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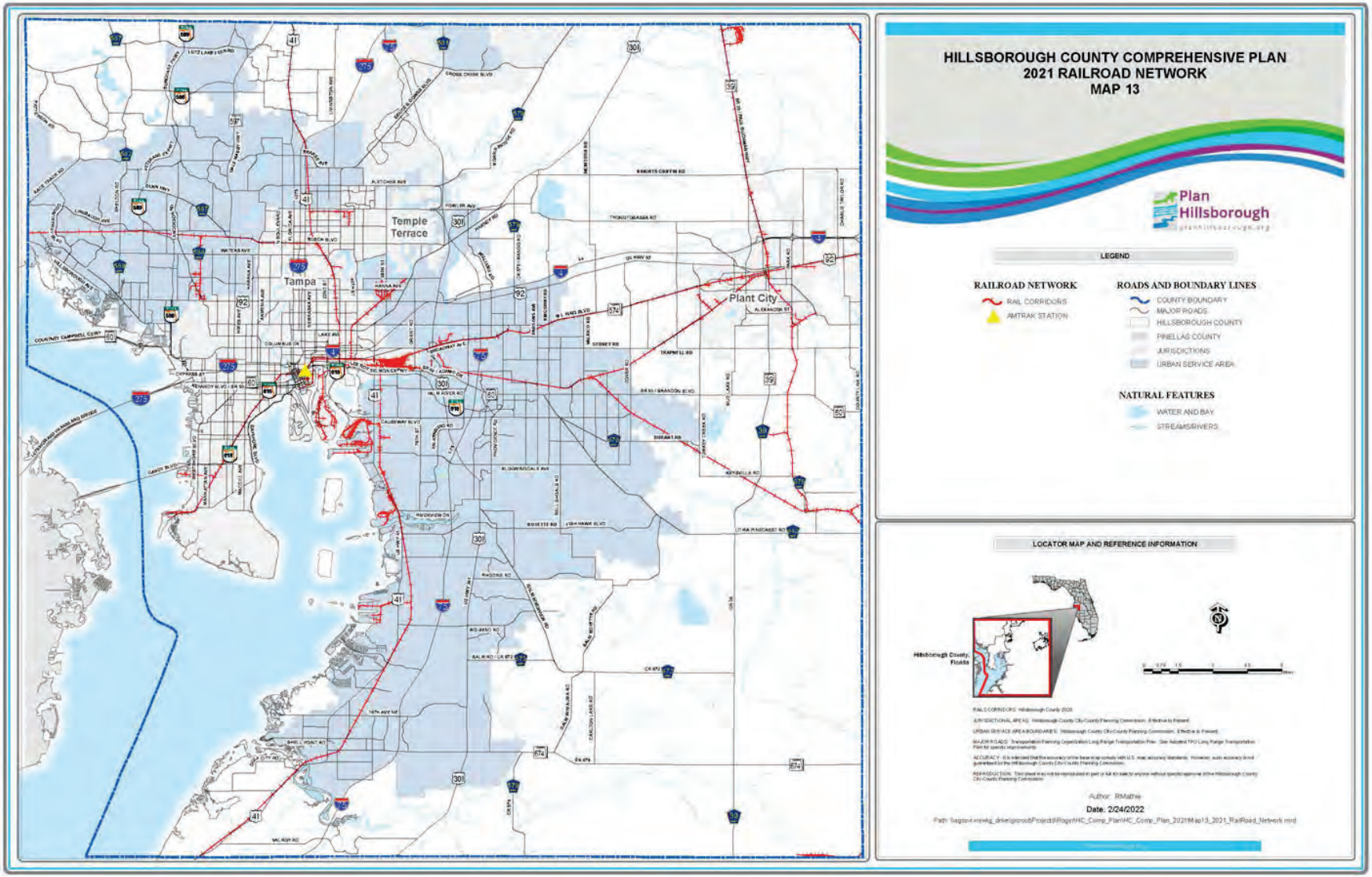
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
NOTE: THE SUNSHINE LINE PROVIDES PARATRANSIT TRIPS TO PERSONS WHO ARE ELIGIBLE FOR TRANSPORTATION DISADVANTAGED SERVICE IN HILLSBOROUGH COUNTY BEYOND HART'S ADA PARATRANSIT SERVICE AREA.
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
Author: RMathe
Date: 2/24/2022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Plant City
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RAILROAD NETWORK
RAIL CORRIDORS
AMTRAK STATION
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MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
LOCATOR MAP AND REFERENCE INFORMATION
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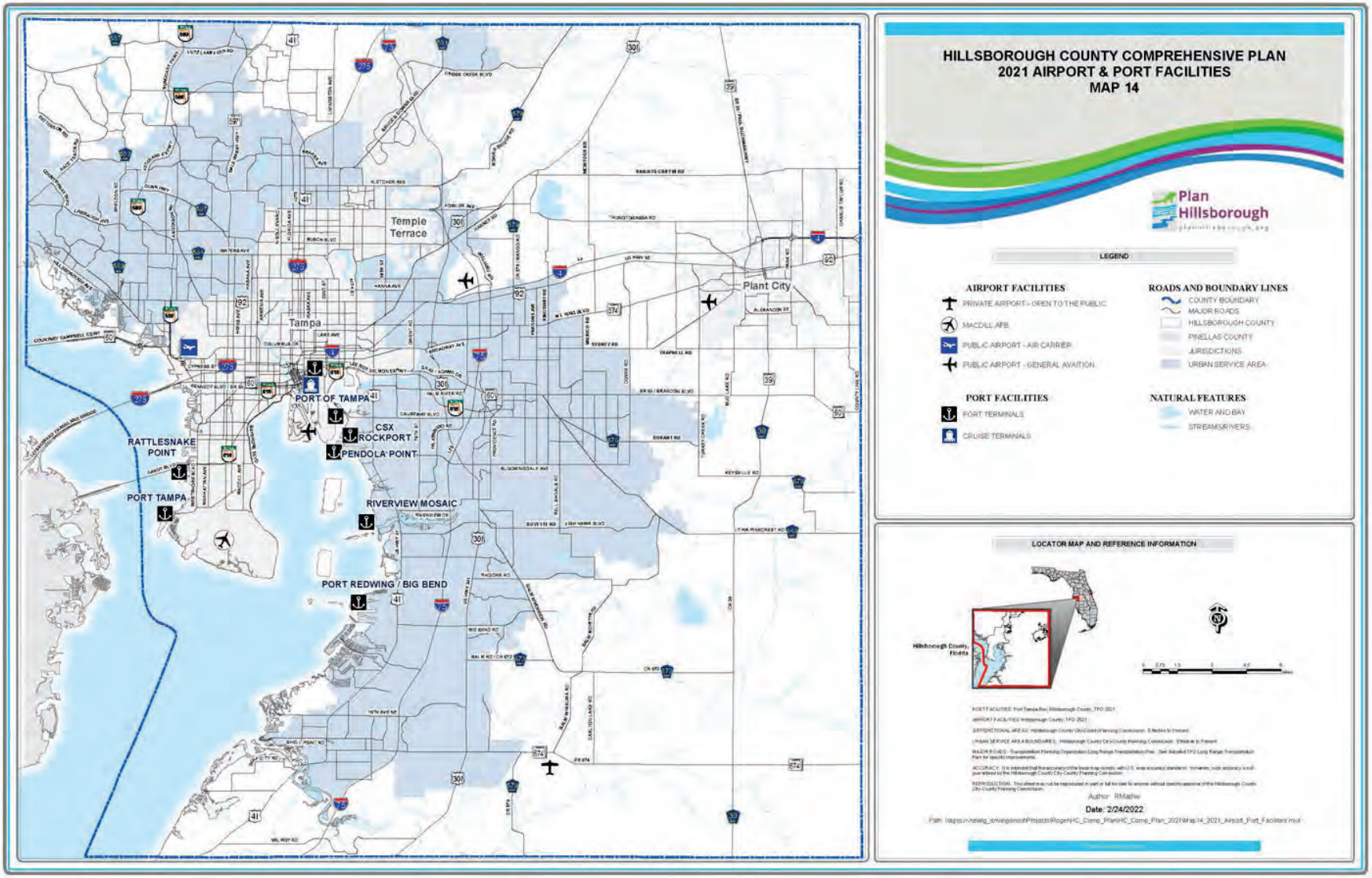
Temple Terrace
Tampa
Plant City
PORT OF TAMPA
CSX ROCKPORT
PENDOLA POINT
RATTLESNAKE POINT
PORT TAMPA
RIVERVIEW MOSAIC
PORT REDWING / BIG BEND
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PRIVATE AIRPORT- OPEN TO THE PUBLIC
MACDILL AFB
PUBLIC AIRPORT - AIR CARRIER
PUBLIC AIRPORT - GENERAL AVAITION
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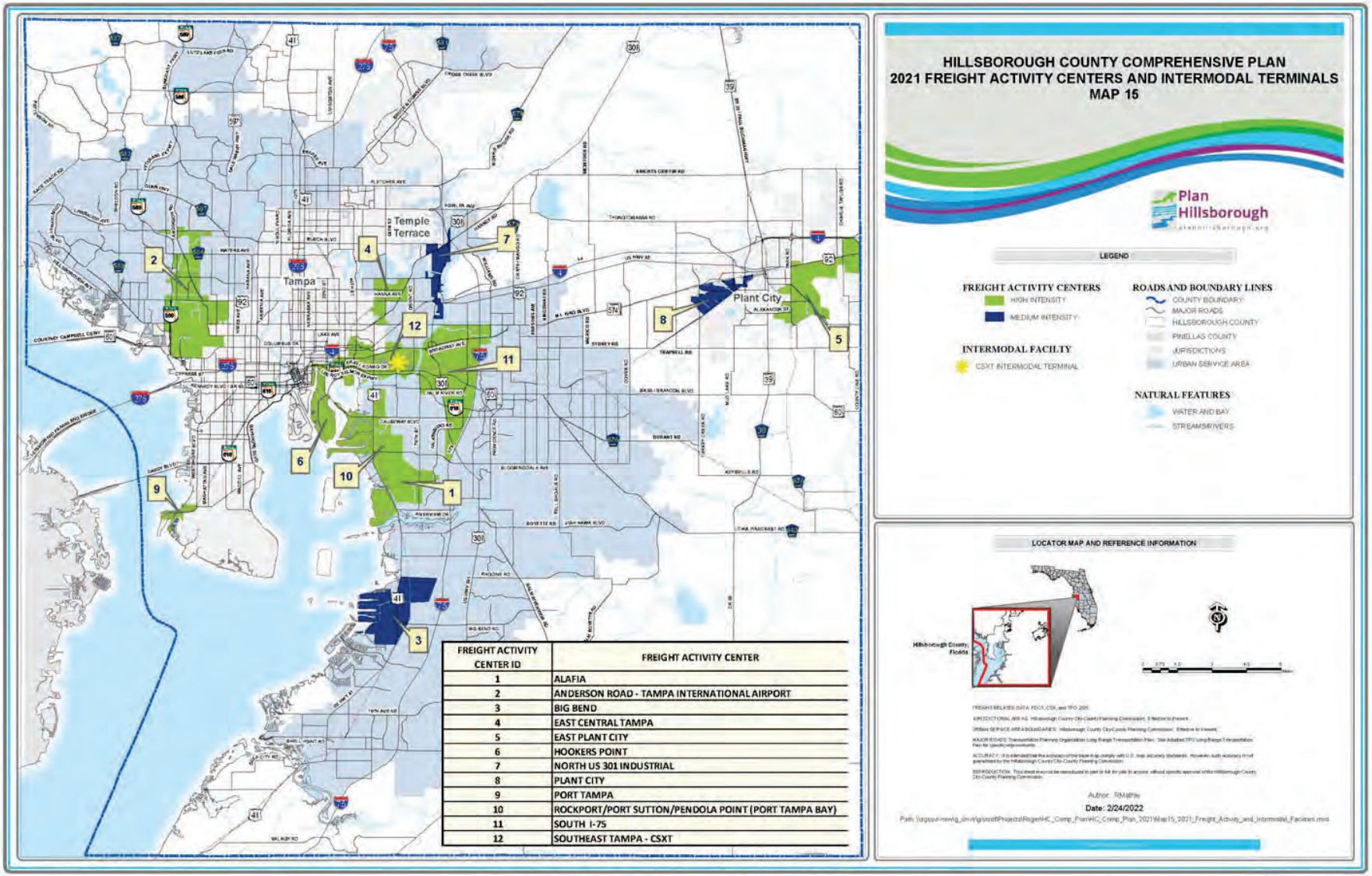
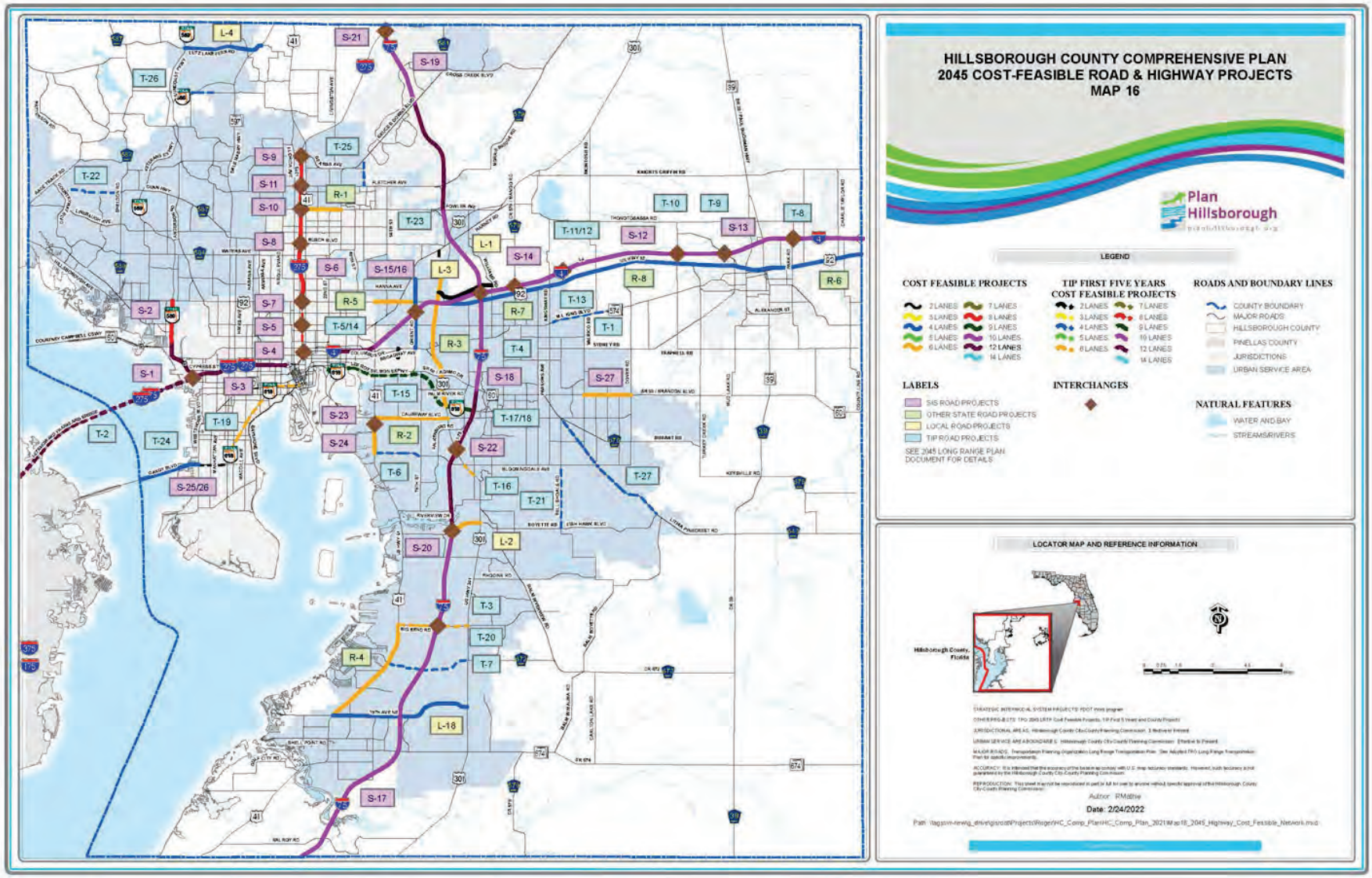
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
PORT FACILITIES
PORT TERMINALS
CRUISE TERMINALS
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
Author: RMathe
Date: 2/24/2022



FREIGHT ACTIVITY CENTER ID	FREIGHT ACTIVITY CENTER
1	ALAFIA
2	ANDERSON ROAD - TAMPA INTERNATIONAL AIRPORT
3	BIG BEND
4	EAST CENTRAL TAMPA
5	EAST PLANT CITY
6	HOOKERS POINT
7	NORTH US 301 INDUSTRIAL
8	PLANT CITY
9	PORT TAMPA
10	ROCKPORT/PORT SUTTON/PENDOLA POINT (PORT TAMPA BAY)
11	SOUTH I-75
12	SOUTHEAST TAMPA - CSXT


HILLSBOROUGH COUNTY COMPREHENSIVE PLAN
2045 COST-FEASIBLE ROAD & HIGHWAY PROJECTS
MAP 16
Plan Hillsborough
LEGEND
COST FEASIBLE PROJECTS
2 LANES
3 LANES
4 LANES
5 LANES
6 LANES
7 LANES
8 LANES
9 LANES
10 LANES
12 LANES
14 LANES
TIP FIRST FIVE YEARS COST FEASIBLE PROJECTS
2 LANES
3 LANES
4 LANES
5 LANES
6 LANES
7 LANES
8 LANES
9 LANES
10 LANES
12 LANES
14 LANES
ROADS AND BOUNDARY LINES
COUNTY BOUNDARY
MAJOR ROADS
HILLSBOROUGH COUNTY
PINELLAS COUNTY
JURISDICTIONS
URBAN SERVICE AREA
LABELS
SIS ROAD PROJECTS
OTHER STATE ROAD PROJECTS
LOCAL ROAD PROJECTS
TIP ROAD PROJECTS
SEE 2045 LONG RANGE PLAN DOCUMENT FOR DETAILS
INTERCHANGES
NATURAL FEATURES
WATER AND BAY
STREAMS/RIVERS
LOCATOR MAP AND REFERENCE INFORMATION
Hillsborough County, Florida
Author: RMathe
Date: 2/24/2022

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Appendix B
Related Document's Summary

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1 BACKGROUND

COMPLETE STREETS GUIDES AND BEST PRACTICES

The movement toward designing with the Complete Streets approach has resulted in the creation of many excellent resources regarding Complete Streets design. The creation of this document was aided through a thorough review of best practice approaches across the country. Design standards were included based on their inclusion across a number of leading publications as well as a context-sensitive approach to the unique needs and opportunities in Hillsborough County.

Engineers and planners follow established standards and guidelines to prepare designs for roadway projects. Many of the existing standards and guidelines available at the federal and state levels provide some guidance on Complete Streets and their design. The most relevant of federal, national, and state standards and best practices are shown in the call out box.

Development of this Guide builds on various local documents and policies summarized below.

Relevant Standards and Best Practices

- *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*, Institute of Transportation Engineers/Congress for New Urbanism
- *Urban Street Design Guide*, National Association of City Transportation Officials (NACTO)
- *Urban Bikeway Design Guide, NACTO*
- *Transit Street Design Guide, NACTO*
- *Achieving Multimodal Networks, Applying Design Flexibility,* Federal Highway Association
- *A Policy on Geometric Design of Highways and Streets* (the "Green Book"), American Association of State Highway and Transportation Officials
- *The Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways* (the "Florida Greenbook")
- *The Manual on Uniform Traffic Control Devices* (MUTCD), FHWA
- Plans Preparation Manual (PPM), FDOT
- Americans with Disabilities Act (ADA) Standards for Accessible Design

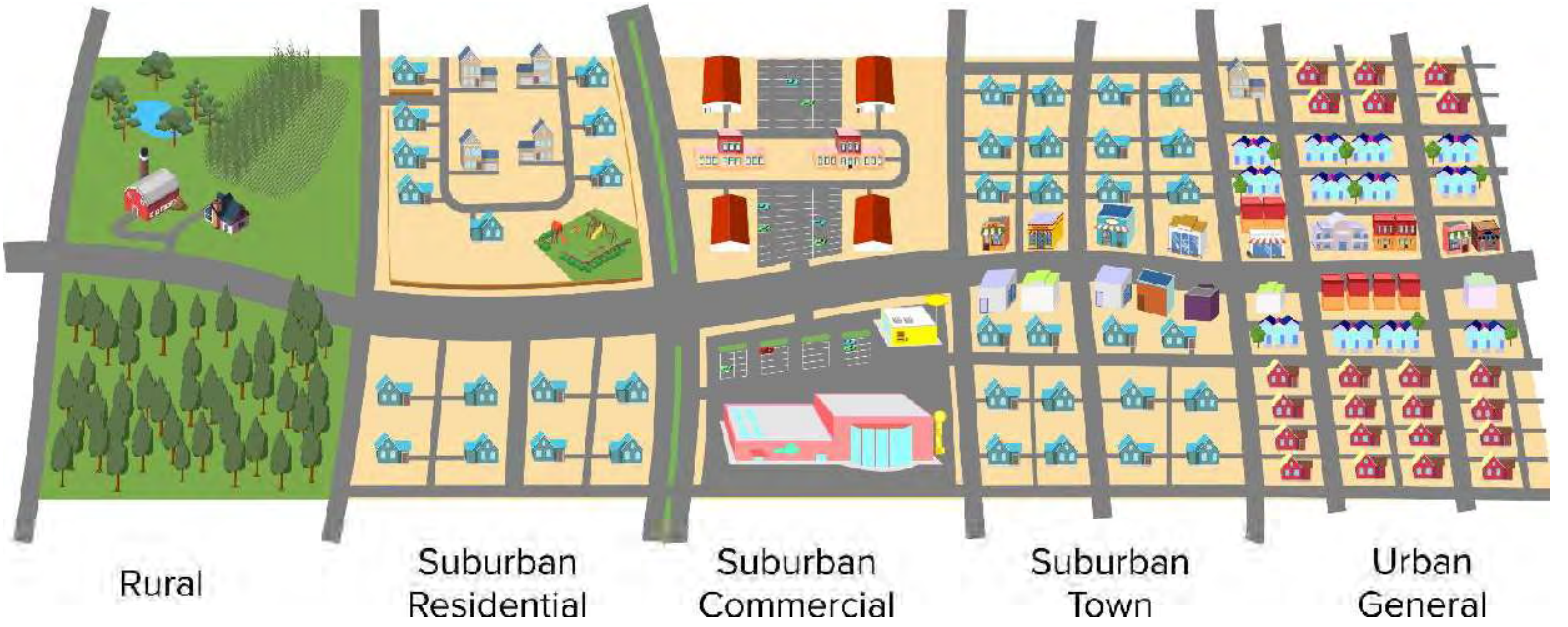
COMPREHENSIVE PLAN FOR UNINCORPORATED HILLSBOROUGH COUNTY

Transportation Element

As noted in the introduction, Hillsborough County's two-pronged system is comprised of its Context Based Classification system, as well as this Complete Streets Guide. To implement the classification system, the County has adopted its Context Based Classification System and Map in the Transportation Element of its Comprehensive Plan.

In addition to the Context Based Classification Map, a layer has been provided on the County's GIS Information and Mapping Tool. This map will be used as an internal resource to assist

Figure 3-1 An Illustration of Hillsborough County Context Based Classifications



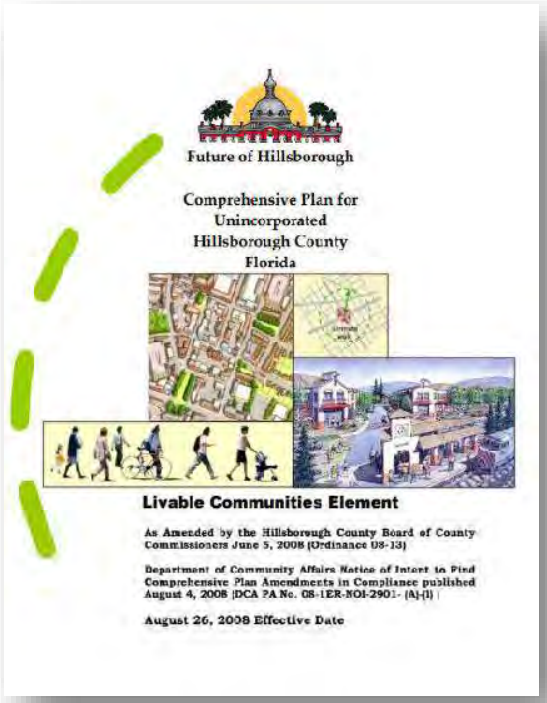
county planners and engineers in identifying complete street characteristics and designing transportation facilities that complement the surrounding community and create safe, vibrant, public spaces. To illustrate this, typical roadway cross-sections have been developed for each classification.

Relevance to This Guide

The Complete Streets Guide builds upon the Context Based Classification system, providing design insight for streets within residential, retail, industrial, or mixed-use areas, as applicable, within each context. The Complete Streets Guide will build on the refined Context Based Classifications to establish complete street typologies and identify design features that are appropriate for each street type, mode of travel, and community environment.

Livable Communities Element

The Livable Communities Element contains all the adopted Community Plans. The Livable Communities Element, as a concept, are those designed to sustain basic life activities, economic needs, and the social well-being of individuals of all ages, specifically elderly and low-income populations. They also balance safe, multimodal, and accessible transportation systems to support these activities while maintaining cultural and environmental resources such as historic structures, wetlands, and traditional architectural styles unique to each community. It identifies future main streets, signature streets, urban design patterns and connectivity to help refine CBCs of Suburban Town (C3T) and Urban General (C4)



Relevance to This Guide

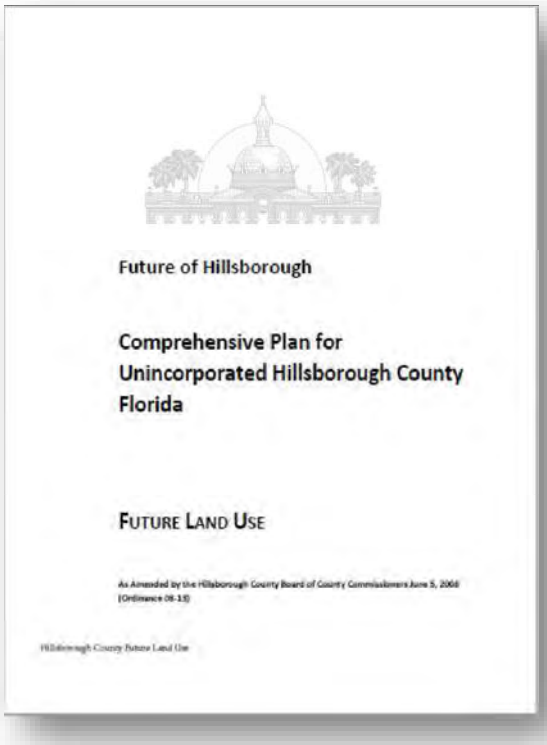
The Livable Communities Element provides guidance to application of the Context Based Classifications.

Future Land Use Element

The Community Design Component of the Future Land Use Element (FLUE)of the Comprehensive Plan was drafted to support the County's growth management program by providing a more specific vision of livable communities.

This Element of the Comprehensive Plan presents design related goals, objectives, and policies for a more "people friendly" community design to create livable communities. It is organized categorically, providing design standards for each community system or element. These include community-level design, neighborhood-level design, roadway-level design, site design, and objectives to support the implementation of the livable community guidelines.

The Livable Roadways Guidelines are incorporated into the community design component. These guidelines provide a new approach to roadway design which emphasizes the movement of people over vehicles and to create public spaces which enhance livability on city and county transportation thoroughfares. They have been incorporated into the Livable Communities Element. It



includes more flexible design features and standards which safely accommodate a variety of modes as well as vulnerable users.

Relevance to this Guide

This Complete Streets Guide incorporates Future Land Use Element's Livable Roadways Guidelines, including the creation of complete transportation systems for pedestrians, transit users, and bicyclists through the design of streets which accommodate all modes. The Guide complements the objectives of livable roadways in creating safe, public spaces within the rights-of-way to support vibrant, sustainable and user-friendly communities. It will further the goals and objectives of the Community Design Component, specifically:

- Plan a pattern of compact, livable and walkable neighborhoods and communities within the urban service area which are supported by locally oriented employment, goods and services.
- Create safer, more livable communities that foster interaction between people and discourage criminal activities through their environment and design.
- Provide a transportation system throughout the County that is safe and functional for all modes of transportation, is aesthetically-pleasing, and is designed to meet the overall needs of the communities it serves.
- Provide aesthetically pleasing landscape treatment along roadways and in the right-of-way.
- Provide for the implementation of Livable Communities considerations by integrating comprehensive plan and other county policies relating to livable roadways into the planning and design process for transportation infrastructure through a process of interagency coordination.

ITS TIME HILLSBOROUGH: 2045 LONG RANGE TRANSPORTATION PLAN

Hillsborough MPO's Long Range Transportation Plan (LRTP) sets the policy framework and guides funding for multimodal transportation projects for Hillsborough County and its municipalities. The LRTP was shaped by input from residents and collaboration with regional partners. Balancing population growth and quality transportation systems, it presents an innovative investment approach for transportation priorities and funding. The plan has a 25-year horizon and is updated every five years.

The primary vision for the most recent update of the LRTP is "*twofold: invest in creating viable rapid transit in its own right-of-way and invest in safer*

and more reliable major roadways." This vision will be implemented by prioritizing investments in five major funding programs:

- Good Repair and Resilience - pavement, bridge, stormwater, and transit maintenance.
- Vision Zero - Complete Streets treatments and other safety enhancements.
- Smart Cities systems.
- Real Choices When Not Driving - expansion of bus services and trails/paths separated from roadways.
- Major Investments for Economic Growth - rapid transit in a dedicated right-of-way, interchanges, and additional through lanes on major roadways.

The result of the Plan is a program of cost feasible projects designed to implement and advance the vision and goals established for the County multimodal transportation system.

Relevance to this Guide

The investment strategies and policies developed in the LRTP will be accomplished by integrating the complete streets typologies and processes provided in the Guide into county transportation projects and the project development process.

HILLSBOROUGH COUNTY VISION ZERO ACTION PLAN

In recent years, the number of traffic crashes, crash fatalities, and pedestrian-involved crash fatalities in the County have all trended upward. In response, the Hillsborough MPO and community partners joined the international Vision Zero movement aimed at ending road user deaths. The MPO's 2017 report used a data-driven approach to identify crash hot spots, determine underlying crash causes, and make recommendations for improving safety in these critical areas and throughout the community. Building on existing safety team efforts, the report emphasizes the principles of the Five E's: Engineering, Education, Enforcement, Equity and Evaluation in the hopes of changing the culture that contributes to high crash and fatality rates. Through this program, the County hopes to change the way the public views safe mobility and reinvent the way professionals in the private and public sectors approach people driving, biking and walking.

The first step in developing the Vision Zero Action Plan was to host public workshops and social media forums to engage the public and educate them on the topic of road safety, inform them about current events and news, and share information and updates on the Action Plan development.

The second step was to utilize available data to analyze the current trends and conditions and to pinpoint areas of high concerns. Additionally, the analytics helped to identify the major causes attributed to the crashes. The results of the analysis yielded the top 20 corridors for each mode including: severe automobile crashes, high bicycle and pedestrian crashes, and vulnerable user severe crashes. Additionally, data related to the cause of the crashes was extracted to produce the top 20 severe crash corridors due to aggressive driving, and little to no street lighting.

Lastly, an Action Plan was developed in accordance with the goals and objectives that identified activities, responsibilities, and resources for implementation to improve mobility and avoid perpetuating the existing safety issues and problems as new roads and developments are built. The Plan identified the following goals moving forward for the County transportation program:

- Increase awareness of Vision Zero to influence safer behaviors on our roadways.
- Engage with victims of traffic violence and their families to provide a support system and a platform for their voices to be heard.
- Leverage the capabilities and existing resources of the community traffic safety team as a community law enforcement partnership.
- Establish a Vision Zero "Consistent & Fair" corridor program.
- Update policies, standards, and procedures to foster a culture of safety in the planning and design for the transportation system.
- Create a safe multimodal transportation system through good design, lighting, and connected facilities.

Relevance to this Guide

The Guide will further the goals established in the Action Plan, specifically:

- Update policies, standards, and procedures to foster a culture of safety in the planning and design of transportation system improvements.
- Create a safe, multimodal transportation system through good design, lighting, and connected facilities

By designing County facilities that accommodate all modal users and create safe, comfortable spaces, only then can Vision Zero be achieved.

PROJECT DEVELOPMENT MANUAL

The Project Development Manual (PDM) provides guidance on the project development process for all transportation projects, including analyses of operational conditions, engineering elements, and potential environmental and community impacts associated with a project. Through this process, the most appropriate solutions to transportation problems are identified and developed through detailed design and construction. The PDM is intended to provide technical guidance—not establish operating procedures. It incorporates and references the

latest county, state and national practices and standards to provide a more efficient and consistent project evaluation, delivery and documentation process.

The PDM proposes a new process of the Preliminary Land Use Assessment and Transportation (PLAT) study as a connection between the LRTP and the engineering phase of a project's implementation (Project Development and Environment Study).PLAT assessments are conducted for all corridor projects, and include an assessment of area planning studies, land uses, and development market trends with respect to a proposed project. The goal: contextualize the corridor in terms of its relationship to the community and ensure the transportation investment supports it.

Relevance to this Guide

This Guide provides guidance on the roadway planning and preliminary design process by informing the roadway design recommended through the PLAT. This serves to carry forward previous planning efforts, analyses and decisions related to the transportation investment by shaping the development pattern and form to add value to the community.

GREEN INFRASTRUCTURE MANUAL

Hillsborough County's Green Infrastructure Manual is currently being developed to provide guidance on design, implementation and maintenance of green infrastructure for application to projects in the County. Key emphases include proper stewardship of our environment and water resources, as well as improving the livability of our communities through green infrastructure.

Relevance to this Guide

The Complete Streets Guide identifies compatible green infrastructure elements for each context typology. By contrast, the Green Infrastructure Manual defines how to implement and maintain these elements. Both the Guide and Green Infrastructure Manual should be used together to select, design, and manage green infrastructure elements as part of a Complete Street.

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Appendix C
Bicycle Facility Selection Toolkit

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BICYCLE **FACILITY SELECTION** TOOLKIT

FEBRUARY 2019

Hillsborough MPO
Metropolitan Planning for Transportation

CONTENTS

EXECUTIVE SUMMARY

The ability to walk and bike in a community is typically deterred by how comfortable or safe a person walking or biking feels using the network. In order for the general population to walk or bike for transportation, they need to feel safe for the entire trip. The Hillsborough MPO developed their existing multi-modal level of service methodology over 20 years ago. Over time, the needs of non-motorized users across the MPO area and the tools available to serve those needs have changed drastically. The MPO recently compiled national best practices on measuring multi-modal comfort on the street network and applied a new approach that considers not only whether a bicycle facility is present, but whether it is comfortable for even an 8-year old. The MPO applied a network-wide Bicycle Level of Traffic Stress analysis, which gives a score of LTS 1 through 4, to measure the comfort and level of stress bicyclist experience on bike facilities and in mixed traffic. In this analysis, an LTS 1 facility is considered low stress and suitable for the general population and an LTS 4 is considered high-stress, where even confident and strong bicycle riders will not travel.

Building on this methodology, the MPO developed this Bicycle Facility Toolkit to provide guidance to planners and implementation staff on projects. This guide outlines a decision-making framework that leverages the LTS assessment and helps planners identify the necessary bicycle facility type to make the street a low stress trip. The guide also provides planners a framework for network panning in a way that leverages existing low stress streets and assets such as trails and shared-use paths. Finally, the toolkit provides design guidance for implementation staff on the bicycle facilities themselves.

INTRODUCTION

MISSION STATEMENT

TO PROVIDE FLEXIBLE DESIGN GUIDANCE FOR THE IMPLEMENTATION OF APPROPRIATE BICYCLE FACILITIES ON HILLSBOROUGH COUNTY'S STREET NETWORK.

PURPOSE

This toolkit is designed to help Hillsborough County planning and implementation staff make well-informed decisions about bikeway design. Selecting the right facility for a given roadway can be challenging due to the range of factors that influence bicycle users' safety and comfort level. One of the most important factors is to determine what type of bicyclist the facility is meant to attract. Section III outlines the differing levels of comfort and skill bicyclists have.

HOW TO USE THE TOOLKIT

This toolkit has taken design best practices and compiled them in a framework that is intended to be useful for staff undertaking high-level planning efforts as well as implementation staff seeking to advance projects through their design and construction phases.

The sections in this toolkit are broken down by,

"For Planning Staff"

&

"For Implementation Staff"

callouts to tailor the application of the facility guidance to the user's need.

WHAT IS LEVEL OF TRAFFIC STRESS?

For Planning Staff: The primary goal is to select a bicycle facility that will provide the greatest amount of safety and protection within the existing roadway design for the expected user group. During the planning phase, the expected user group should be determined based on the surrounding environment. For example, a high-speed arterial with a high volume of traffic will not attract 'low skill' bicyclists who ride recreationally, but rather determined commuters who make routine trips. A breakdown of the various user groups is provided in Section III.

The decision to ride a bike in Hillsborough County can strongly rely on how comfortable someone will feel making the trip by bike. The first and most basic condition that must be met in order for people to consider riding a bike is they must feel safe doing so and must feel safe for the entire trip. The Level of Traffic Stress (LTS) provides a high-level look at how bicyclists are likely to experience each roadway in Hillsborough County.

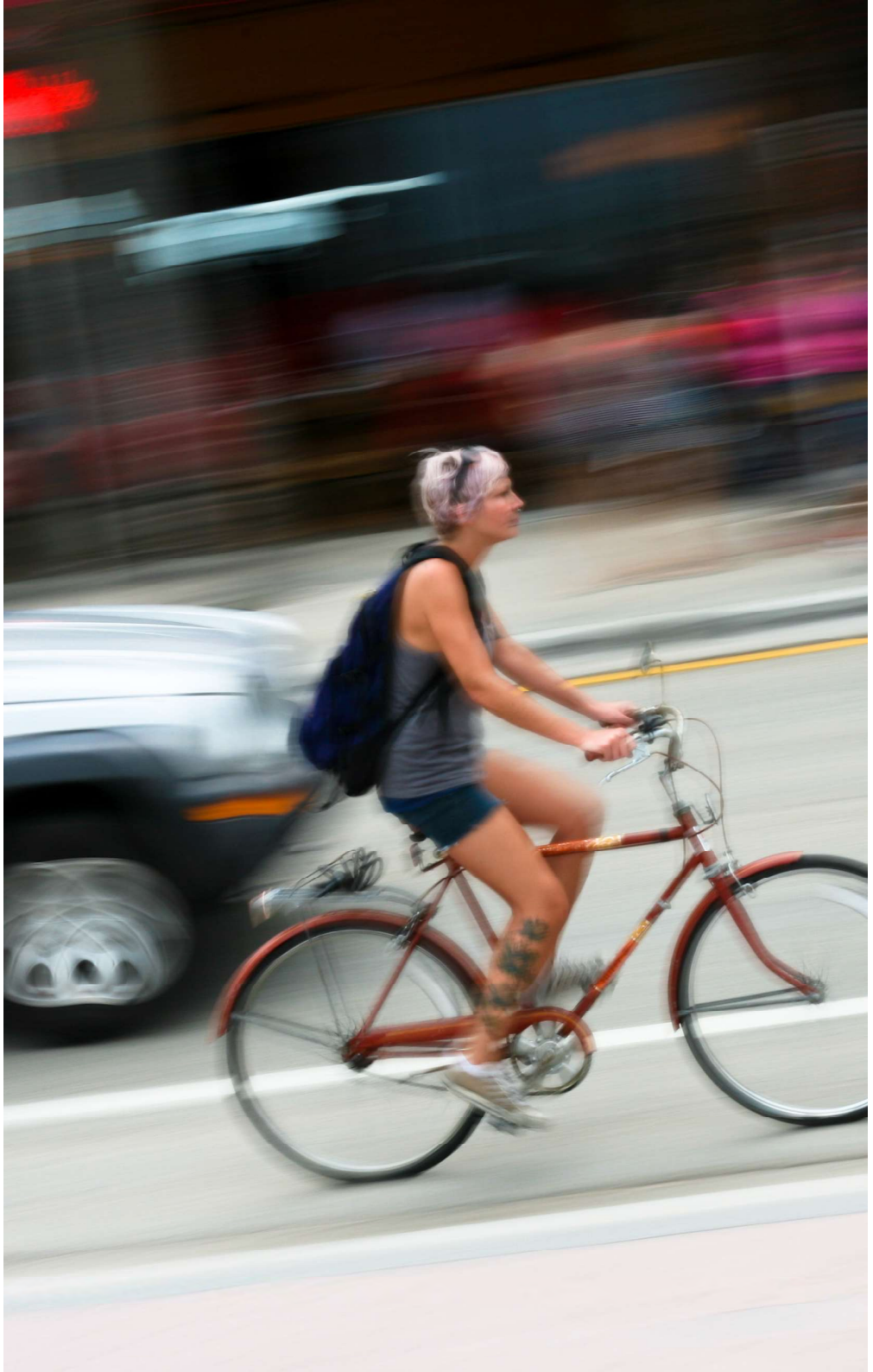
This can be used to show a project's usefulness in

1. connecting important destinations and places that are already bike-suitable to one another

and

2. extending bike travel as a viable option into more of Hillsborough County neighborhoods.

It can also be used to select which facility type is appropriate in a given location depending on who it is purported to serve.



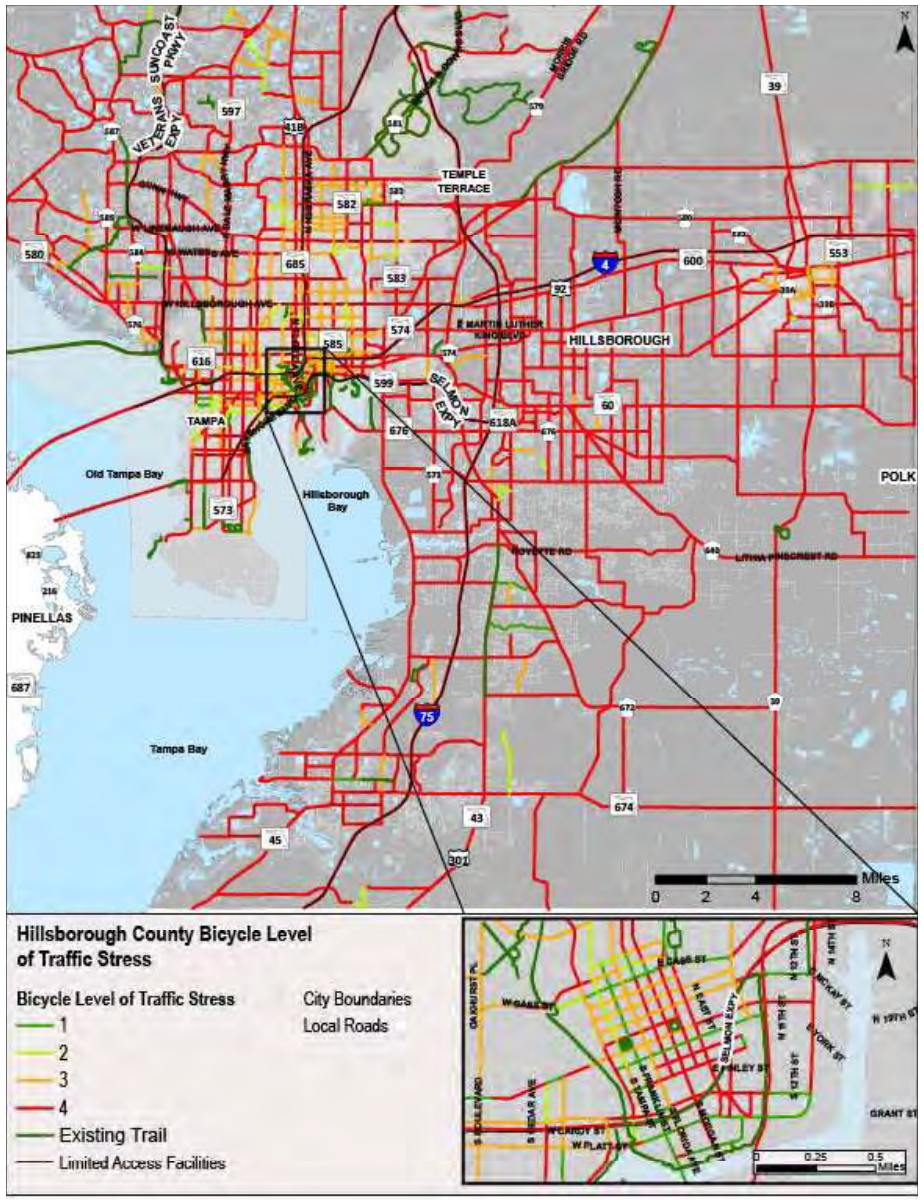
A DATA-DRIVEN PROCESS TO PLAN A BICYCLE FACILITY SYSTEM BASED ON COMFORT

The LTS analysis uses a "weakest link" methodology of assigning stress level; this reflects the reality that people on bikes experience various types of traffic stress (speed of traffic, volume of traffic, degree of separation from traffic, incursions into their space) simultaneously. For example, if even one of these factors is excessive, the whole street segment is a high stress experience for most potential riders.

A roadway stress level can depend on as few as one factor. Thus, roadways are first evaluated based on whether they have existing bike facilities. The methodology has two assessment processes, one for roadways with a bicycle facility and one for mixed traffic conditions. The following five factors are considered in both: (1) traffic speed; (2) surrounding land use; (3) traffic volume (as assumed from the number of travel lanes); (4) the level of separation from traffic; and, (5) incursions into the space used by people on bikes (e.g. high turnover parking).

The LTS scores range from an LTS 1, which is comfortable for most of the general population, to an LTS 4, which is uncomfortable for even experienced bicyclists. The LTS scores can help plan a complete bicycle network that is useful to the general population, leverage low-stress streets that are already comfortable for most people, and help identify the appropriate bicycle facility based on key characteristics of the street.

With the goal of assessing every roadway segment in the County true comfort level by bicycle, the County applied LTS to the entire County and State roadway network. This is depicted in the map to the right.



LEVERAGING LTS FOR NETWORK PLANNING

Once LTS scores are identified for all roads in the Network, LTS can be used to identify the ideal location(s) for adding or upgrading bike facilities. This is thought of as "unlocking" or "interconnecting" the low-stress system by identifying and overcoming the barriers to a complete network of facilities. This section provides important context as to how the application of LTS in-network planning is applicable for planning and implementation staff as defined below:

For Planning Staff: LTS provides a network-wide assessment of the locations where different user groups feel comfortable, enabling network planners to identify strategic corridors, sub-networks, and spot-improvements that will achieve maximum value, in terms of enabling safe and comfortable bike travel in more parts of Hillsborough County. These strategic interventions should be organized into 'projects' of one or more corridors/spot improvements and undertaken in a strategic order to maximize the area around the project that can reach it via low-stress streets/trails. With this, each individual project should be thoughtfully linked to its "catchment" area.

LTS FOR FACILITY SELECTION

Bicyclists categorized in User Group A (Strong and Fearless) are comfortable riding on busy roads with little physical separation from motorist through travel lanes.

User Group B (Enthused and Confident) cyclists are generally recreational and utilitarian riders who will ride on busy streets if there are facilities provided, but may also deviate from the most direct route to ride on low-traffic or shared use paths.

The majority of the population is categorized into User Group C (Interested but Concerned). This group includes a wide range of people of all ages who enjoy cycling, but may only ride on shared use paths, low traffic local streets, or protected on-street facilities.

User Group D (No way no how) will not choose to bicycle for transportation or recreation, regardless of provided infrastructure.

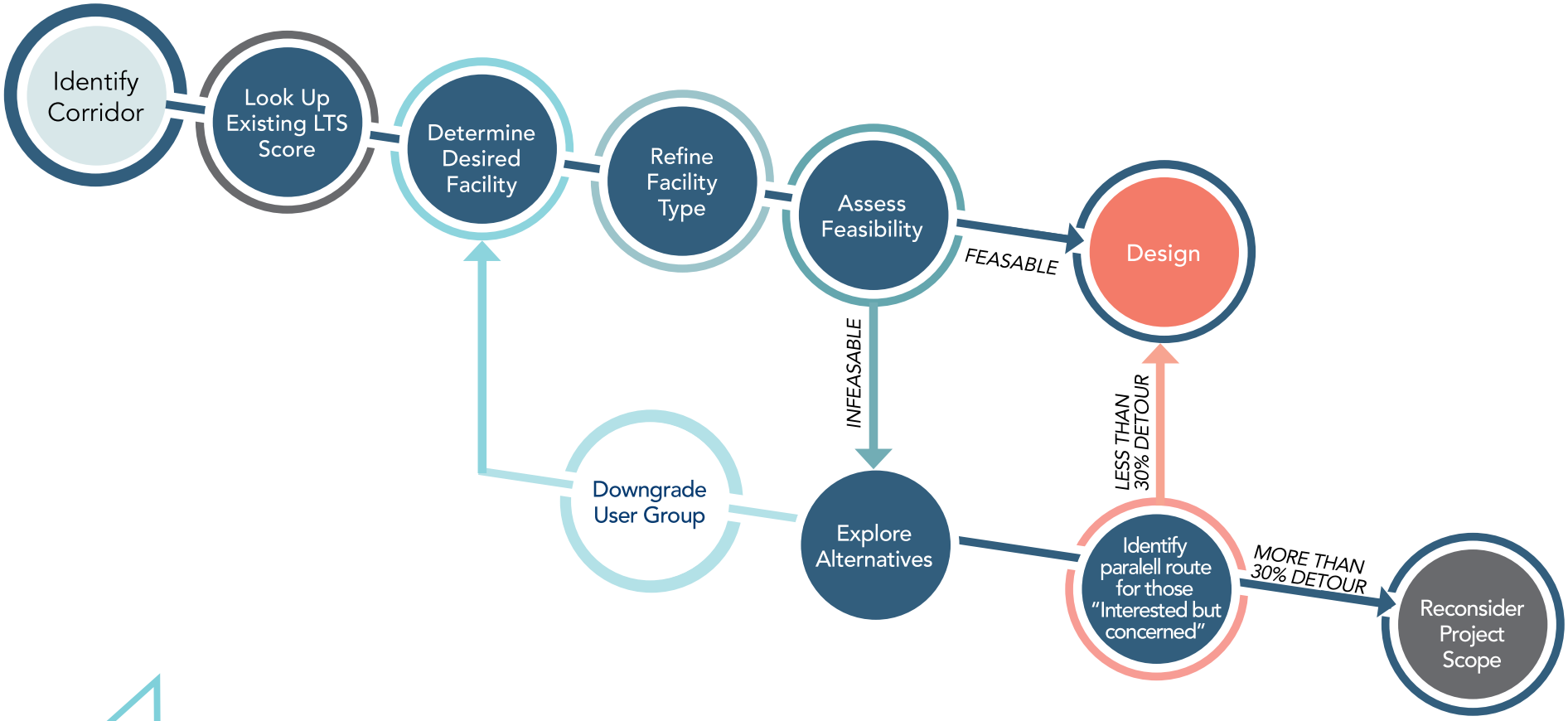
It is generally accepted that less-experienced and risk-averse bicyclists in User Group C account for most of the population. These bicyclists need to be connected via bike facilities/streets that are LTS 1 or 2 for the entirety of their trip. This makes it crucial to create connected networks, as shown above, AND to select and build a well-designed facility that meets the needs of these riders. In general terms, this user group prefers:

- Physically separated facilities such as protected bike lanes and trails
- Wide, preferably-buffered bike lanes on medium to low speed and low volume streets, adjacent to the curb (not a parking lane)
- Bike boulevard treatments on low-stress neighborhood streets

With the above context in place, this section will breakdown how facility selection, based on LTS, is applied for planning and implementation staff:

For Planning Staff: The use of the existing LTS map and field visit (if applicable) should be sufficient to determine the general existing stress level of a street or road, which can be used to select the appropriate general facility type for a corridor. It may be sufficient to simply designate the level of physical separation from traffic that these general population riders would need to feel comfortable and leave more detailed assessment to design and implementation staff. The flow chart in Figure 4 provides a planning-level process that helps determine the level of separation necessary for the corridor.

FACILITY SELECTION PROCESS



For Implementation Staff: A project will likely reach its implementation phase as a concept, at best, or a drawing as a line on a map with a general level of required separation. Additionally, it will depend on the implementation and design team to refine this into a plan that:

- Fits within the space that is available (this should have been determined in the planning phase)
  - Sometimes a road diet is assumed in the planning phase. In rare cases, if planning assumptions cannot be realized it may be necessary to choose a parallel, nearby route that can perform a similar bike network function.
- Achieves a low-stress bicycling condition
  - This is to be determined at each specific segment of the corridor, and at each intersection, bus stop, and other special-case locations.
- Is this acceptable to community members and stakeholders
  - It may be necessary to develop several alternatives to achieve a low-stress condition and engage in a public engagement process to choose a preferred alternative.

Implementation staff typically encounter irregularities in the corridor cross section in the design phase that is not found or realized at the planning stage. In these cases, the below table can be used to identify possible mitigations. To build on to the below table, we can add a column that references best practice resources (the City's Manual, NACTO Guidance, AASHTO etc.).

CONSIDERATION	MITIGATION
Bus stops along bike route	Bike lanes: Minimize and clearly mark conflict areas to alert bicyclists and buses Physically seperate facilities: Provide pedestrian queuing, landing, and shelter (if preseent) between bike facility and roadway, if feasible.
Bikeway adjacent to on-street parking with low occupancy	Consider removal or consolidation of parking
Bikeway adjacent to on-street parking with high turnover	Wide or buffered bike lanes preferred to reduce risk from opening car doors
Front-in perpendicular or angled parking	The use of back-in angled parking preferred
Bikeways along streets with numerous commercial driveways and/or unsignalized intersections	Clearly sign and mark conflict areas with colored pavement to warn motorists and bicyclists. Design high-volume driveways as intersections
Bikeways crossing a major signalized intersection	Consider bike boxes, turn-queue boxes, warning signs and markings, bicycle signals (especially at separated bicycle facility)
New bicycle route connecting existing facilities	Provide continuity with adjacent facilities, where possible. Provide bicycle facility at same or higher level of protection compared to adjacent facilities.
Bikeway on a truck route or road with greater than 10% heavy vehicles	Step up to next level of protection recommended by the chart (i.e. from mixed traffic to bike lanes, from buffered bike lanes to separated bicycle facility). Generally, separated bicycle facilities preferred, bike lane with buffer optional, depending on speed & volume characteristics of the roadway.

FACILITIES

Once a facility type is selected, the appropriate design practices must be applied to design a useful facility based on the street context. The following toolkit provides a summary of design best practices for each facility type as well as additional design resources available to reference in further detail

CONVENTIONAL BIKE LANE

BUFFERED BIKE LANE

BICYCLE BOULEVARD

ONE-WAY SEPARATED BIKE LANE

TWO-WAY SEPARATED BIKE LANE

SHARED-USE PATHS

WAYFINDING/SIGNAGE

MEDIAN REFUGE ISLANDS

THROUGH BIKE LANES

BIKE BOXES

TWO-STAGE TURN QUEUE BOXES

BIKE SIGNALS

CONVENTIONAL BIKE LANE

DESIGN SUMMARY

Shoulder bike lanes provide spaces for bicyclists to ride, separate from motor vehicle traffic. They are generally used on arterial and collector streets, where higher traffic volumes and higher speeds warrant more separation. Bike lanes increase safety, while reducing wrong-way riding.

DIMENSIONS

- 6′ recommended
- 5′ if no on-street parking is present
- 4′ minimum in constrained locations
- If on-street parking or buffer, total width 14.5′ – minimum 12′

TYPICAL APPLICATION

- Low traffic volumes (≥ 3,000 AADT)
- Posted travel speed ≥ 25 mph

LAND USE CONTEXT

- Urban and suburban

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9C
- NACTO Urban Bikeway Design Guide: Pages 7-11
- FDOT Complete Streets Design Handbook: Chapter 4

EXPECTED COST

$

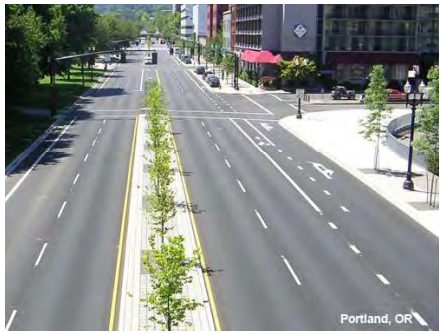
CONSIDERATIONS FOR LTS

Interested but Concerned

- Conventional bike lanes are only appropriate for inexperienced riders if the street is low-volume or low-stress. Typically, try to not place parking next to the bike lane, as inexperienced riders can find the car turnover and doors opening to be an unsafe environment (or add a buffer between parking and bike lane).
- Standard bike lanes should be used in conjunction with traffic calming measures (bottlenecks, chicanes, neckdowns, etc.) for LTS 2 roadways. More separation is required for an LTS 2 street to ensure the comfort of the range of riders.

Enthusiastic and Confident

- More experienced riders are comfortable with bike lanes next to parking lanes.



Images (Source: NACTO)

BUFFERED BIKE LANE

DESIGN SUMMARY

Buffered bike lanes are designed to increase space between bike lanes and the travel lane(s). They work best on high-volume or high-speed roadways or spaces where cars are parked too close to bike traffic. These conditions can be dangerous or uncomfortable for bicyclists.

DIMENSIONS

- Same as conventional bike lane (5′ – 6′), plus 2′ – 3′ painted buffer
  - Typically, paint buffer with diagonal lines to increase visibility
  - Buffer may be on the travel lane or parking lane side
- Together, the bike lane and buffer should be at least 7′

TYPICAL APPLICATION

- High traffic volume (≥ 10,000 AADT)
- Travel Speed ≥ 25 mph

LAND USE CONTEXT

- Urban, suburban, rural

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9C
- *NACTO Urban Bikeway Design Guide*: Pages 21-25
- FDOT Complete Streets Design Handbook: Chapter 4

EXPECTED COST

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CONSIDERATIONS FOR LTS

Interested but Concerned

- For inexperienced riders, a painted buffer between parked cars and the bike lane is helpful. It protects bicyclists from car doors opening and adds to their overall safety. The buffer should be painted with diagonal lines to make it clear to drivers to keep out of the designated bike space.

Enthusiastic and Confident

- More experienced and confident riders require buffered bike lanes when traffic volumes or speeds are high. Consider adding flex posts or a traffic calming device (daylighting, chicanes, narrowing roads, etc.) to ensure the bicyclist feels comfortable and is a safe distance from high speed traffic on through streets.

Images (Source: NACTO)

BICYCLE BOULEVARD

DESIGN SUMMARY

Bicycle boulevards are used on low-volume streets where motorists and bicyclists share the same space. Through traffic calming measures, they generally travel at the same speed, which creates a more comfortable environment for all users. Bike boulevards incorporate cost-effective and less physically-intrusive treatments compared to other bicycle facilities. Residents who live on bicycle boulevards benefit from reduced vehicle speeds, creating a safer environment.

DIMENSIONS

- Use Wayfinding signs, standard traffic calming measures (choker, chicane, neckdown, etc.)

TYPICAL APPLICATION

- Low traffic volumes (≤3,000 AADT)
- Posted travel speed ≤ 25 mph

LAND USE CONTEXT

- Urban and suburban
  - Avoid major streets

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9C
- NACTO Urban Bikeway Design Guide: https://nacto.org/publication/urban-bikeway-design-guide/bicycle-boulevards/, and Page 240

EXPECTED COST

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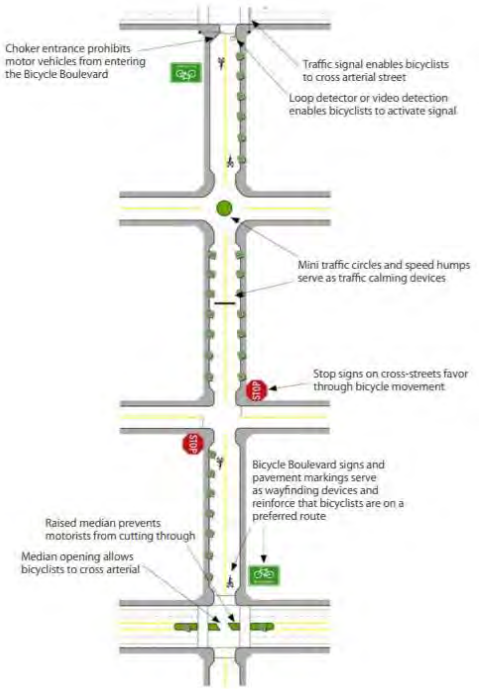
CONSIDERATIONS FOR LTS

Interested but Concerned

- Bicycle boulevards are perfect for low-stress streets, because little mitigation needs to be done. Residential streets or roads to public parks/ schools work best due to their slower speeds. Inexperienced riders can easily ride on these streets, as they generally have lower motor speeds or volumes. Ideally, bicycle boulevards should be used as parallel/alternative routes in comparison with higher stress streets.



Images (Source: NACTO)

ONE-WAY SEPARATED BIKE LANE

DESIGN SUMMARY

Also called 'protected cycle tracks,' separated bike lanes are on-street facilities that provide the comfort and safety of multi-use paths within the road right-of-way. This is done by combining a painted buffer with a physical barrier, such as flex posts, a parking lane, or a landscaped buffer. The added protection separates bicyclists from high-speed or high-volume motor traffic.

DIMENSIONS

- 5' – 7' bike lane
- 2' – 3' painted buffer (see buffered bike lane standards)

TYPICAL APPLICATION

- High traffic volumes (≥ 10,000 AADT)
- Travel speeds ≥ 40 mph
- Multi-lane streets with few intersections and driveway access points

LAND USE CONTEXT

- Urban and suburban

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9C
- NACTO Urban Bikeway Design Guide: Pages 62-70
- FDOT Complete Streets Handbook: Chapter 4

EXPECTED COST

$$$

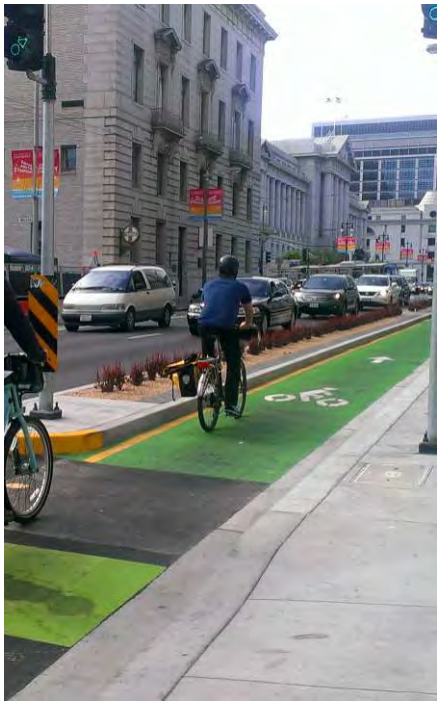
CONSIDERATIONS FOR LTS

Interested but Concerned

- Arterials are not safe or comfortable for inexperienced riders and therefore demand more separation for interested but concerned riders to be able to bike on or near the road. A physical barrier helps motorists stay in their space, away from bicyclists – giving even inexperienced riders a comfortable and safe environment, despite higher speeds and volumes.
- Typically, avoid a separated facility for a lower stress corridor, as it is more expensive and often conventional or buffered bike lanes will work. However, implementation of separated facilities is still important, as the raised buffer or flex posts give riders a sense of security due to the physical separation.

Enthusiastic and Confident

- Confident riders tend to ride faster than inexperienced riders, and thus the geometry of the facility should allow room for them to pass slower riders, space permitting.



Images (Source: NACTO)

TWO-WAY SEPARATED BIKE LANE

DESIGN SUMMARY

Also called "two-way cycle tracks," separated bike lanes allow bicycle travel in two directions on the same side of the road. Additional safety design is required because bicyclists travelling in the opposite direction of traffic is often unexpected and can cause confusion for drivers. Two-way cycle tracks are preferred when cyclists are already riding the "wrong" way on corridors where alternate routes are unsafe or have no bike facilities, or where there is not room for a one-way separated bike lane on both sides of the street.

DIMENSIONS

- At least 9' bike lane (total width)
- 2' – 3' painted buffer (see buffered bike lane standards)

TYPICAL APPLICATION

- High traffic volumes (≥ 10,000 AADT)
- Travel speeds ≥ 40 mph
- Multi-lane streets with few intersections and driveway access points

LAND USE CONTEXT

- Urban and suburban

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9C
- NACTO Urban Bikeway Design Guide: Pages 62-70
- FDOT Complete Streets Handbook: Chapter 4

EXPECTED COST

$$$

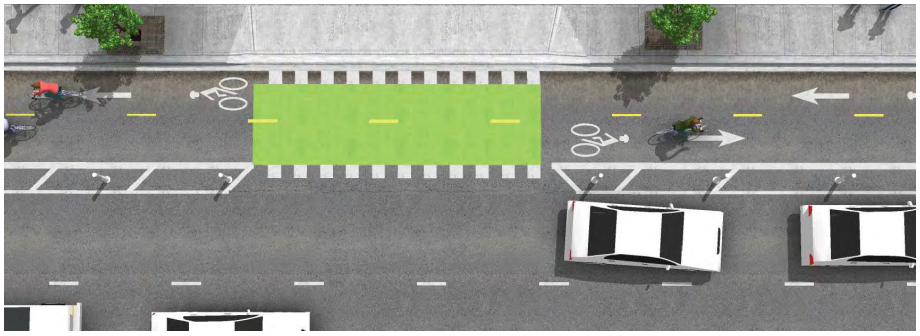
CONSIDERATIONS FOR LTS

Interested but Concerned

- Arterials are not safe or comfortable for inexperienced riders, and therefore demand more separation for interested riders to be able to bike on or near the road. A physical barrier helps motorists stay in their space, away from bicyclists – giving even inexperienced riders a comfortable and safe environment, despite higher speeds and volumes.
- Typically, avoid a separated facility for a lower stress corridor, as it is more expensive and often conventional or buffered bike lanes will work. However, implementation of separated facilities is still important, as the raised buffer or flex posts give riders a sense of security due to the physical separation.

Enthusiastic and Confident

- Confident riders tend to ride faster than inexperienced riders, and thus the design of the facility should allow room for them to pass slower riders, if space permits.



Images (Source: NACTO)

SHARED-USE PATHS

DESIGN SUMMARY

Shared-use paths, also called "multi-use paths," provide additional width for pedestrians and bicyclists, over a standard sidewalk. Paths next to roadways must have some sort of vertical or horizontal buffer – for example, a curb or landscaped barrier, respectively. Off-street paths are commonly found in urban and rural settings across the country.

DIMENSIONS

- 10' minimum in low traffic conditions
- 12' for high-use areas, or in areas where multiple users such as pedestrians, bicyclists and rollerbladers share the same space. In that context, pavement markings may be appropriate to separate them.

TYPICAL APPLICATION

- High volume, high speed roads with constricted right-of-way
- Few at-grade crossings, like driveways or alleyways

LAND USE CONTEXT

- Urban, suburban, and rural

ADDITIONAL GUIDANCE

- NACTO Urban Bikeway Design Guide: http://www.fdot.gov/design/training/DesignExpo/2016/Presentations/Multi-UseTrails-RobinBirdsongAndMaryAnneKoos.pdf
- FDOT Complete Streets Handbook: Chapter 4
- AASHTO Guide for Development of Bicycle Facilities: Chapter 5

EXPECTED COST

$$$$

CONSIDERATIONS FOR LTS

Interested but Concerned

- In high-volume and high-speed conditions, additional separation from drivers can make bicyclists feel more comfortable. The extra pavement also gives the cyclist more space to ride.
- In areas with very high motorist traffic, shared-use paths grant cyclists and pedestrians a safe space away from drivers. The raised separation between motor traffic and bicycles also adds to the overall environment, making it more comfortable for all users of the space.

Enthusiastic and Confident

- In areas where shared use paths are provided, usually bicyclists are mandated to ride them. Because of this, enthusiastic riders may want extra space to overtake slower pedestrians or cyclists. Appropriate sight distance should also be integrated accordingly, as experienced riders tend to travel faster.

WAYFINDING/SIGNAGE

DESIGN SUMMARY

Wayfinding signs are typically placed at key locations leading to and along bicycle boulevards. They are also helpful where multiple routes intersect, and at key bicyclist "decision points." Wayfinding signs displaying destinations, distances, and approximate riding time can dispel common misperceptions about time and distance, while simultaneously increasing comfort and accessibility to destinations. Aside from signage, wayfinding can also exist in the pavement, in the form of shared arrow markings (sharrows), pavement markings, etc.

DIMENSIONS

- Too many signs clutter the right-of-way, so signs should be posted at a level most visible to bicyclists and pedestrians rather than following the per vehicle signage standards
- Should be placed consistently along designated bike routes to be most effective

TYPICAL APPLICATION

- Designated bicycle routes (conventional bike lane, buffered, cycle tracks, etc.)
- Bicycle boulevards

LAND USE CONTEXT

- Urban, suburban, rural

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9B
- NACTO Urban Bikeway Design Guide: Pages 246-252

EXPECTED COST

$

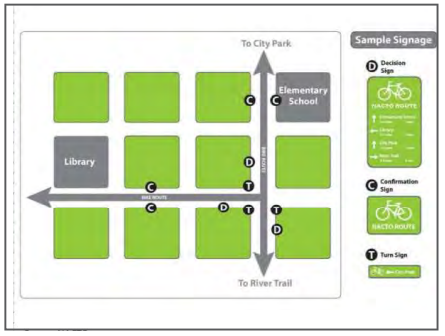
CONSIDERATIONS FOR LTS

Interested but Concerned

- Wayfinding and signage are only appropriate on low-stress streets because they do not improve physical separation between traffic and bicyclists, but rather improve the environment for the rider. Wayfinding and signage are strictly communication tools. Make sure the signs are at an appropriate eye level and are spaced at consistent intervals, to increase efficiency and visibility.

Enthusiastic and Confident

- Since these riders tend to bike at higher speeds, it is important to place the signs in a way that they can read it and gather the important information quickly as they pass it by.



Images (Source: NACTO)

MEDIAN REFUGE ISLANDS

DESIGN SUMMARY

Median refuge islands provide a space for pedestrians and bicyclists to wait to cross populated or long intersections. They help facilitate crossing one direction of traffic at a time and can be used in conjunction with bike boxes or cycle track crossings for additional safety. Median refuge islands provide a protected space for bicyclists to take advantage of gaps in traffic while simultaneously reducing delays to cross. They can also act as a traffic calming device, by narrowing the roadway and restricting turning movements.

DIMENSIONS

- Want 10' wide with an absolute minimum of 6'
- Place the median in the middle of the right-of-way
- Want the height to be curb level (6" typically

TYPICAL APPLICATION

- Where a bikeway crosses high-volume, high-speed traffic
- Signalized or unsignalized intersections
- Where cycle tracks end or intersect with motor traffic

LAND USE CONTEXT

- Urban and suburban

ADDITIONAL GUIDANCE

- MUTCD 3I.02
- NACTO Urban Bikeway Design Guide: https://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/median-refuge-island/, page 157-160
- FDOT Complete Streets Handbook: Chapter 4

EXPECTED COST

$$

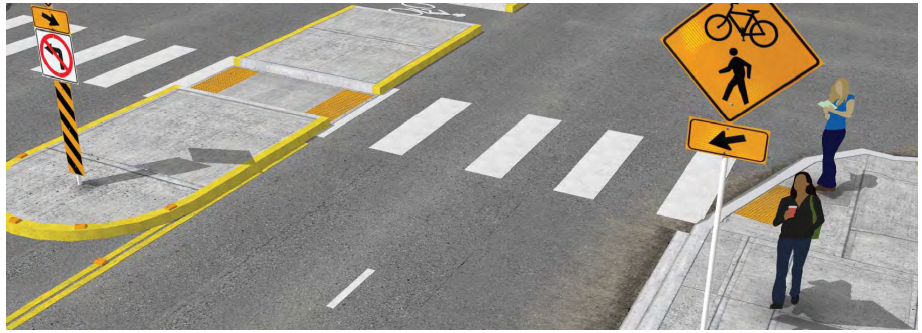
CONSIDERATIONS FOR LTS

Interested but Concerned

- A median refuge island shields bicyclists from incoming traffic and gives them a protected area to wait to cross an intersection.
- On higher volume and higher speed roadways, the full design suite (longer widths, reflective markers the approach to the island, angled cut-through, etc.) should be used to make inexperienced riders feel more comfortable crossing busy intersections. The raised median provides them with more visibility and allows them to wait until an appropriate gap in traffic before they cross.
- They work well in conjunction with raised cycle tracks, to give structure to the floating parking lane. Medians also provide shelter to bicycles making a two-stage turn.

Enthusiastic and Confident

- Confident riders can take advantage of an angled-cut through across the median, to position them to face traffic and judge when the best time to cross would be. Medians should be wide enough to allow for two-way traffic, or for these cyclists to pass the less experienced ones.



Images (Source: NACTO Design Guide pg 159)

THROUGH BIKE LANES

DESIGN SUMMARY

Through bike lanes are design approaches to intersections that allow bicyclists to correctly position themselves in anticipation of upcoming intersections. They typically work well in areas where a bike lane merges into a turning lane or parking lane, or on streets with right-turn only lanes.

DIMENSIONS

- Dashed white lines, 6" wide, 2' long
- Right-turn only lanes should be as short as possible

TYPICAL APPLICATION

- In context with right-turn only lanes
- Areas where the bike lane merges with a parking lane

LAND USE CONTEXT

- Urban and suburban

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9C
- NACTO Urban Bikeway Design Guide: Pages 173-176

EXPECTED COST

$

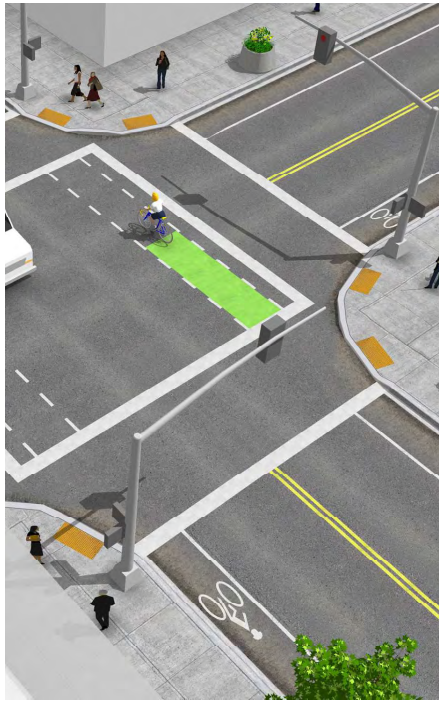
CONSIDERATIONS FOR LTS

Interested but Concerned

- A through bike lane does not provide any additional separation from motorists, but instead keeps the same bike lane intact throughout the intersection. This can be helpful for inexperienced riders to stay in their lane, but traffic often uses the lane to merge into a turning lane, therefore creating a difficult environment for them.

Enthusiastic and Confident

- More experienced riders should be able to navigate around turning traffic. Painting the through lane green will help bicyclists and motorist both identify conflict areas to help maintain awareness.
- This intersection treatment works well in conjunction with conventional or buffered bike lanes, as it acts as a continuation to the lane.



Images (Source: NACTO page 175)

BIKE BOXES

DESIGN SUMMARY

Bike boxes move the stop bar back for vehicles at signalized intersections. This creates a designated area for cyclists to wait during the red light phase. Bike boxes create a comfortable environment for riders by making them more visible and providing them a way to get ahead of queued traffic.

DIMENSIONS

- Use transverse lines to create a box 10' – 16' deep, and indicate where motorists are required to stop
- Center a bike symbol in the ox, between the crosswalk like and stop line
- Can also dye the pavement green for extra visibility

TYPICAL APPLICATION

- Signalized intersections on streets with bike lanes or cycle tracks
- Intersections with high-volume traffic, or a high number of right-turn movements

LAND USE CONTEXT

- Urban and suburban

ADDITIONAL GUIDANCE

- MUTCD: Chapters 3B, 9C
- NACTO Urban Bikeway Design Guide: Pages 110-116

EXPECTED COST

$$

CONSIDERATIONS FOR LTS

Interested but Concerned

- Bike boxes give cyclists an area to wait in front of drivers, to improve their visibility and give them additional space to wait ahead of queued traffic. They work best at signalized intersections, when the light is already red, as it gives the cyclist time to position themselves before the green light. If a cyclist arrives at a green light, see Two-Stage Queue Boxes.

Enthusiastic and Confident

- In higher volume or higher-turning-movement areas, green-colored bike boxes increase visibility and safety of the cyclist. By putting the cyclist ahead of motorists, the bike box allows cyclists to get a head start through the intersection and safely merge into their own lane once they cross it.
- If the bicycle box spans across multiple lanes, and is sufficiently deep, experienced cyclists have a chance to move in front of slower riders, without having to weave through traffic at an intersection.

TWO-STAGE TURN QUEUE BOXES

DESIGN SUMMARY

Two-stage turn queue boxes are treatments for intersections with a high-volume of left-turning cyclists or where bike facilities merge onto the main road. In a two-stage left-turn, cyclists proceed through the intersection on a green light, and wait in a marked queue box on the cross street to proceed through the intersection on the next green phase. Whereas a bike box works well for riders arriving during the red phase, a two-stage box gives riders the opportunity to be equally safe arriving during the green phase.

DIMENSIONS

- The queue box needs to be in a protected area (within on-street parking, or between the bike lane and pedestrian crosswalk, for example)
- Include pavement makings to indicate bicycle direction and positioning
- Can dye the pavement green for increased visibility

TYPICAL APPLICATION

- Signalized intersections with high volumes or speeds
- Streets with a significant amount of bike riders making left turns

LAND USE CONTEXT

- Urban, suburban, and rural

ADDITIONAL GUIDANCE

- MUTCD: Chapters 3B, 9C
- NACTO Urban Bikeway Design Guide: Pages 146-149

EXPECTED COST

$$

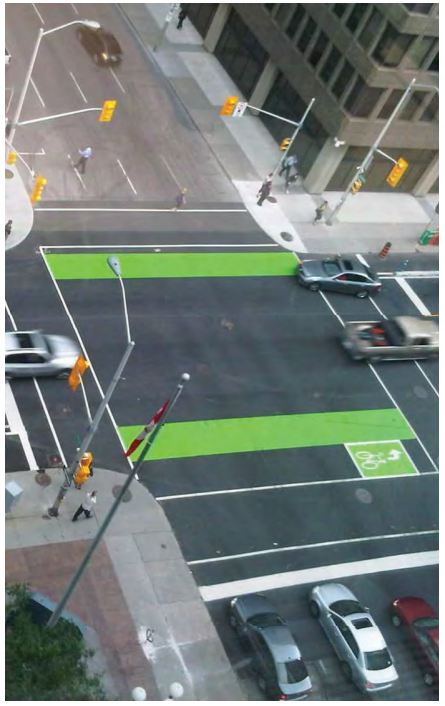
CONSIDERATIONS FOR LTS

Interested but Concerned

- For intersections with high speeds or volumes, a painted two-stage queue box gives inexperienced riders a designated safe area to wait before crossing. This treatment reduces conflict with motorists, as the cyclists will always travel parallel to through traffic.

Enthusiastic and Confident

- Two-stage queue boxes also separate turning cyclists from through bicyclists and works well in conjunction with cycle tracks or conventional and buffered bike lanes. More experienced riders can use the space to navigate the intersection at their own speed, with the additional room in the intersection.



Images (Source: NACTO)

BIKE SIGNALS

DESIGN SUMMARY

At intersections with conflicting movements, such as areas with high pedestrian or cyclist volumes, transit movements, or high motorist traffic, bicycle signal heads can be used to provide additional guidance to bicyclists and other users. Bike signals are used in conjunction with conventional traffic signals, and have the same standard green, yellow, and red light phases. They also prioritize bike movements and separate the traffic from conflicting movements.

DIMENSIONS

- Signal head should be clearly visible to cyclists and motorists
- Bicycle-only phase should provide adequate clearance time and actuation detection if it's not pretimed

TYPICAL APPLICATION

- Intersections with high volumes of bicyclists
- Transitions from trails or shared-use paths to on-street facilities

LAND USE CONTEXT

- Urban, suburban, and rural

ADDITIONAL GUIDANCE

- MUTCD: Chapter 9C
- NACTO Urban Bikeway Design Guide: Pages 206-213

EXPECTED COST

$$

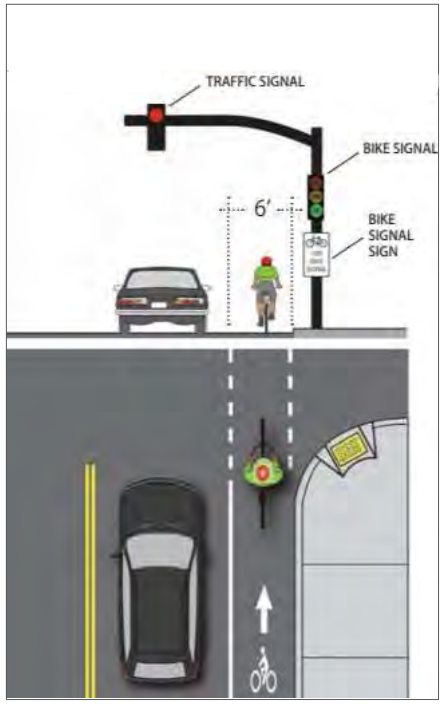
CONSIDERATIONS FOR LTS

Interested but Concerned

- Bike signals can help slower riders pace themselves through the intersection during the bike-only phase. During this phase, they do not have to compete with motorists for the right of way.

Enthusiastic and Confident

- In areas with high car and bicycle ridership, a bike-only phase is helpful in separating cyclists from motor traffic. The bicycle signal head allows cyclists to move safely through crowded intersections, and their protected phase also gives them an accurate sense of how much time they have to cross an intersection.
- For high stress areas, a bike box may also be used in conjunction with a signal head for increased separation.

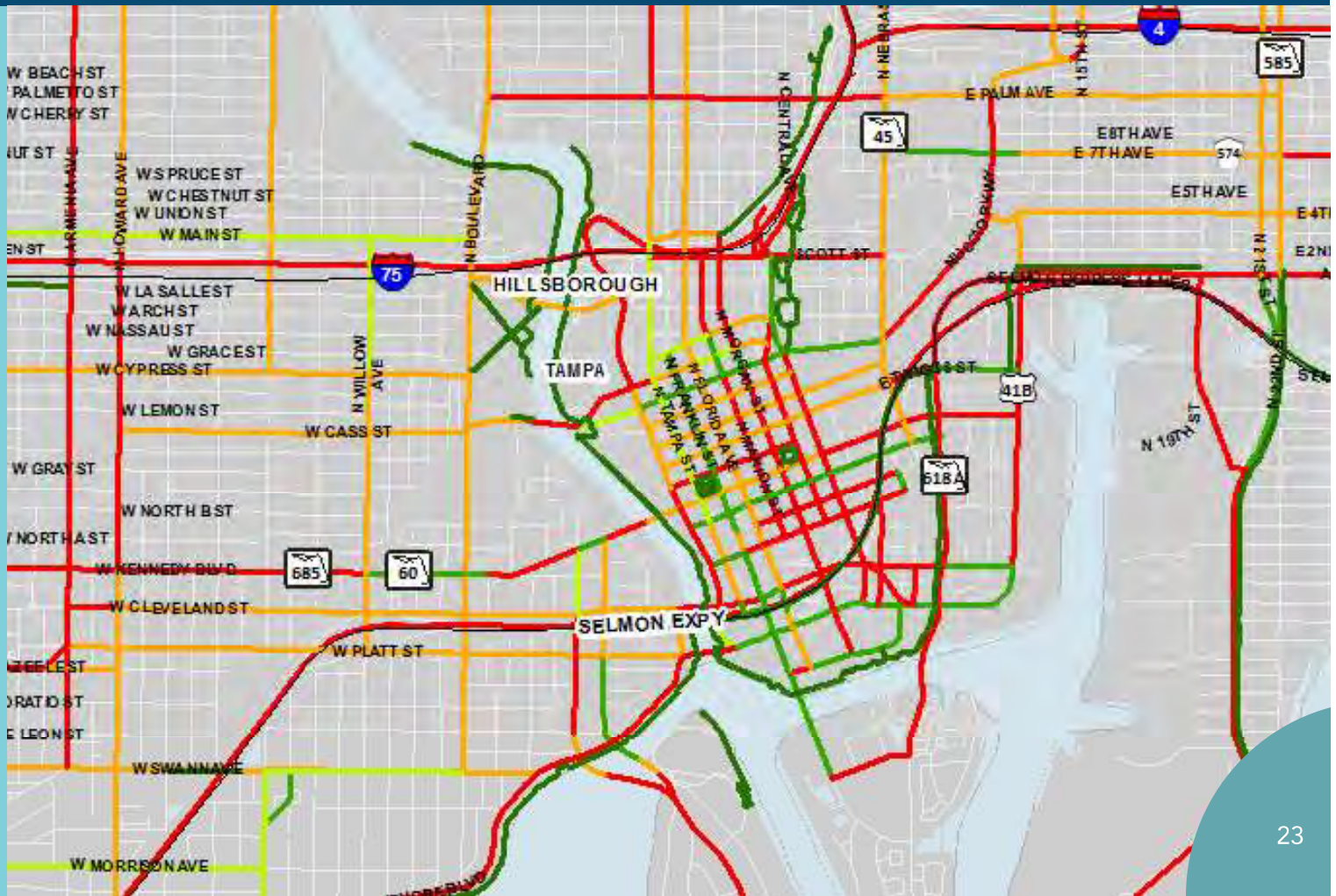


Images (Source: NACTO)

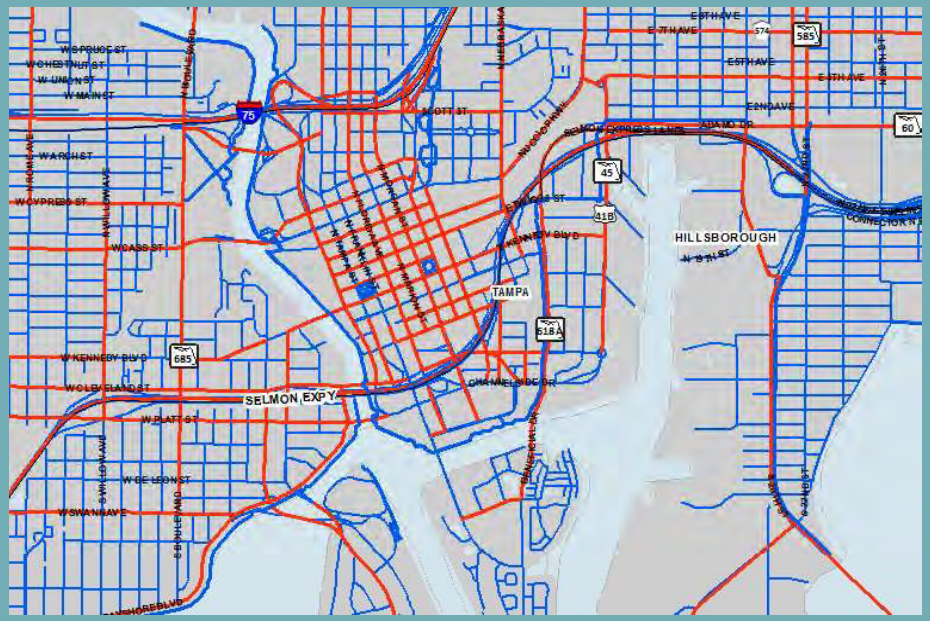
APPENDIX A – TAMPA, FL CASE STUDY

This section summarizes a case study of an LTS analysis conducted in Hillsborough, FL and applied in Downtown Tampa to understand how the LTS analysis can be used to identify critical infrastructure. The below maps show the greater Tampa area within Hillsborough County.

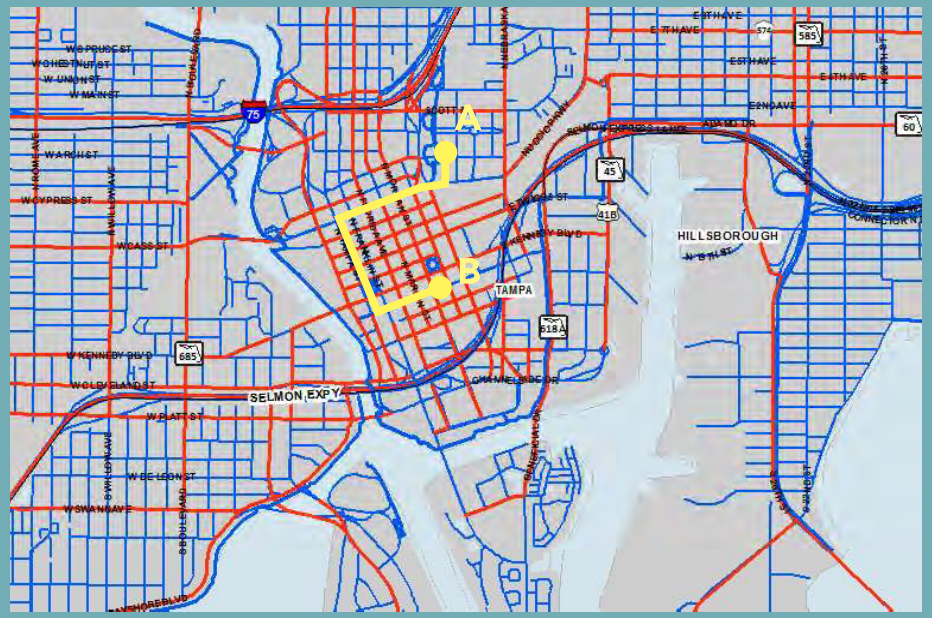
This map shows the LTS score for all FDOT and County roads. In this case, all local roads are assumed to be an LTS 1.



The second map shows the portion of the network that is lower stress and useful to the general population in blue (LTS 1 and 2, plus trails) and the streets that act as barriers to the general population (LTS 3 and 4).



The below map shows how the network breaks down for bicyclist. To get from point A to Point B via a continuous, low stress trip, bicyclist must travel 10 blocks out of their way. This can be reduced to a low stress 2-block diversion with the construction of a 4-block facility (green dashed lines) to connect the existing low stress facilities.



For Implementation Staff: LTS provides a relatively up-to-date map of the perceived level of stress of each roadway in COH as a useful tool for implementation staff. When a bike project reaches an implementation staff member, this is an additional opportunity to review the preliminary planning process, and check if changing real world conditions have modified the need.

Questions that an up-to-date LTS map can help implementation staff answer:

- Does this project connect to a significant low-stress network?
- Would a short extension or a nearby spot improvement significantly increase this project area's "low-stress catchment"?
- Is there an intersecting street that is listed as low-stress on the map that could use traffic calming, wayfinding, or other low-cost upgrades, to improve the function of this project?
  - If so, can this traffic calming/wayfinding be rolled into this project?.

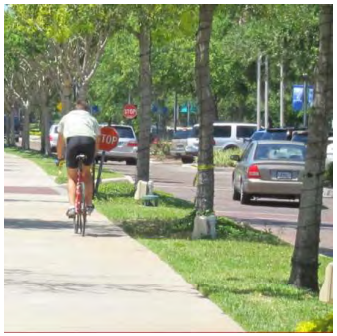
APPENDIX B - BICYCLE FACILITY TOOLKIT SUMMARY MATRIX

	COST	TYPICAL APPLICATION	REQUIRED	RECOMMENDED	PREFERRED
SIGNED ROUTES/WAYFINDING					
	$	• Placed at designated bike routes or bicycle boulevards • Good for urban areas to improve visibility • Appropriate LTS: 1	• Follow MUTCD Section 9B.01 – Application and Placement of Signs (as per NACTO Urban Bikeway Design Guide pg. 246)	• Design signs should be placed in advance of all turns at the near side of intersection • Include direction, destinations; with closest place on top • See pg. 247 of NACTO	• Periodically place bike route maps on/under signage • Use a routing number system if there is a route map (see MUTCD Section 9B2.1 for more) • See pg. 250 of NACTO
BICYCLE BOULEVARDS					
	$	• Low traffic volumes (≤3,000 AADT) • Posted travel speed ≤ 25 mph • Avoid major streets • Appropriate LTS: 1, 2 (Apply full suite of traffic calming)	• Use Wayfinding signs (starting on pg. 240) • Indicate how bicyclists can stay on path if boulevard turns onto another road • https://nacto.org/publication/urbanbikewaydesignguide/bicycleboulevards/	• Pavement marking should be standard size (112" x 40") • If narrow roads, place signs closer • (See link for more)	• Curb heights lower than 6" can be used on diverters and medians for emergency vehicles • (see link for more)

Figure 5: https://nacto.org/publication/urbanbikewaydesignguide/bicycleboulevards/signsandpavementmarkings/

BIKE LANES					
	$	• Streets with traffic volumes ≥ 3000 AADT • Streets with travel speeds ≥ 25 mph • Most appropriate on arterials and collectors • Appropriate LTS: 1, 2	• Desired width is 6' with a minimum of 4' along street edge • If next to a parking lane, want parking/bike/buffer width total to be 14.5' with a minimum of 12' • Words, symbols to define lane periodically throughout (as per MUTCD Figure 9C3) • 68" solid line to mark the difference between motor travel and bike • See page 7 of NACTO Urban Bikeway Design Guide	• Make wider than minimum widths wherever possible • If next to a parking lane, solid white line of 4" between parking and bike lanes to avoid encroachment • If there's space, separation between parking and bike lane – maybe by buffer • If turning vehicles must merge into bike lanes, increase dashed line length from 50 to 200' • See pg. 9 of NACTO	• Color the lanes to enhance space • Bike lane signs before the beginning of a marked bike lane to designate preferential bike use • Bike lanes adjacent to curbs, make it "No Parking" (see MUTCD R83) • See pg. 11 of NACTO

	COST	TYPICAL APPLICATION	REQUIRED	RECOMMENDED	PREFERRED
BUFFERED BIKE LANES					
	$$	• Motor traffic volume ≥ 10,000 AADT • Travel Speed ≥ 25 mph • High volume or higher speed warrant greater separation • Appropriate LTS: 1, 2, 3	• Mark the bike lane with words or symbol/arrow • Buffer marked with 2 solid white lines with diagonal hatching if 3ft or wider • See page 21 of NACTO Urban Bikeway Design Guide	• Next to parking, 5′ minimum width • If high speed, buffer and bike lane should be 7′ • Buffers at least 2′ wide • intersection, transition to through bike lane • See pg. 22 of NACTO	• Wide (68″) solid line to mark the line closest to adjacent traffic • Separation between bike lane striping and parking • Color the beginning of each block • See pg. 23 of NACTO
ONEWAY SEPARATED BIKE LANES					
	$$$	• Multi lane traffic • Traffic volume ≥ 10,000 AADT • Travel speeds ≥ 40 mph) • Streets with few intersections and driveway access points • Appropriate LTS: 2, 3, 4	• Use a cycle track, as outlined by MUTCD • Need the symbol or arrow at the beginning and periodically throughout the track • See page 62 of NACTO Urban Bikeway Design Guide	• Desired is 5′ but if high bicycle volume, want 7′ • At least a 3′ buffer • When using a pavement marker buffer, combined parking and buffer width should be 11′ • See pg. 64 of NACTO	• Cycle tracks can be closer to travel lane as intersections approach, to put bicyclists in clear view of drivers • Color pavement to define bike space • See pg. 68 of NACTO
TWOWAY SEPARATED BIKE LANES					
	$$$	• Multi lane traffic • Traffic volume ≥ 10,000 AADT • Travel speeds ≥ 40 mph) • Streets with few intersections and driveway access points • Contraflow bike travel is desirable • Appropriate LTS: 2, 3, 4	• Word, symbol or marking to indicate bike lane periodically throughout length • "Do Not Enter" with "Except Bike" (as per MUTCD R51) • Traffic controls along the street oriented towards contraflow • See page 95 of NACTO Urban Bikeway Design Guide	• 8′ minimum, want 12′ • 3′ buffer if next to parking lane • Dashed yellow line to separate the directions of flow • Two stage turn boxes to assist in making turns from the cycle track • See pg. 97 of NACTO	• On minor intersections, can shift track more closely to travel lane • Can configure the track to be raised for better visibility • See pg. 99 of NACTO

	COST	TYPICAL APPLICATION	REQUIRED	RECOMMENDED	PREFERRED
SHARED USE PATH					
	$$$$	• Existing roadway has high traffic speed and volumes in a constrained rightofway • Appropriate LTS: 3, 4	• Separation between path and road • See FDOT for more http://www.fdot.gov/design/training/DesignExpo/2016/Presentations/ultiUseTrailsRobinBirdsongAndMaryAnneKoos.pdf	• Want 14' width, 8' minimum • Use a design speed of 18 mph (See AASHTO Guide for Development of Bicycle Facilities, 2012)	• 10' Vertical clearance, with 8' minimum • Meet ADA requirements very often • See Ch 8 of FDOT
Figure 6: FDOT Design Expo, Slide 20					
INTERSECTION TREATMENTS: BIKE LANE					
THROUGH BIKE LANES					
	$	• See page 172 on NACTO Urban Bikeway Design Guide, Case study on St. Petersburg, FL (Evaluation of a Green Bike Lane Weaving Area)	• Dashed white lines 6" wide, 2' long • Rightturn only lanes should be as short as possible • Color/add signage to enforce bike right of way • See pg. 173 of NACTO	• Use a bike box instead to designated through turn lane (See pg. • Bike warning signs or "share the road" signs in advance of transition • See pg. 175 of NACTO	• Use a bike box instead to designated through turn lane (See pg. • Bike warning signs or "share the road" signs in advance of transition • See pg. 175 of NACTO
MEDIAN REFUGE ISLAND					
	$$	• Want 10' or wider, absolute minimum is 6' • See Section 3I.02 MUTCD for pavement markings • Outline median in retroreflective white or yellow • See page 157 of NACTO Urban Bikeway Design Guide	• Length should be greater than 6' • Height of island should be curb level (6") • Wide enough for 2way • Angled cutthrough so bicyclists can face oncoming traffic • See pg. 159 of NACTO	• Median Refuge Island: • Can provide landscaping if it doesn't compromise visibility • Install lighting for night • Can carry the median refuge across entire street to act as diverter • See pg. 160 of NACTO	• Can provide landscaping if it doesn't compromise visibility • Install lighting for night • Can carry the median refuge across entire street to act as diverter • See pg. 160 of NACTO

	COST	TYPICAL APPLICATION	REQUIRED	RECOMMENDED	PREFERRED
INTERSECTION TREATMENTS: BIKE BOX					
	$$	• Signalized intersection with high volumes of motorists or bicyclists • Frequent motorist right turns or bicycle left turns	• 10 – 16' deep transverse lines to create the box • Use a stop line to show where motorists must wait • Center a pavement marking of a bike rider with a helmet between crosswalk and stop line • see Page 110 of NACTO	• Place a "Stop here on red" sign at the stop line for cars • Color the pavement green to encourage compliance • Define potential areas of conflict across the intersection with green paint • See pg. 112 of NACTO	• Stop lines can be placed up to 7' in advance of bike box • Bike box can extend across multiple travel lanes • Can combine with exclusive bike signal phase I high volume of bicyclists • See pg. 115 of NACTO
INTERSECTION TREATMENTS: CROSSINGS SHARED USE PATH					
	$$$	• Conventional Bike Lanes • See above in table • Bicycle Signal • Intersections with bicycleonly movements	• Conventional Bike Lanes • See above in table • Bicycle Signal • Clear standards are not defined, consider MUTCD general guidance	• Conventional Bike Lanes • See above in table • Bicycle Signal • Signal head should be clearly visible to oncoming bicycles • Bicycle phase should provide adequate clearance time and actuation/ • detection (if not pretimed)	• Conventional Bike Lanes • See above in table • Bicycle Signal • Clear standards are not defined, consider MUTCD general guidance
INTERSECTION TREATMENTS: TWO STAGE QUEUE BOX					
	$$$	• Areas with high left turning volume • Works best for green lights, in contrast with bike box at red lights	• A designated area to hold queuing bicyclists • Include a bicycle stencil and turn arrow to indicate proper bicycle positioning • Place bike box in protected area • See Page 146 of NACTO	• Color the pavement green to further define the space • Using markings throughout the intersection • See pg. 147 of NACTO	• Position the queue box laterally in cross street parking, instead of in front of the travel lane • Can use bike signals in conjunction with twostage queue box • See pg. 148 of NACTO

Hillsborough MPO
Metropolitan Planning for Transportation

BICYCLE **FACILITY SELECTION** TOOLKIT

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Appendix D
Speed Management Countermeasure Toolkit

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Aggressive Driving Crash Countermeasures

	Area Type			Location Type			Effects		
Countermeasure	Urban (C4,C5,C6)	Suburban (C3)	Rural (C1-C2)	Intersection	Slow Street	Arterial / Corridor	Crash Reducing	Speed Reducing	Severity Reducing
Safe People Walking or Bicycling:									
Pedestrian Crossing - High Visibility	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raised Pedestrian Crossing	✓	✓		✓	✓	✓		✓	✓
Sidewalks Required on both sides	✓	✓		✓	✓	✓	✓		✓
Sidewalks (8 foot min standard)	✓	✓		✓	✓	✓	✓		✓
Sidewalk Seperation (from travel lanes)	✓	✓	✓	✓	✓	✓	✓		✓
Mid-Block Pedestrian Crossing/Short Blocks	✓	✓			✓	✓	✓	✓	✓
Refuge Islands (raised/painted)	✓	✓		✓	✓	✓	✓	✓	✓
Painted Intersections / Crosswalks	✓	✓		✓	✓	✓		✓	✓
Protected Intersections	✓	✓		✓	✓	✓	✓	✓	✓
Bike Lanes (seperated)	✓	✓		✓	✓		✓	✓	✓
Bike Lanes (protected)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Shade Trees / Landscaping	✓	✓	✓	✓	✓	✓	✓	✓	✓
ADA Curb Ramps	✓	✓	✓	✓	✓	✓	✓	✓	✓
Expand Radius of Safe Routes to School	✓	✓	✓	✓	✓	✓	✓	✓	✓
Work Zone Temporary Facilities	✓	✓		✓	✓	✓	✓	✓	✓
Create Shared / Slow Streets	✓			✓	✓		✓	✓	✓
Re-evaluate Context Class	✓	✓	✓		✓	✓	✓	✓	✓
Re-evaluate Target Speed Limit	✓	✓	✓	✓	✓	✓	✓	✓	✓

Aggressive Driving Crash Countermeasures (cont.)

	Area Type			Location Type			Effects		
Countermeasure	Urban (C4,C5,C6)	Suburban (C3)	Rural (C1-C2)	Intersection	Slow Street	Arterial / Corridor	Crash Reducing	Speed Reducing	Severity Reducing
Safe Streets:									
Chicanes / Lateral Shifts	✓	✓		✓	✓	✓		✓	✓
Full / Half Closure	✓			✓	✓	✓	✓	✓	✓
Lane Width (10 foot standard)	✓	✓		✓	✓	✓	✓	✓	✓
Road Diet (repurpose space)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gateway Treatement	✓	✓	✓	✓	✓	✓	✓	✓	✓
Roundabout	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mini Traffic Circle	✓	✓	✓	✓	✓		✓	✓	✓
Speed Tables/Raised Intersections	✓	✓		✓	✓	✓		✓	✓
Bulb Outs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Corner Radii / Radius Reduction	✓	✓	✓	✓	✓	✓		✓	✓
Centerline Hardening	✓	✓		✓	✓	✓	✓	✓	✓
Eliminate Acceleration Lanes	✓	✓		✓	✓	✓	✓	✓	✓
Eliminate Deceleration Lanes	✓	✓		✓	✓	✓		✓	✓
Eliminate Right Turn Channelization	✓	✓		✓	✓	✓	✓	✓	✓
On-Street Parking	✓	✓			✓	✓		✓	✓
Tactical Urbanism-Quick Fixes	✓	✓	✓	✓	✓	✓	✓	✓	✓
Provide Street / Pedestrian Lighting	✓	✓		✓	✓	✓	✓	✓	✓
Convert to Two-Way Streets	✓	✓	✓		✓	✓		✓	✓
Enhanced Curve Delineation	✓	✓	✓		✓	✓	✓	✓	✓
Optical Speed Bars/ Converging Chevrons	✓	✓	✓			✓	✓	✓	✓
Re-evaluate Context Class	✓	✓	✓	✓	✓	✓	✓	✓	✓
Re-evaluate Target Speed Limit	✓	✓	✓		✓	✓	✓	✓	✓

Aggressive Driving Crash Countermeasures (cont.)

	Area Type			Location Type			Effects		
Countermeasure	Urban (C4,C5,C6)	Suburban (C3)	Rural (C1-C2)	Intersection	Slow Street	Arterial / Corridor	Crash Reducing	Speed Reducing	Severity Reducing
Safe Freeway Interchanges:									
Eliminate Acceleration Lanes	✓	✓	✓		✓	✓	✓	✓	✓
Redesign High Speed Exit Ramps	✓	✓	✓		✓	✓	✓	✓	✓
Redesign High Speed On-Ramps	✓	✓	✓		✓	✓	✓	✓	✓
Transverse(in lane) Rumble Strips	✓	✓	✓		✓	✓	✓	✓	✓
Provide Safe Continuous Bike Lanes	✓	✓			✓	✓	✓	✓	✓
Provide Safe Pedestrian Crossings	✓	✓			✓	✓	✓	✓	✓
Re-evaluate Context Class	✓	✓	✓	✓	✓	✓	✓	✓	✓
Re-evaluate Target Speed Limit	✓	✓	✓		✓	✓	✓	✓	✓
Safe Traffic Operations:									
Lower Speed Limits	✓	✓	✓		✓	✓	✓	✓	✓
Add New Signals / Improve Connectivity	✓	✓	✓	✓	✓	✓		✓	✓
Protected-only Left Turn Signal Phasing	✓	✓	✓	✓	✓	✓	✓	✓	✓
Signal Coordination-Target Speed	✓	✓		✓	✓	✓	✓	✓	✓
Variable Speed Limits (Expressways)	✓	✓						✓	✓
Driver Feedback Signs - Speed	✓	✓	✓		✓	✓	✓	✓	✓
Leading Pedestrian Interval	✓			✓	✓	✓	✓	✓	✓
Rectangular Rapid Flashing Beacon	✓	✓		✓	✓	✓	✓	✓	✓
Hybrid Ped Beacon / HAWK	✓	✓		✓	✓	✓	✓	✓	✓
Rest in Red Signal Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓
Advanced Speed Detection Signals	✓	✓	✓	✓	✓	✓	✓	✓	✓
Shorter Signal Cycle Lengths	✓	✓	✓	✓	✓	✓	✓	✓	✓
Traffic Signal- Demand Responsive off-peak	✓	✓	✓	✓	✓	✓	✓	✓	✓
Street Lighting / Pedestrian Level Lighting	✓	✓	✓	✓	✓	✓	✓	✓	✓
Update Pedestrian Countdown Timers	✓	✓	✓	✓	✓	✓	✓	✓	✓
Automated Section Speed Enforcement	✓	✓	✓		✓	✓	✓	✓	✓
Mobile Speed Camera Enforcement	✓	✓	✓	✓	✓	✓	✓	✓	✓
Red Light Cameras	✓	✓	✓	✓	✓	✓		✓	✓
Re-evaluate Context Class	✓	✓	✓	✓	✓	✓	✓	✓	✓
Re-evaluate Target Speed Limit	✓	✓	✓		✓	✓	✓	✓	✓

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Complete Streets Guide

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