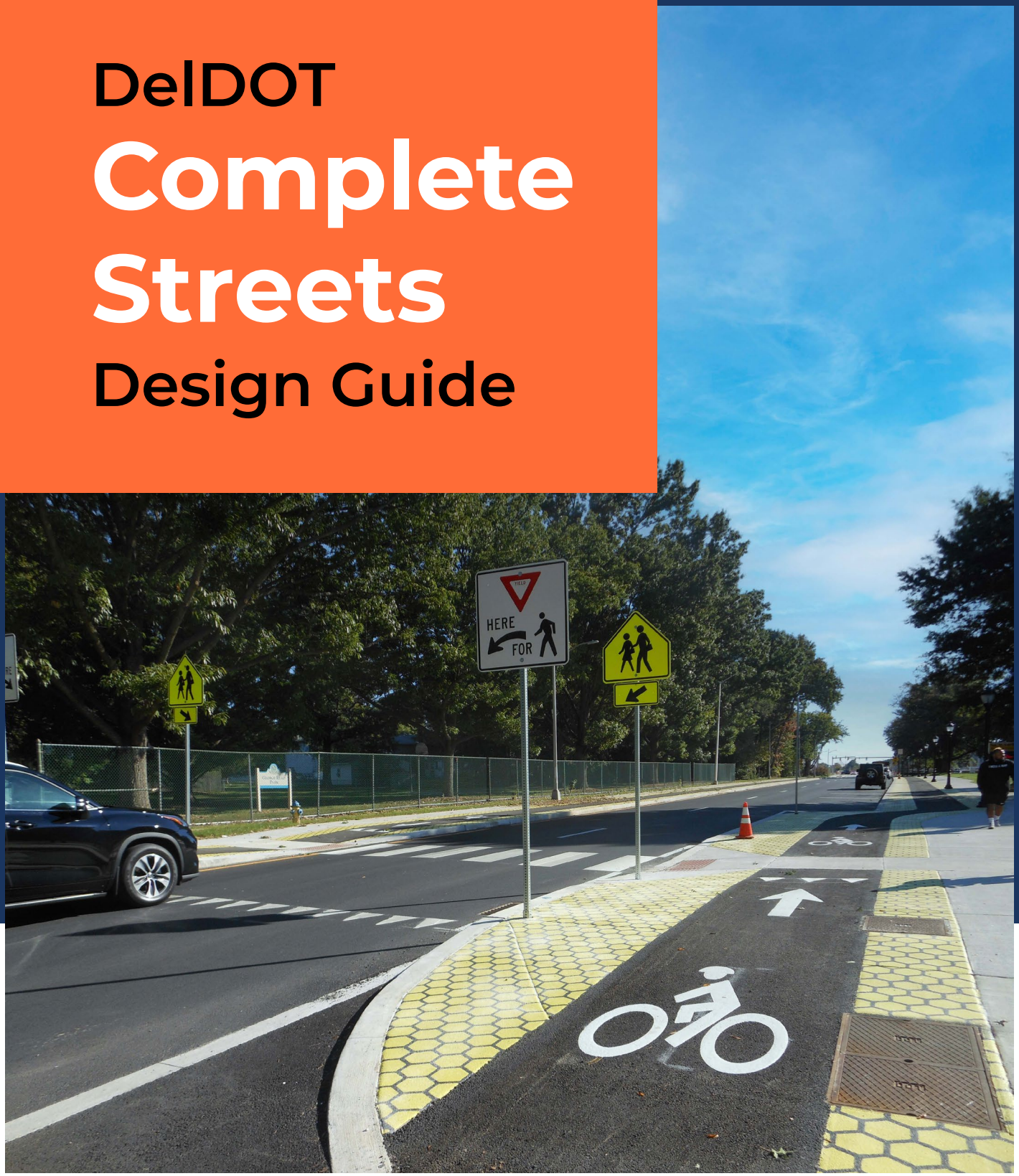
DelDOT Complete Streets Design Guide



DelDOT

March 2025

Acknowledgement

The Delaware Department of Transportation (DelDOT) extends its sincere appreciation to all those who contributed to the development of the Complete Streets Design Guide. This guide was made possible through the dedication and collaboration of a multidisciplinary team of planners, engineers, and designers who provided their expertise and insight. This collective effort will serve as a vital resource in creating safer, more accessible, and inclusive streets for all users.

We extend our gratitude to the following contributors for their expertise, dedication, and valuable input:

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Letter of Support

A policy, no matter how bold or innovative, is only as effective as its execution. On behalf of the Delaware Department of Transportation (DelDOT), I am proud to present the DelDOT Complete Streets Design Guide. This guide translates our Complete Streets Policy into a practical blueprint for project development and decision-making, providing the tools to implement safer, more accessible transportation networks.

At DelDOT, we are committed to a Safe System approach — recognizing that people will make mistakes, but our roads should be designed to prevent serious injuries and fatalities. By applying the principles of Complete Streets, we can build transportation networks that reduce risks, promote safer speeds, and protect all users, whether walking, biking, driving, or using public transit.

Our streets are not just pathways for vehicles; they are essential public spaces that connect people to jobs, schools, healthcare, and recreation. This guide provides a clear framework to prioritize the needs of all users, fostering mobility, accessibility, and healthier, more vibrant communities.

I encourage planners, engineers, and decision-makers to use this guide as a resource for designing streets that reflect our collective commitment to safe multimodal streets. Together, we can create a transportation system that supports connected, sustainable, and accessible communities.

Thank you for your continued partnership and dedication to making Delaware's streets safer and more welcoming for all.

Sincerely,

Shanté Hastings
Secretary
Delaware Department of Transportation

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DelDOT

Definitions

ACTIVE TRANSPORTATION
Active transportation refers to human-powered movement from one point to another, generally through walking, wheeling, or bicycling. Active transportation is sometimes referred to as nonmotorized transportation.

ALIGHTING PAD
The alighting pad is the area passengers use to get on and off the bus.

BIKE LANE
A bike lane is a portion of a roadway designated for preferential or exclusive use by bicyclists by pavement markings and, if used, signs.

BUFFERED BIKE LANE
Buffered bike lanes are on-street bike lanes that include a 2-foot minimum striped buffer area between the bike lane and travel lanes to increase lateral separation between bicyclists and motor vehicles.

BUS PULL-OFF
A bus pull-off is a designated area on the side of the road where buses can pull away from traffic to load and unload passengers.

CHICANE
Chicanes are a series of narrowings or curb extensions that alternate from one side of the street to the other, forming an S-shaped, curvilinear roadway alignment.

CHOKER
Chokers narrow the travel lanes of a road by bringing the existing curbs closer to the centerline of the road.

CONTEXT-SENSITIVE DESIGN
Context-sensitive design refers to an approach to transportation planning and design that takes into consideration the land use and needs of the community surrounding a transportation project.

FLOATING BUS STOP ISLAND
Floating bus stop islands provide space for a bike lane between the sidewalk and the boarding area of the bus stop.

INVESTMENT LEVEL
As defined in the Delaware Strategies for State Policies and Spending, Investment Levels are land categories that are characterized by their level of existing infrastructure and development and which guide decision-making regarding state spending. Identifying the State's goals and policies for land use, infrastructure investment, and other priorities. The categories are data-driven and range from urban to rural and also include "Out of Play" areas that are not available for private development.

MICROMOBILITY
Micromobility refers to the use of small, lightweight, low-speed electric or manual vehicles such as bikes, scooters, and other wheeled conveyances as a medium-range transportation solution.

RIGHT-OF-WAY
Right-of-way refers to the land area used for roads, nonmotorized facilities (e.g., sidewalks and shared-use paths), and other public facilities that generally extend from the property line on one side of the road to the property line on the other.

ROAD DIET
A road diet is a type of roadway reconfiguration where the number of lanes or effective width of the roadway/street is decreased in order to improve the transportation system, such as by calming traffic or providing better bicycle/pedestrian infrastructure.

SEPARATED BIKE LANE
Separated bike lanes are facilities for exclusive use by bicyclists (e.g., bike lanes and two-way cycle tracks) located within or directly adjacent to the roadway and are physically separated from motor vehicle traffic by a vertical element and separated from pedestrians with a vertical object, change in elevation, or visual delineator. Separated bike lanes can use a variety of vertical separation elements separating the bike lanes from the roadway, including, but not limited to, raised curbs or medians, bollards, on-street parking, landscaping, or planters. Separated bike lanes are sometimes referred to as protected bike lanes.

SHARED-USE PATH
Shared-use paths are facilities provided for active transportation users (including bicyclists, pedestrians, in-line skaters, roller skaters, wheelchair users, and other micromobility users. Shared-use paths are most often designed for two-way travel unless otherwise designated. They are typically placed on corridors with minimal cross-flow by roadway vehicular traffic. Shared-use paths can be constructed of concrete, bituminous concrete, pavers, compacted materials, or a combination of such materials.

SHARROW
Sharrows are pavement markings – designated with two upside-down V shapes above a depiction of a bicyclist – that indicate that a road is a preferred bicycle route and that drivers should be prepared to share the road with bicyclists. They are generally used on roads that are too narrow for dedicated bike lanes. Sharrows also show where bicyclists should be positioned in the roadway and encourage bicyclists to avoid cycling on sidewalks.

TRAFFIC CALMING
Traffic calming is the combination of mainly physical measures intended to slow or even deter cut-through traffic, alter driver behavior, and improve conditions for nonmotorized and micromobility street users. Traffic calming includes, but is not limited to, the use of narrower lane widths, road diets, chicanes, roundabouts, rumble strips, speed humps, and speed cameras.

TWO-WAY SEPARATED BIKE LANE
Also referred to as “cycle tracks” are physically separated bike lanes that allow bicycle movement in both directions on one side of the road.

1. Overview

WHAT ARE COMPLETE STREETS?

Brief History

The term “Complete Streets” has been used in transportation and urban planning since it was first coined circa 2003. The main idea behind Complete Streets is that streets should be accessible to everyone, regardless of one’s ability, disability, or mode of transportation. Complete Streets balance the needs of drivers, pedestrians, bicyclists, transit riders, emergency responders, and the movement of freight and goods while considering local context and need.

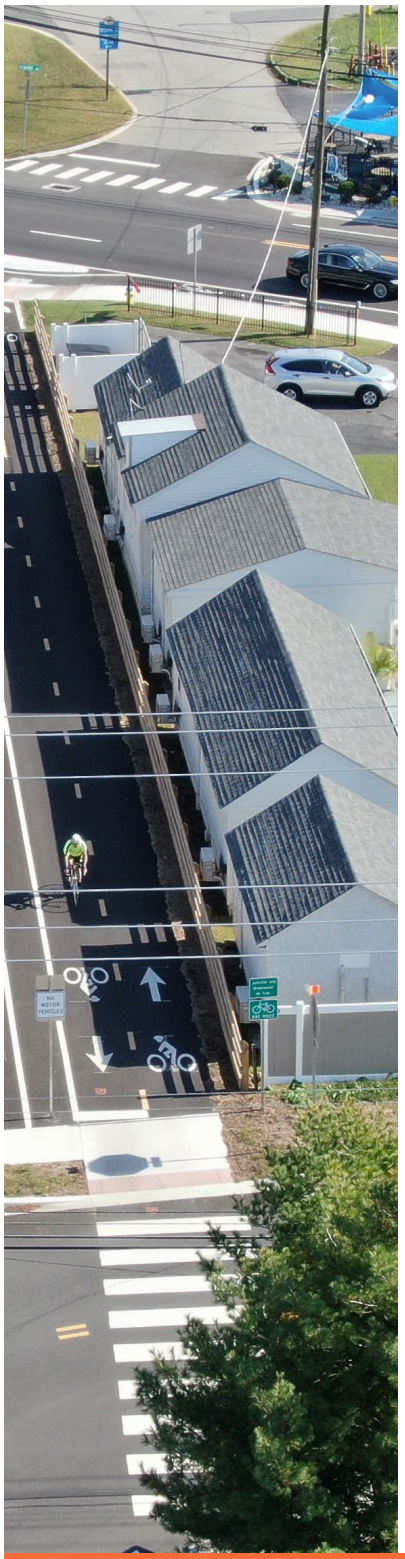
The Complete Streets process in Delaware was first formalized in April 2009 with Executive Order 6, which called for a “Statewide Complete Streets Policy.” On January 6, 2010, the DelDOT Complete Streets Policy became effective. The policy was a concrete step toward creating a transportation system that provides facilities for biking, walking, and transit to increase safety, reduce automobile traffic congestion, and improve air quality.

JUNCTION BREAKWATER TRAIL - REHOBOTH BEACH

The purpose of the DelDOT Complete Streets Policy was "to ensure that the Delaware Department of Transportation (DelDOT) system modifications are routinely planned, designed, constructed, operated and maintained in a way that enables safe and efficient access for all users. The result should be a system for all users that is comprehensive, integrated, connected, safe, and efficient allowing users to choose among different transportation modes, both motorized and non-motorized." Although some streets have been initially designed and built primarily for motor vehicle use and have disconnected pedestrian and bicycling segments, the intent of the DelDOT Complete Streets Policy is to incrementally expand and develop community and regional networks of Complete Streets over time.

When designing Complete Streets, it is critical that accommodations for all roadway users are considered and provided with the same level of attention and detail that is given to the movement of automobiles and heavy vehicles. This means that pedestrian infrastructure, bicycle facilities, micromobility infrastructure, transit facilities, and other street elements are connected and accessible. Complete Streets need to consider the unique context of the surrounding land use, users of the street, and both current and future community needs. Designers must take care not to assume that current bicycle and pedestrian usage will remain unchanged in the future. If analysis for future demand is inconclusive, the designer should make a reasonable attempt to include bicycle and pedestrian facilities.

Under the DelDOT Complete Streets Policy, "all projects in the state right-of-way that are considered road reconstruction, widens the pavement width, or allows for the inclusion of facilities for all users, shall consider all transportation modes and accommodate accordingly; facility type shall be based on the project location and the needs of the community." Furthermore, "system maintenance projects are designed to keep what the State already owns in a good state of repair and are usually maintenance/pavement rehabilitation projects and require limited design and no right-of-way acquisition. While it is not the specific intent of these projects to expand existing facilities, opportunities to provide and improve safety for other modes shall be explored during the project development stage."



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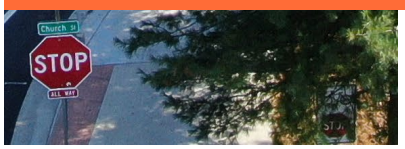


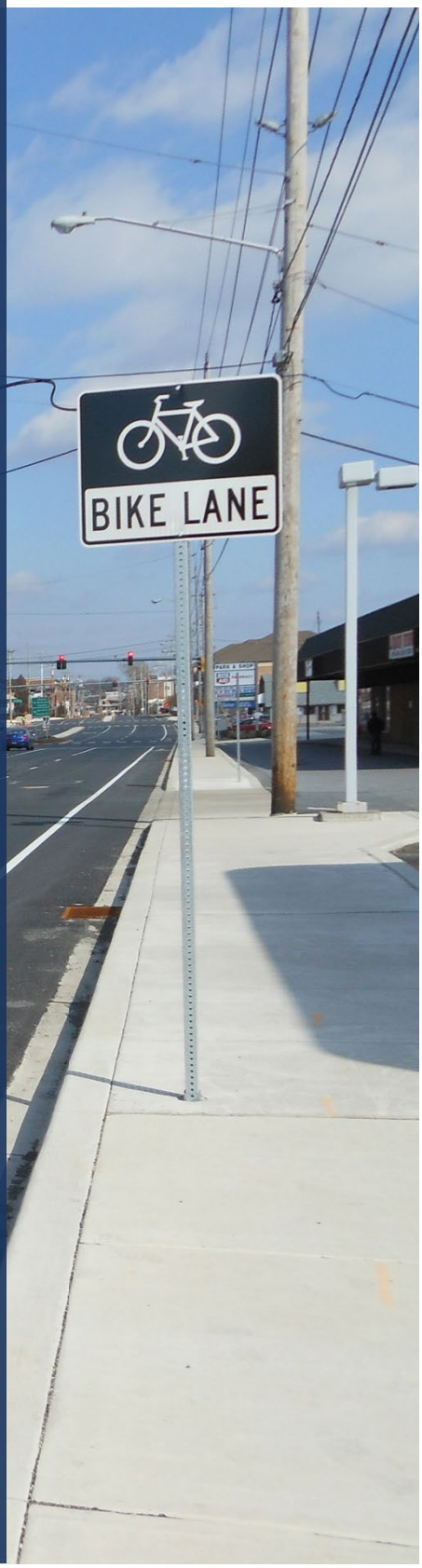
Policy Definition

In the DelDOT Complete Streets Policy, "the term 'Complete Street' means a roadway that accommodates all travelers, particularly public transit users, bicyclists, pedestrians (including individuals of all ages and individuals with mobility, sensory, neurological, or hidden disabilities), and motorists, to enable all travelers to use the roadway safely and efficiently. (House of Representatives 1443 IH). Creating Complete Streets means planning, designing, constructing, maintaining, and operating streets and all directly related components for motorized and nonmotorized modes of travel, as appropriate for the area. The most basic element of a Complete Streets policy is that it ensures that roads are planned and built to serve all users."

HOW TO USE THIS DESIGN GUIDE

Purpose of this Design Guide

The purpose of this DelDOT Complete Streets Design Guide is to provide design guidance for state, county, and local transportation staff to create comfortable and viable Complete Streets transportation facilities. This guide includes tools and methodologies for designing Complete Streets in a variety of settings that can be customized to meet the needs of the surrounding communities and fit local context to support safer, more connected, and livable communities. When a street is being considered for Complete Streets improvements, the localized transportation network should be reviewed for connections to determine appropriate project limits. For example, nearby assets such as bus stops, pathway connections, entrances to a well-used park with recreation facilities, or other active transportation origins or destinations should be considered when determining the project limits, ensuring that facilities are connected when possible. More information on determining project limits is in the DelDOT Project Development Manual.



This guide is intended to be used by DelDOT planning and design staff, county and municipal transportation staff, transportation planning and design professionals, members of the public and community groups, and anyone else involved in the planning and design of streets in Delaware. The guide is focused on street projects within the state-maintained public right-of-way, including the construction of new streets and improvements to existing streets.

INTENDED AUDIENCE	PURPOSE
DelDOT Planning and Design Staff	• Use Complete Streets design considerations into all project development (including PEL studies). • Explore available design options based on street type and context. • Document Complete Streets planning and concept design decisions and outcomes. • Follow up reviews to ensure compliance with the DelDOT Complete Streets Policy.
County, Municipal, MPO, and Private Transportation Planning and Design Staff	• Integrate Complete Streets design considerations into planning stage of project development (including PEL studies). • Understand DelDOT Complete Streets Policy and processes to other partners. • Explore available design options based on street type and context.
Members of the Public, Advocacy Groups, and Community Groups	• Communicate the benefits of Complete Streets. • Understand DelDOT Complete Streets Policy and processes. • Learn about different Complete Streets design elements and how street type and context influence design options.

JUNCTION BREAKWATER TRAIL

SAFE SYSTEMS

The safe system approach is a guiding system designed by FHWA to address roadway safety. DelDOT has adopted the safe system approach to mitigate the risk of crashes and improve safety on state roadways. The safe system approach works by building and reinforcing multiple layers of protection to both prevent crashes from happening in the first place and minimize the harm caused to those involved when crashes do occur. It is a holistic and comprehensive approach that provides a guiding framework to make places safer for people. The U.S. DOT safe system approach is built up around six guiding principles:

- Death and Serious Injuries are Unacceptable
- Humans Make Mistakes
- Humans are Vulnerable
- Responsibility is Shared
- Safety is Proactive
- Redundancy is Crucial

This approach to safety focuses on human mistakes and vulnerability. The principles of the safe systems approach are further supported by the following five:

Objectives of the Safe System Approach

Safer People:

Encouraging safe and responsible driving and behavior by people who use our roads and create conditions that prioritize their ability to reach their destination safely. Allowing all users of the roadway to be safer, encouraging better actions, and using the roadway system in a safer manner.

Safer Roads:

Design roadway environments to mitigate human mistakes and account for injury tolerance, encourage safer behaviors, and to facilitate safe travel by the most vulnerable users.

The design of a roadway influences how people will use the roadways. The environment around the roadway plays a significant role in this, including land use, surrounding intersections and roads, and other modes of transportation. Transportation agencies are to consider the implementation of countermeasures to achieve the nation's safety goals. The

proven safety countermeasures is a collection of strategies designed to reduce roadway facilities and serious injuries. The strategies include:

- Crosswalk visibility enhancements
- Medians and pedestrian refuge islands
- Bicycle lanes
- Rumble strips

Safer Vehicles:

Expand the availability of vehicle systems and features that help to prevent crashes and minimize the impact of crashes on both occupants and non-occupants.

Vehicle safety performance in avoiding the harm of crashes cannot be overstated. Requirements in the Federal Motor Vehicle Safety Standards (FMVSS), such as seat belts and airbags prevented around 425,000 fatalities from crashes. As the next generation of vehicles grows, they will have the technology to prevent certain crashes and could reduce the harm to others outside of the vehicles. Having access to safer vehicles also means implementing strategies to improve the safety of commercial vehicles, used for transporting goods and passengers.

Safer Speeds:

Promote safer speeds in all roadway environments through a combination of thoughtful, equitable, context-appropriate design, targeted education, outreach campaigns, and enforcement.

Speeding increases both the frequency and severity of the crashes. Speeding is a significant factor in deaths on our roadways and is especially hazardous to pedestrians.

Post-Crash Care:

Enhance the survivability of crashes through expedient access to emergency medical care, while creating a safe working environment for vital first responders and preventing secondary crashes through robust traffic incident management practices.

The department is committed to supporting activities that improve post-crash care. Managing the scene and controlling traffic through it, increases how effective the post-crash care will be. The timely arrival of emergency vehicles is a key factor in ensuring the medical attention needed to survive a crash. This is critical in rural scenes, where response times are longer.

THE SAFE SYSTEM APPROACH VS. TRADITIONAL ROAD SAFETY PRACTICES

Traditional	Safe System
Prevent crashes	Prevent deaths and serious injuries
Improve human behavior	Design for human mistakes/limitations
Control speeding	Reduce system kinetic energy
Individuals are responsible	Share responsibility
React based on crash history	Proactively identify and address risks

Whereas traditional road safety strives to modify human behavior and prevent all crashes, the Safe System approach also refocuses transportation system design and operation on anticipating human mistakes and lessening impact forces to reduce crash severity and save lives.

Source: FHWA

SAFE SYSTEM ELEMENTS

Making a commitment to zero deaths means addressing every aspect of crash risks through the five elements of a Safe System, shown below. These layers of protection and shared responsibility promote a holistic approach to safety across the entire transportation system. The key focus of the Safe System approach is to reduce death and serious injuries through design that accommodates human mistakes and injury tolerances.

Safe Road Users

The Safe System approach addresses the safety of all road users, including those who walk, bike, drive, ride transit, and travel by other modes.

Safe Vehicles

Vehicles are designed and regulated to minimize the occurrence and severity of collisions using safety measures that incorporate the latest technology.

Safe Speeds

Humans are unlikely to survive high-speed crashes. Reducing speeds can accommodate human injury tolerances in three ways: reducing impact forces, providing additional time for drivers to stop, and improving visibility.

Safe Roads

Designing to accommodate human mistakes and injury tolerances can greatly reduce the severity of crashes that do occur. Examples include physically seperating people traveling at different speeds, providing dedicated times for different users to omove through a space, and alerting users to hazards and other road users.

Post-Crash Care

When a person is injured in a collision, they rely on emergency first responders to quickly locate them, stabilize their injury, and transport them to medical facilities. Post-crash care also includes forensic analysis at the crash site, traffic incident management, and other activities.

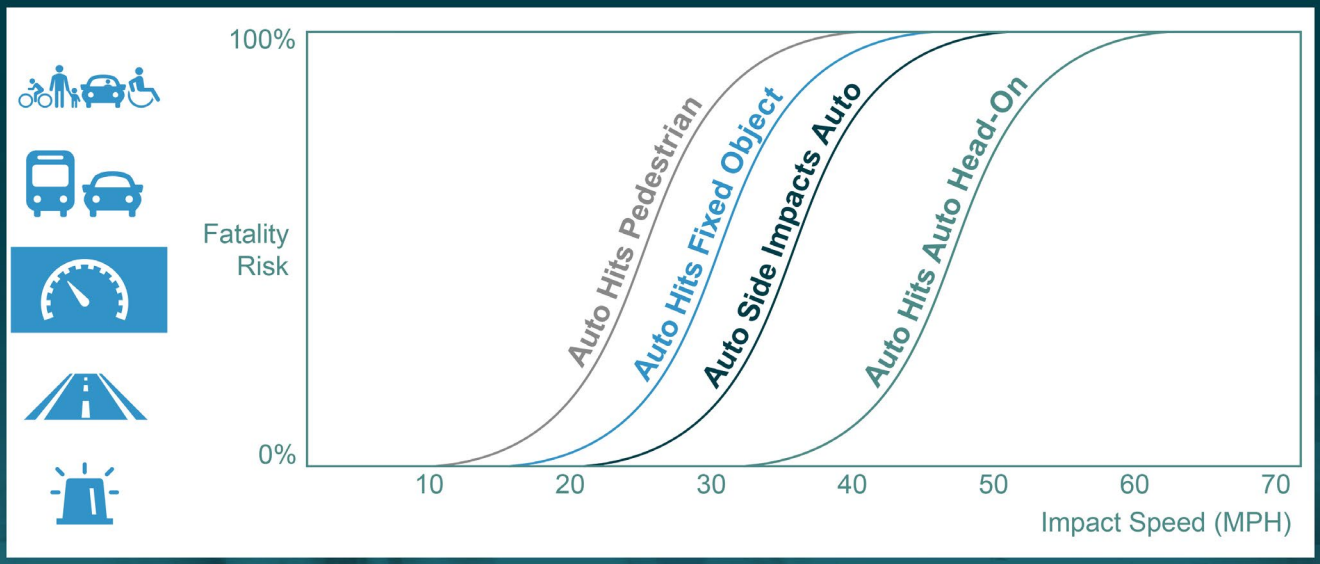
Source: FHWA

SAFE SPEEDS: REDUCING PEDESTRIAN FATALITIES

Hit by a vehicle traveling at	Hit by a vehicle traveling at	Hit by a vehicle traveling at
23	42	58
MPH	MPH	MPH
10% risk of death	50% risk of death	90% risk of death

Source: FHWA. Adapted from USDOT Pedestrian Safety Action Plan

SAFE SPEEDS: FATALITY RISKS



Source: FHWA. Adapted from graphic created by Australian Roads and Traffic Authority of New South Wales.

OTHER COMPLETE STREETS GUIDES AND DESIGN RESOURCES

The information within this guide is a compilation of current best practices and does NOT supersede any existing federal, state, or city laws, rules, or regulations. This design guide supplements existing manuals and standards, including the Delaware Manual on Uniform Traffic Control Devices (DE MUTCD) and guidance issued by the National Association of City Transportation Officials (NACTO), the American Association of State Highway Transportation Officials (AASHTO), and the Federal Highway Administration (FHWA).

DelDOT uses several design guides and resources from the above-mentioned sources for transportation planning and design during all phases of developing the state transportation system. On the following page are some of the most relevant guides and design resources used by DelDOT to implement Complete Streets.

MARSH ROAD AND CARR ROAD
WILMINGTON, DE

Other State Guides and Design Resources:

- DelDOT Road Design Manual
- Delaware Manual on Uniform Traffic Control Devices (DE MUTCD)
- Pedestrian Accessibility Standards for Facilities in the Public Right-of-Way
- Delaware Traffic Calming Design Manual
- DelDOT Development Coordination Manual
- Blueprint for a Bicycle-Friendly Delaware
- Statewide Rails-to-Trails/Rail-with-Trail System Master Plan
- DelDOT Traffic Lighting Policy
- Delaware Complete Communities Toolbox by the Institute for Public Administration (IPA) at the University of Delaware
- DTC's Bus Stop Policy

National Guides and Design Resources:

- FHWA Separated Bike Lane Planning and Design Guide
- FHWA Small Town and Rural Multimodal Networks
- FHWA Shared Use Path Level of Service Calculator
- FHWA Safety for Pedestrians and Bicyclists Accessing Transit
- AASHTO Guide for the Development of Bicycle Facilities
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO Green Book - Policy on Geometric Design of Highways and Streets
- NCHRP Report 562 - Improving Pedestrian Safety at Unsignalized Crossings
- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- NACTO Transit Street Design Guide
- NACTO Designing for All Ages & Abilities

RODNEY SQUARE
WILMINGTON, DE

2. Applicability & Implementation

DELDOT PROJECT DEVELOPMENT APPLICABILITY

Since adopting the DelDOT Complete Streets Policy in 2010, DelDOT has worked to integrate the policy into project development and delivery processes.

This guide is focused on the first phase of project development, project planning, which includes project-level planning and development of conceptual designs. The intent of this guide is that it be used at the earliest stage of project development to ensure that Complete Streets design considerations are evaluated at the beginning of a project. However, this guide may also be helpful for projects that have moved into the design phase if Complete Streets considerations were not included in the planning stage of the project.

This guide provides a general overview of Complete Streets concepts and serves as a planning and design project development resource during project planning. The alternatives or facilities identified as possible solutions in the planning stage will need to be further refined during the design phase using other DelDOT and national design resources and standard specifications.

DELDOT COMPLETE STREETS CHECKLIST

The DelDOT Complete Streets Checklist has been developed to assist DelDOT project managers, project planners, and designers in including Complete Streets considerations during project planning and scoping, as well as in identifying proposed Complete Streets design alternatives that will need to be further refined during subsequent design phases. Using this checklist will help to ensure that DelDOT system modifications are routinely planned, designed, constructed, operated, and maintained in a way that enables safe and efficient access for all users as per the DelDOT Complete Streets Policy. The project manager is responsible for completing the checklist and must work with project planners, designers, and consultants to ensure that the checklist has been completed. The project manager should then coordinate with the DelDOT Active Transportation and Community Connections Team to review the checklist before final acceptance and before advancing the project to the design phase.

The checklist helps project managers, project planners, and designers evaluate the context of the project area and assess and understand the needs of different travel modes and users, ensuring the needs of all users and modes are appropriately addressed as the project moves into design. The checklist is data-oriented and focuses on existing conditions as well as desired future conditions and goals.

PROJECT TYPE EXCEPTIONS

DelDOT will consider Complete Streets principles and design options for all projects unless one of the two exceptions listed below is met.

1. Use of the facility by pedestrians, bicyclists, or other users is prohibited by law.

This exemption applies to the Interstate Highway System and any other limited-access roadways that restrict use by nonmotorized transportation. However, when an interstate project also includes ramps or intersections with other roadways, it is possible that minor work could be accomplished that meet Complete Streets principles for the intersecting roadways. For example, on a paving project where the intersecting roadway has parallel sidewalks, the curb ramps, signage, and pavement markings could be upgraded to meet current ADA standards.

2. Complete Streets considerations are outside the scope of the project because of its very nature.

There are several DelDOT projects and activities, especially maintenance activities, that are limited in scope that may not provide an opportunity to incorporate Complete Streets. Such activities include, but are not limited to:

- Crack sealing
- Emergency repairs
- Guardrail replacement
- Ledge/slope projects
- Pothole repair
- Preventative maintenance, bridge maintenance projects
- Roadside mowing
- Road/shoulder sweeping
- Leveling projects
- Sign replacement
- Projects with pre-approved scopes of work (e.g., funded through grant programs such as earmark funding with a specific purpose)

3. Street Types

Creating Complete Streets requires the consideration of all users, the surrounding land use context, future development/improvements, and community goals. Users of any street, whether suburban, urban, or rural, have different safety and mobility needs depending on land use, density, and other context-based factors. This section of the guide contains a stepped process meant to help identify potential Complete Streets priorities and design options appropriate to the specific characteristics of a given street.

MARSH ROAD AND CARR ROAD
WILMINGTON, DE

The street types in this section have been developed to represent a range of roads and streets within Delaware to which the Complete Streets design is likely to apply. Each street type contains criteria designed to help identify the appropriate street type for any project.

The criteria include:

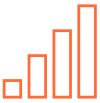
FHWA Functional Classification

Target design/posted speed (presented in ranges)

Annual Average Daily Traffic (AADT)

Land use context (development density and typical uses)

Development Form (building form, typical setbacks, and parking)



Delaware State Investment Levels

Mobility Priorities

The graphical illustrations accompanying the street types presented in this section are just examples of what a complete street may look like; they are not intended as a one-size fits all example in any given type. Likewise, the recommendations listed within each street type are intended to give planners and designers ideas of what infrastructure could be considered when planning and designing Complete Streets. These recommendations are meant to generate ideas for consideration, not to be an exhaustive menu of design options. **More information on design elements and options to consider is found in Section 4. Design Solutions.**

It is important to note that street types are not always continuous along any given street corridor as the context, functionality, and needs of a street may change with location. Transportation corridors on projects may include multiple street types. Special attention must be made to ensure the transitions between street types are considered and designed to ensure comfortable transitions for users. **More information on transition zones is found in Section 4. Design Solutions.**

IDENTIFYING POTENTIAL STREET TYPES

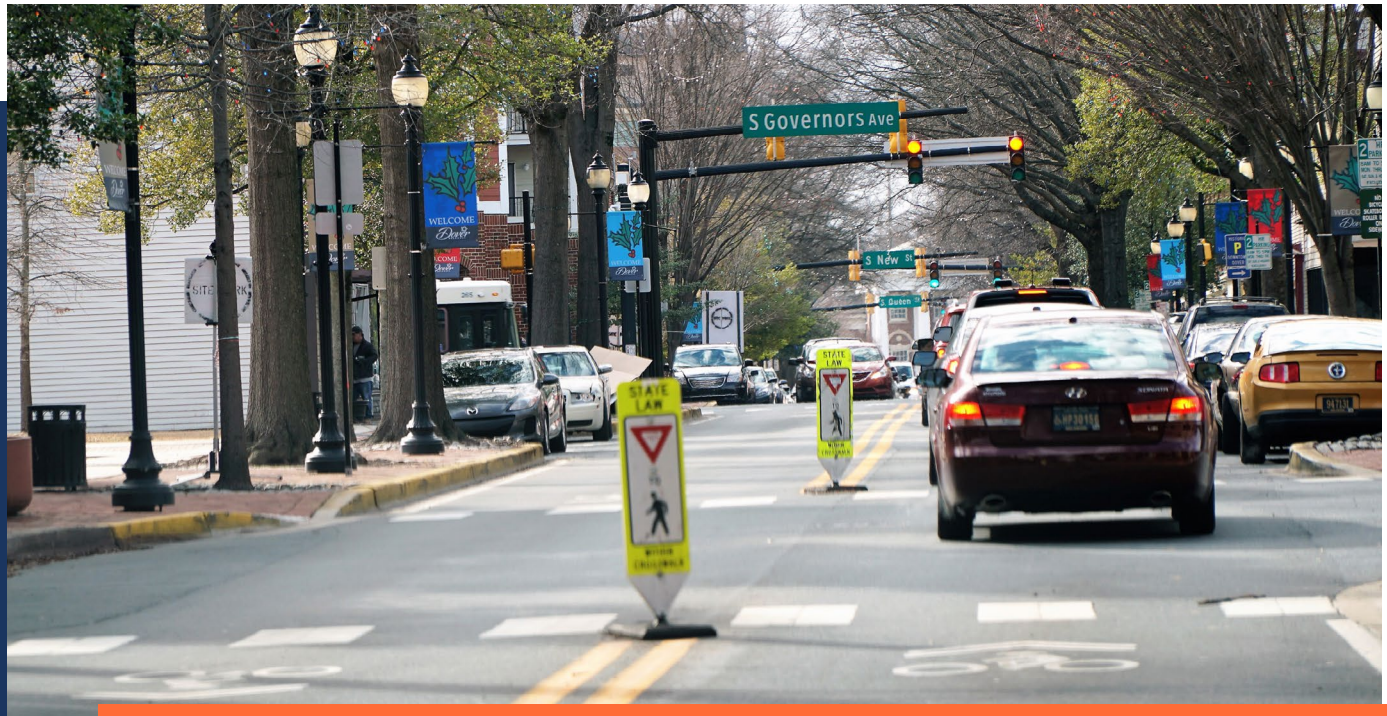
Below is a simple stepped process to assist in quickly identifying potential street types and design options that may be considered for a project at a high level. More detailed information on identifying street types and design solutions is in the Complete Streets Checklist.

Step 1:
Identify Roadway Functional Classification

Consult DelDOT functional classification mapping to identify appropriate classification. Potential classifications are:

- Arterials
- Collectors
- Local Roads and Streets

Note: This guide is not typically applicable to Interstate Highways and freeways as pedestrians and bicycle users are typically restricted from using these types of roadways.



LOOCKERMAN STREET
DOVER, DE

Step 2:
Identify Context Zone

Consult zone information below to identify appropriate context zone.

Urban Zone

- High diversity of land uses with a moderate to high level of development density.
- Typically characterized by multi-story structures with minimal street setbacks.
- On-street parking is typical but could include off-street parking as well.
- Trips are often a mix of local travel as well as through trips for commuters and long-distance travelers.
- Typically within State Investment Level 1 or 2.

Suburban Zone

- The interface between urban and rural, moderate to low diversity of uses.
- Contains primarily single-family residential development with various lot sizes.
- Office and commercial development often scattered throughout this context, along with neighborhood civic and cultural facilities.
- Could be within any State Investment Level.

Rural Zone

- Primarily a mix of agricultural uses and green space with some scattered low-density development in large-lot clustered development.
- Trip distances are generally longer than those in other context zones.
- Typically within State Investment Level 3 or Out of Play areas.

Step 3:
Identify Potential Street Types Based on Functional Classification and Context Zone

Consult the categories below of roadway functional classification and context zones for the street types that align with the roadway functional classification and context zone identified in Steps 1 and 2 above.

After the street types are identified, consult the street type criteria to further compare street types using the filters within each type, including current and future land use, development density, form, state levels of investment, and mobility.

ARTERIALS

Arterials - Urban Context

- Downtown Urban Core
- Main Street
- Commercial Strip Corridor

Arterials - Suburban Context

- Main Street
- Commercial Strip Corridor

Arterials - Rural Context

- Commercial Strip Corridor
- Low-Density Highway

COLLECTORS

Collectors - Urban Context

- Downtown Urban Core
- Main Street
- Office & Light Industrial
- Commercial Strip Corridor
- Urban Residential

Collectors - Suburban Context

- Main Street
- Office & Light Industrial
- Commercial Strip Corridor
- Suburban/Rural Residential - High-Volume

Collectors - Rural Context

- Office & Light Industrial
- Commercial Strip Corridor
- Suburban/Rural Residential - High-Volume
- Low-Density Highway

LOCAL ROADS AND STREETS

Local Roads and Streets – Urban Context

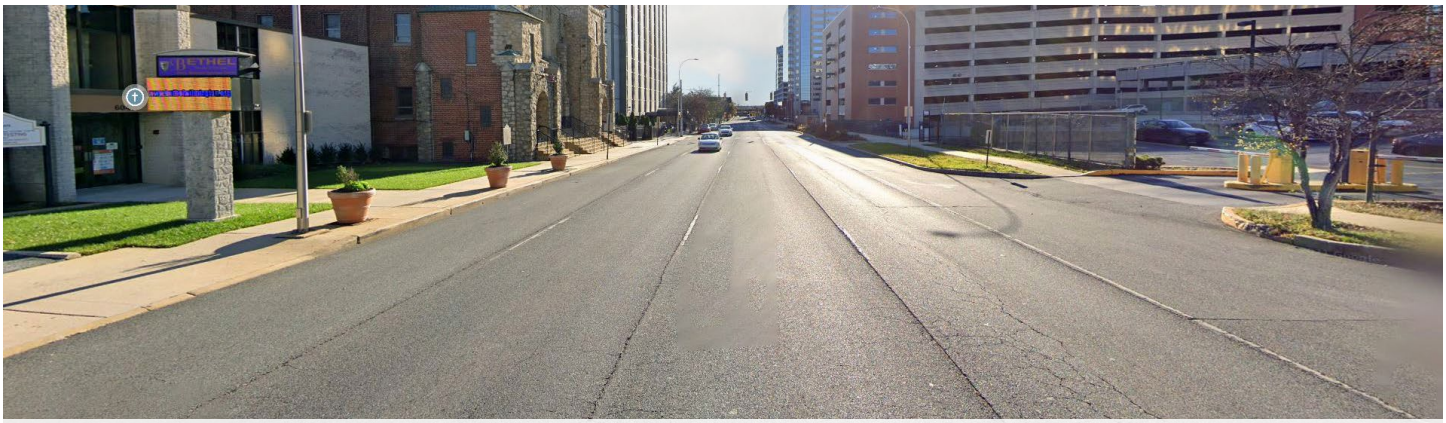
- Office & Light Industrial
- Urban Residential

Local Roads and Streets – Suburban Context

- Office & Light Industrial
- Suburban/Rural Residential - High-Volume
- Suburban/Rural Residential - Low-Volume

Local Roads and Streets – Rural Context

- Office & Light Industrial
- Suburban/Rural Residential - High-Volume
- Suburban/Rural Residential - Low-Volume



WALNUT STREET - WILMINGTON, DE

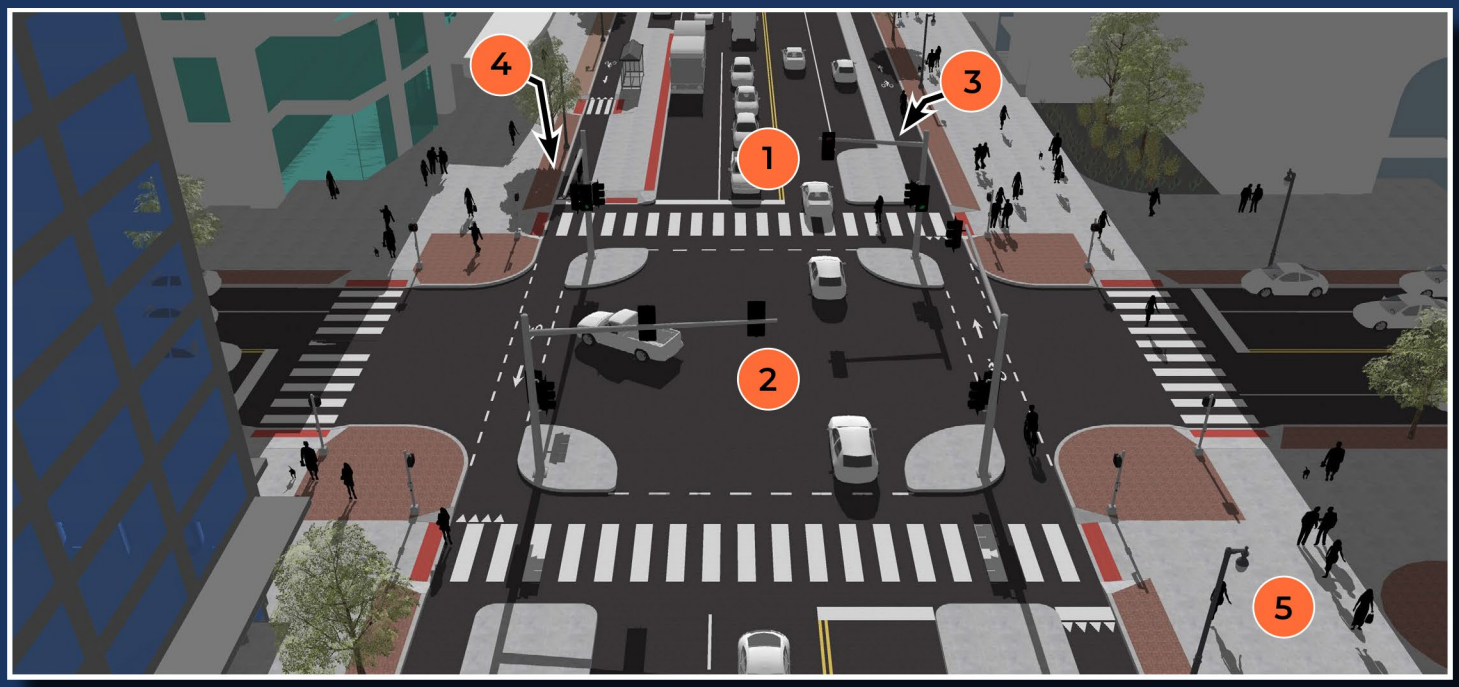
Downtown Urban Core

Representative Places in Delaware:

- King Street - Wilmington, DE
- Walnut Street - Wilmington, DE
- Delaware Avenue/Pennsylvania Avenue - Wilmington, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Arterials, Collectors
Target Design/Posted Speed	25 mph
Annual Average Daily Traffic (AADT)	40,000 AADT or less
Land Use Context (Development density and typical uses)	High-density mixed land use development including multi-family residential, office, retail, entertainment, civic, and cultural facilities
Development form (Building form, typical setbacks, and parking)	• High-rise structures with minimal setbacks • Minimal building gaps • Off-street parking is typical, but some on-street can occur
Delaware State Investment Level	Typically Investment Level 1
Mobility	High demand for multimodal trips, including walking, transit, bicycling, and freight movement

Downtown Urban Core



RECOMMENDATIONS

1. For streets that were historically overdesigned for motor vehicle traffic, a roadway reconfiguration (road diet) provides an opportunity to reorganize space within the right-of-way to provide expanded accommodations for active transportation and transit.

2. Protected intersections using raised concrete islands provide higher levels of comfort and safety for bicycle riders in the bicycle lanes. They also provide traffic calming for turning vehicles, which increases comfort and safety for pedestrians crossing the street by creating shorter crossing distances. The types of trucks or buses and turning movements that will be accommodated at the intersection must be carefully considered.

3. Separated bicycle lanes reduce conflicts between bicyclists and motorists and create a low-stress facility for bicyclists of all ages and abilities. At intersections, bicycle signals may be needed to allow bicycle traffic to operate safely along the corridor. Separate bicycle and pedestrian facilities are important due to likely high demand for both modes.

4. Visual and tactile delineation separating the sidewalk space from the bicycle lanes assists low-vision pedestrians when navigating the sidewalk. This buffered space also provides room for pedestrian amenities such as street furniture, street plantings, and green stormwater facilities.

5. Wide sidewalks provide space for higher volumes of pedestrians, storefront seating, sidewalk displays, and other business and public space amenities.

MAIN STREET - MIDDLETOWN, DE

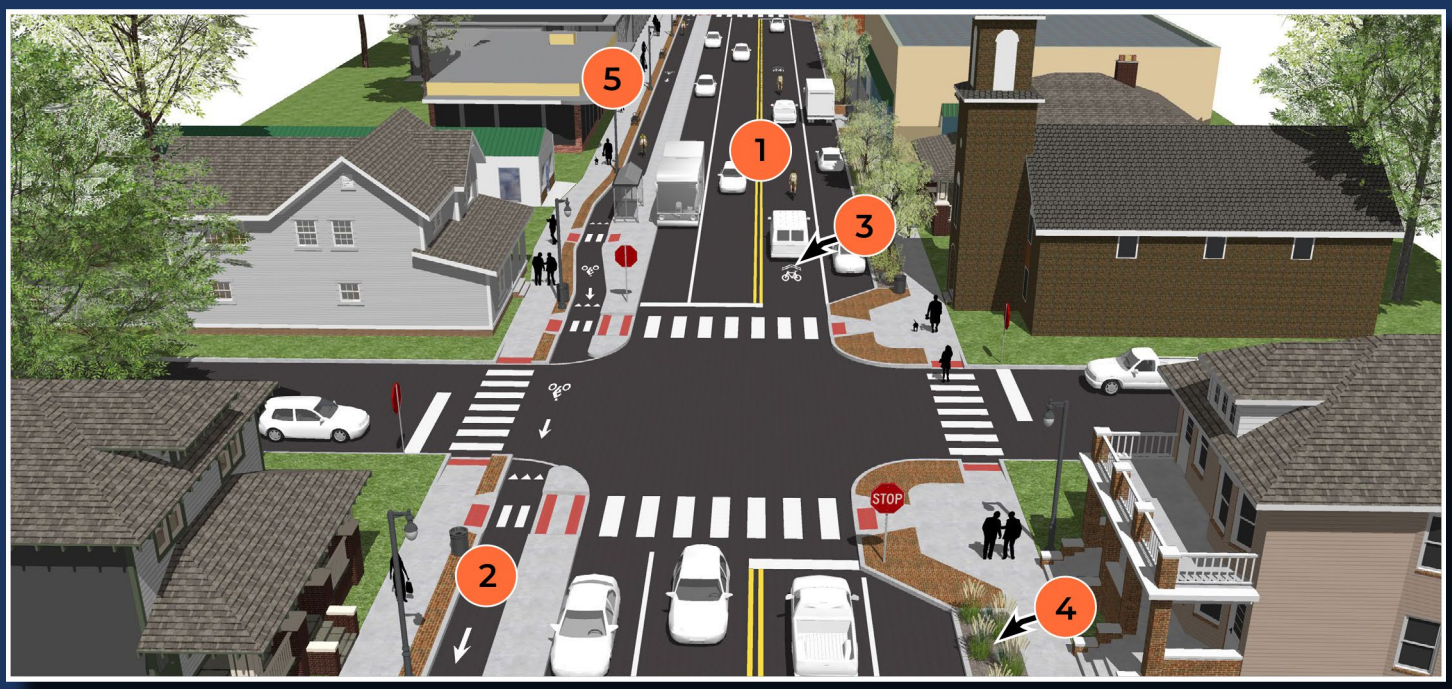
Main Street

Representative Places in Delaware:

- Main Street – Middletown, DE
- Market Street – Georgetown, DE
- Loockerman Street – Dover, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Arterials, Collectors
Target Design/Posted Speed	25 to 30 mph
Annual Average Daily Traffic (AADT)	10,000 to 40,000 AADT
Land Use Context (Development density and typical uses)	Diversity of uses (typically dense development patterns), including residential, office, retail, civic, and cultural facilities
Development form (Building form, typical setbacks, and parking)	• Mid- to low-rise development, oriented toward the street with minimal setbacks • On-street parking typical along the main thoroughfare, with additional parking at the rear of buildings accessible via alleys or other minor streets
Delaware State Investment Level	Typically Investment Level 1 or 2
Mobility	Provide regional connectivity while balancing local community needs. High volumes of pedestrians, transit vehicles/passengers, bicyclists, motorists, and commercial freight sharing limited space.

Main Street



RECOMMENDATIONS

1. Many main streets are located in historic areas and/or well-developed areas with minimal building setbacks. This makes it difficult to include new spaces for bike lanes, sidewalk widening, or other street elements in the narrow right-of-way.

2. Separated bicycle lanes reduce conflicts between bicyclists and motorists and create a low-stress facility for bicyclists of all ages and abilities. If placed next to on-street parking, a minimum 4' buffer should be provided to prevent "dooring" crashes.

3. Sharrows may be appropriate to emphasize certain streets as priority bicycle connections and to indicate preferred bicyclist positioning in the roadway. Sharrows are road markers to indicate a shared lane but do not provide any protection from motorists.

4. Biofiltration systems capture, slow, and treat stormwater runoff before it is discharged to the downstream stormwater system. Biofiltration systems may be installed in buffer areas, medians, or bulb-outs.

5. Wide sidewalks provide space for higher volumes of pedestrians, storefront seating, sidewalk displays, and other business and public space amenities.

QUIGLEY BOULEVARD - NEW CASTLE, DE

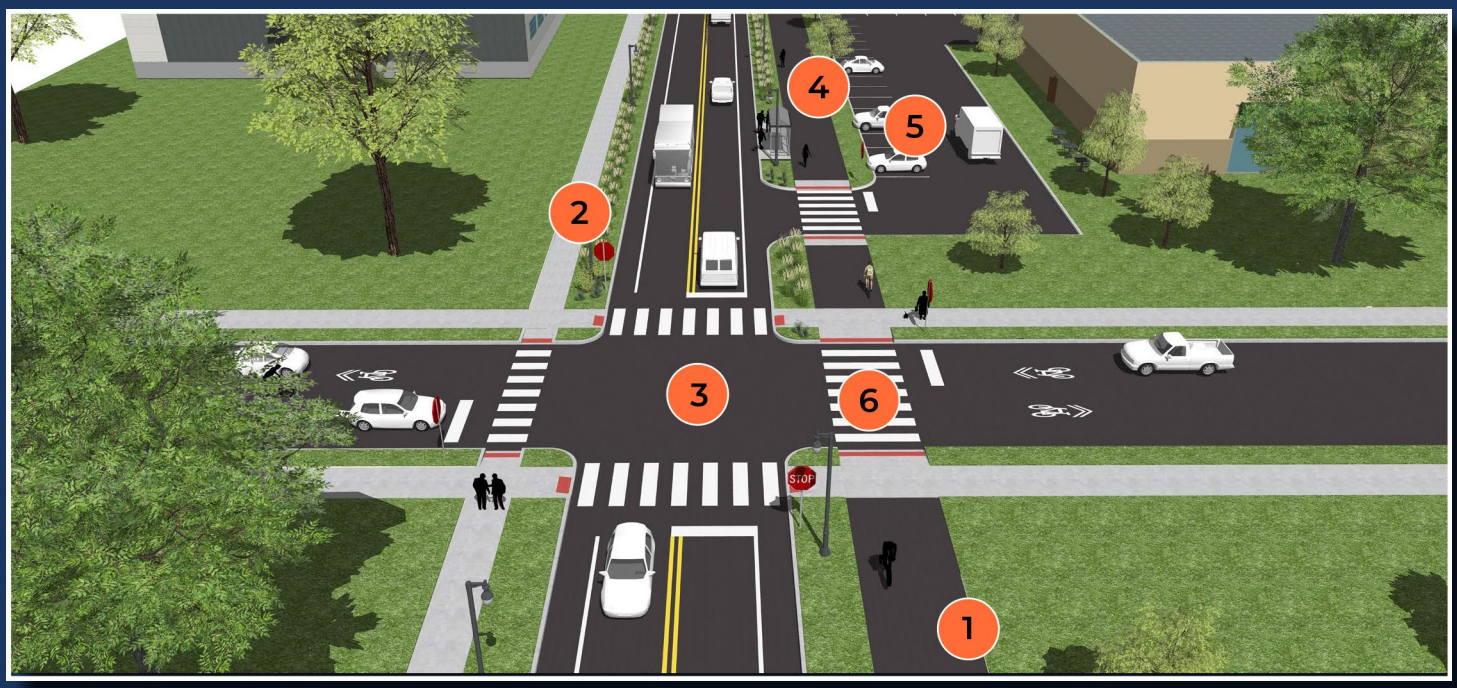
Office & Light Industrial

Representative Places in Delaware:

- Quigley Boulevard – New Castle, DE
- Diamond State Boulevard – Middletown, DE
- Ruthar Drive – Newark, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Collectors, Local Streets
Target Design/Posted Speed	25 to 35 mph
Annual Average Daily Traffic (AADT)	8,000 or less AADT
Land Use Context (Development density and typical uses)	Low-density office and industrial land uses. Can have some commercial uses mixed throughout.
Development form (Building form, typical setbacks, and parking)	• Large industrial/commercial structures with large setbacks on large land plots • Off-street parking typical
Delaware State Investment Level	Typically Investment Level 2 or 3
Mobility	Accommodates deliveries or truck traffic, internal circulation for pedestrians and bicyclists, and connections to nearby bicycle, pedestrian, and transit networks.

Office & Light Industrial



RECOMMENDATIONS

1. Shared-use paths are encouraged to provide shared bicycle and pedestrian facilities separated from motor vehicle traffic. Shared-use paths can be considered on both sides of the roadway when bicycle and pedestrian traffic is expected on both sides of the road or when bicycle and pedestrian land use generators are present or planned in future development plans. Shared-use paths can be lit by overhead corridor lighting (in accordance with the DelDOT Lighting Policy) in which the lighting is for the entire corridor and not just the path. DelDOT does not typically maintain lighting systems exclusively for pedestrian or bicycle facilities, however lighting specific to off-roadway bicycle and/or pedestrian facilities may be considered when the path is expected to have night usage, and/or when an outside agency agrees to own, maintain, and fund the lighting system and ongoing electric fees. Coordination with property owners is encouraged to provide safe, non-motorized access from shared paths or sidewalks to their properties.

2. If insufficient space exists for a shared-use path, continuous sidewalks and/or bike lanes can be considered to improve pedestrian and bicyclist safety and mobility.

3. Narrowing travel lanes can help reduce travel speeds while maintaining vehicle capacity. However, if a shared use path or other bicycle facility is not being considered, shoulders on the outside of travel lanes should also be considered to preserve space for bicycles to operate outside of the travel lane.

4 A minimum 5’ (10’ preferred) grass buffer between the edge of the roadway and the edge of the shared-use path is desirable. This buffer area can be used for stormwater conveyance. Designers should avoid directing stormwater from the roadway over the shared-use path through the use of curbing or other stormwater management designs. Narrower buffer widths can be used for short distances where the 5’ width cannot be reasonably achieved. When a side path is placed along a high-speed highway, a separation greater than 5 ft is desirable for path user comfort. If greater separation cannot be provided, use of a crashworthy barrier should be considered. A 2’- to 5’-wide graded shoulder area should be provided on either side of the shared-use path.*

5 A minimum 3’-wide buffer should be used between the back of a sidewalk or shared-use path whenever adjacent to a parking area. This buffer provides shy space between vehicles and the active transportation users. This space also prevents parked vehicles from protruding into the sidewalk or shared-use path. If a 3’-wide buffer cannot be provided, the sidewalk should be widened to at least 6’ or install parking bumpers. Planted buffers should be wider and provide space for irrigation and sufficient area for plantings to grow. If trees are planted in the buffer strip, the buffer should be wide enough so trunks (at mature width) are at least 4’ clear of the roadway face of curb and 2’ clear from the pedestrian access route. In addition, the mature reach of the tree should not overlap the SUP or sidewalk. The resulting recommended width therefore will be greater than 6’-6” for most species commonly used as street trees. Surfaces at the base of a tree should either be open or have adjustable openings to allow for the widening of the trunk at ground level over time.

6 Where driveways are controlled with yield or stop control devices or traffic signals, detectable warning surfaces shall be provided on the pedestrian circulation path where the pedestrian circulation path meets the driveway.

*More information on shared-use path design is in the DelDOT shared use path detail, the AASHTO Guide for the Development of Bicycle Facilities, and the DE MUTCD.

US 13 (DUPONT PARKWAY) - SMYRNA, DE

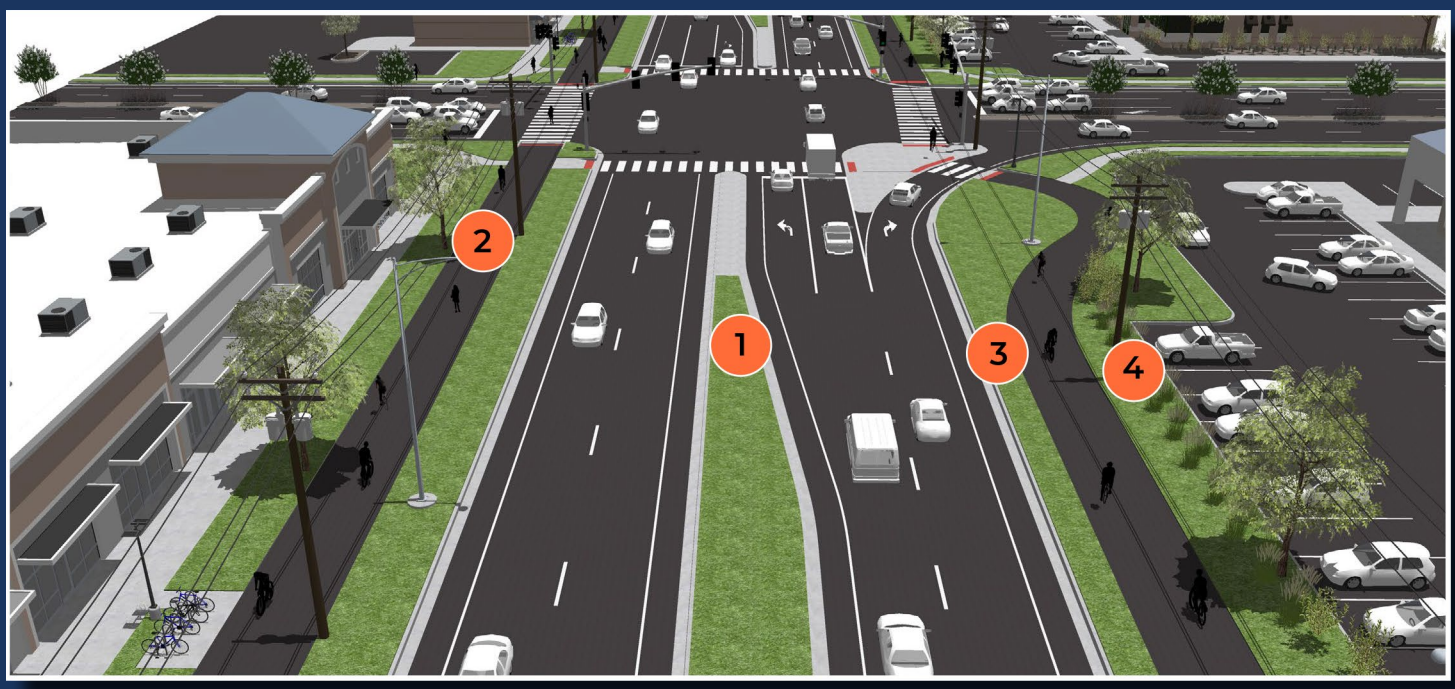
Commercial Strip Corridor

Representative Places in Delaware:

- SR 2 (Kirkwood Highway) – Wilmington, DE
- US 13 (Dupont Parkway) – Smyrna, DE
- US 40 (Pulaski Highway) – Bear, DE
- SR 1 (Coastal Highway) – Fenwick Island, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Arterials, Collectors
Target Design/Posted Speed	35 to 45 mph
Annual Average Daily Traffic (AADT)	15,000 or more AADT
Land Use Context (Development density and typical uses)	Medium diversity of low-density development uses, including residential (multi- and single-family), office, and retail facilities
Development form (Building form, typical setbacks, and parking)	• Detached low-rise structures with a range of setbacks • Off-street parking is typically located between the structures and the roadway in private parking lots
Delaware State Investment Level	Typically Investment Level 1, 2, or 3
Mobility	Often serve as commuter routes with high vehicle volumes but also as routes for non resident and visitors to access goods, services, and jobs. While there are some recreational users, the majority of pedestrian, bicycle, and transit users on these streets work at or are accessing commercial properties along these corridors.

Commercial Strip Corridor



RECOMMENDATIONS

1. Curbed medians can reduce head-on vehicle collisions and can provide a pedestrian refuge space for pedestrian crossings. When combined with fencing or other types of barriers, curbed medians can guide pedestrians to designated crossings. Medians can also serve as biofiltration facilities to capture, slow, and treat stormwater runoff before it is discharged to the downstream storm system. Biofiltration systems may be installed in buffer areas, medians, or bulb-outs.

2. Shared-use paths provide shared bicycle and pedestrian facilities separated from motor vehicle traffic. Shared-use paths can be considered on both sides of the roadway when bicycle and pedestrian traffic is expected on both sides of the road or when bicycle and pedestrian land use generators are present or planned in future development plans. Shared-use paths can be lit by overhead corridor lighting (in accordance with the DelDOT Lighting Policy) in which the lighting is for the entire corridor and not just the path. DelDOT does not typically maintain lighting systems exclusively for pedestrian or bicycle facilities, however lighting specific to off-roadway bicycle and/or pedestrian facilities may be considered when the path is expected to have night usage, and/or when an outside agency agrees to own, maintain, and fund the lighting system and ongoing electric fees. If insufficient space exists for a shared-use path, a continuous sidewalk can be considered to improve pedestrian safety and mobility. Coordination with property owners is needed to provide safe, non-motorized access from shared paths or sidewalks to their properties.

3 A minimum 5’ (10’ preferred) grass buffer between the edge of the roadway and the edge of the shared-use path is desirable. This buffer area can be used for stormwater conveyance; designers should avoid directing stormwater from the roadway over the shared-use path through the use of stormwater management designs. Narrower buffer widths can be used for short distances where the 5’ width cannot be reasonably achieved. When a side path is placed along a high-speed highway, a separation greater than 5 ft is desirable for path user comfort. If greater separation cannot be provided, use of a crashworthy barrier should be considered. A 2’- to 5’-wide graded shoulder area should be provided on either side of the shared-use path.*

4 A minimum 3’-wide buffer should be used between the back of a sidewalk or shared-use path whenever adjacent to a parking area. This buffer provides shy space between vehicles and the active transportation users. This space also prevents parked vehicles from protruding into the sidewalk or shared-use path. If a 3’-wide buffer cannot be provided, the sidewalk should be widened to at least 6’ or install parking bumpers. Planted buffers should be wider and provide space for irrigation and sufficient area for plantings to grow. If trees are planted in the buffer strip, the buffer should be wide enough so trunks (at mature width) are at least 4’ clear of the roadway face of curb and 2’ clear from the pedestrian access route. In addition, the mature reach of the tree should not overlap the SUP or sidewalk. The resulting recommended width therefore will be greater than 6’-6” for most species commonly used as street trees. Surfaces at the base of a tree should either be open or have adjustable openings to allow for the widening of the trunk at ground level over time.

*More information on shared-use path design is in the DelDOT shared-use path detail, the AASHTO Guide for the Development of Bicycle Facilities, and the DE MUTCD.

9TH STREET - WILMINGTON, DE

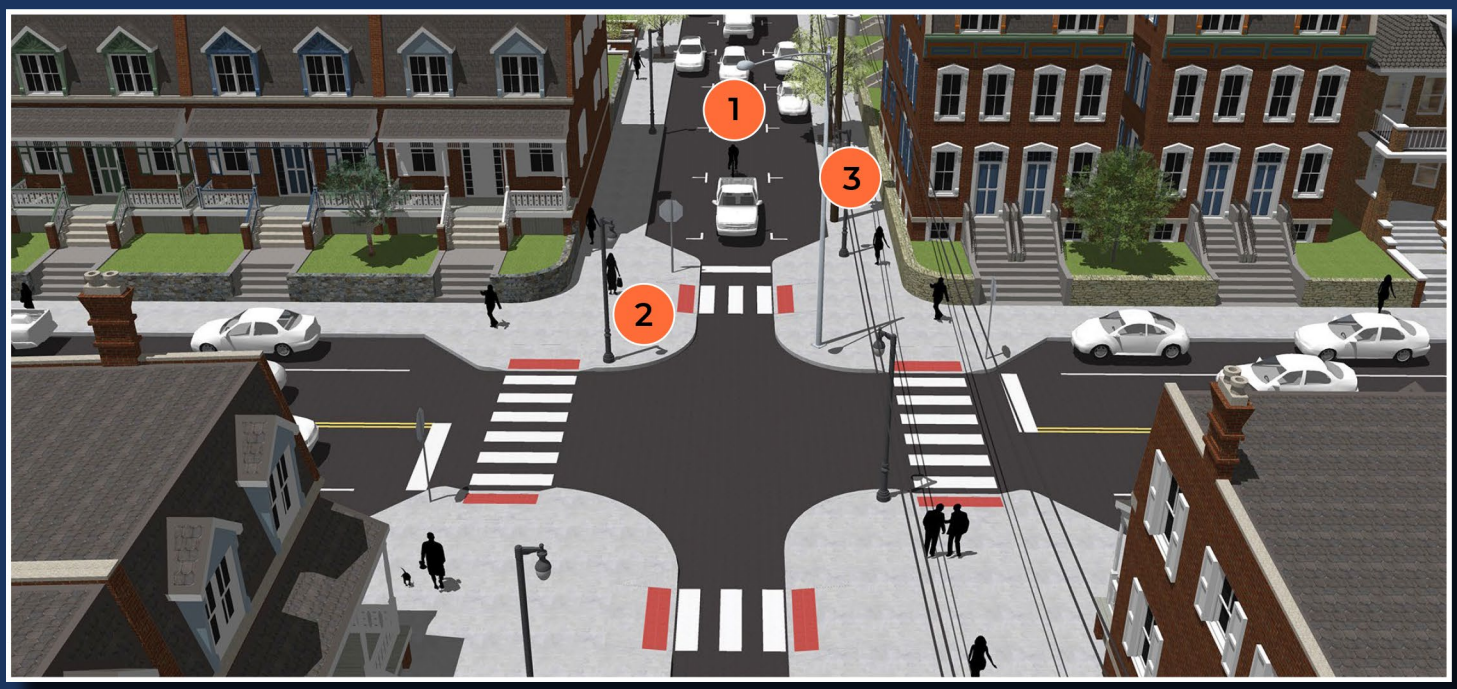
Urban Residential

Representative Places in Delaware:

- 9th Street – Wilmington, DE
- North Adams Street – Wilmington, DE
- Monroe Street – Wilmington, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Collectors, Local Streets
Target Design/Posted Speed	25 to 30 mph
Annual Average Daily Traffic (AADT)	1,000 or less AADT
Land Use Context (Development density and typical uses)	Primary land use is high-density attached multi-family residential, with some mixed-use development
Development form (Building form, typical setbacks, and parking)	• Low-rise structures with minimal setbacks • Minimal building gaps • Narrow street widths and high demands for on-street parking
Delaware State Investment Level	Typically Investment Level 1 or 2
Mobility	High demand for walking, bicycling, and small freight deliveries

Urban Residential



RECOMMENDATIONS

1. Separated or striped bike lanes are generally not appropriate along low-volume urban residential roadways due to the presence of on-street parking. Sharrows may be appropriate to emphasize certain streets as priority bicycle connections and to indicate preferred bicyclist positioning in the roadway.

2. Pedestrian bulb-outs (also called curb extensions) extend the sidewalk into the parking lane to narrow the roadway, decreasing the crossing length and time for pedestrians and providing additional space and visibility for pedestrians and traffic calming for turning vehicles. The types of trucks or buses and turning movements that will be accommodated at the intersection must be carefully considered.

3. A wider sidewalk and a narrower furnishing zone provide more space for pedestrians and increase accessibility for those with mobility limitations. The addition of a tree pit with a pedestrian-accessible metal grate covering provides more room for tree roots to grow, minimizing sidewalk disruption. The metal grate creates a wider effective walking area and reduces tripping hazards for pedestrians.

CARTER ROAD - SMYRNA, DE

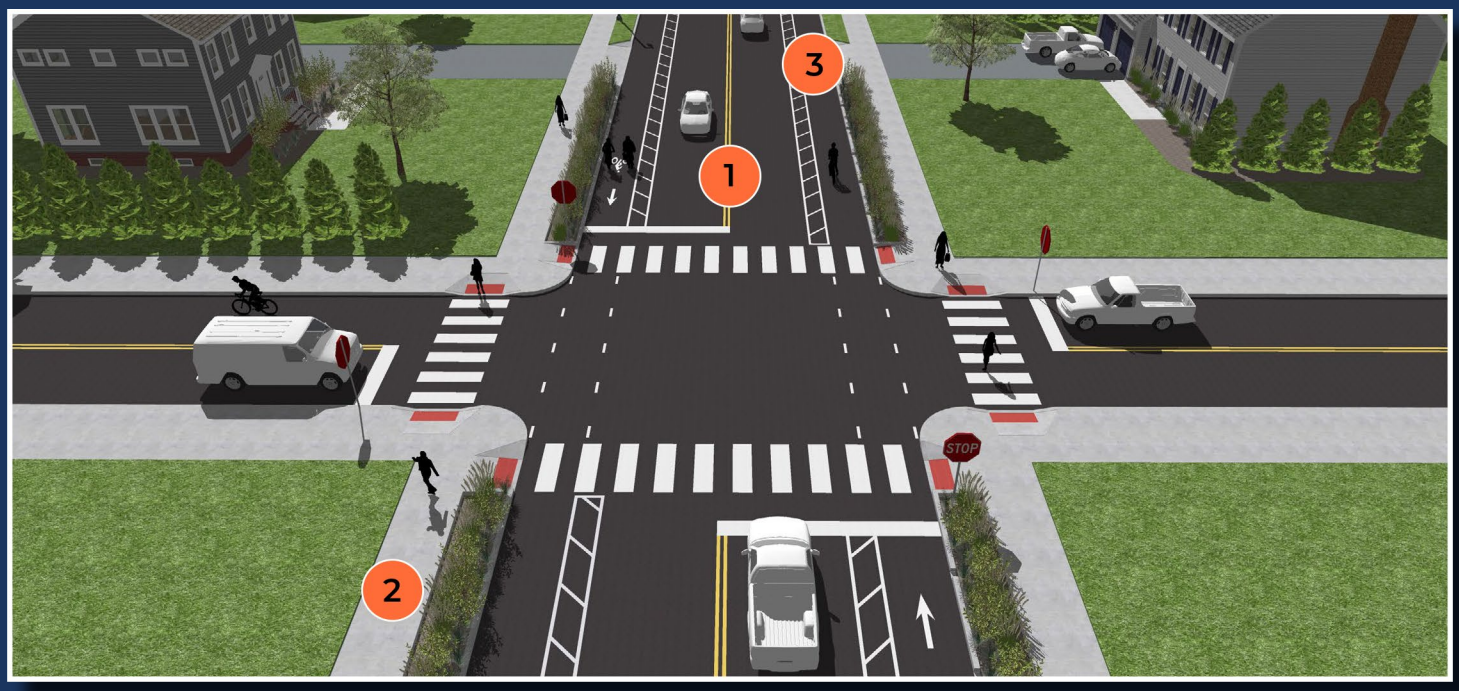
Suburban/Rural Residential - High Volume

Representative Places in Delaware:

- Apple Road – Newark, DE
- South Carter Road – Smyrna, DE
- Elks Lodge Road – Milford, DE
- East High Street – Seaford, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Collectors, Local Streets
Target Design/Posted Speed	25 to 35 mph
Annual Average Daily Traffic (AADT)	9,000 or less AADT
Land Use Context (Development density and typical uses)	Primary land use is low-density detached residential
Development form (Building form, typical setbacks, and parking)	• Low-rise structures with medium setbacks • Residential, detached structures • Typically off-street parking
Delaware State Investment Level	Typically Investment Level 2 or 3
Mobility	Often serve as connector roadways within the larger street network, in addition to providing local residential access and mobility for a mixture of pedestrian, bicycle, and motor vehicle traffic, as well as transit in some areas

Suburban/Rural Residential - High Volume (Option 1)



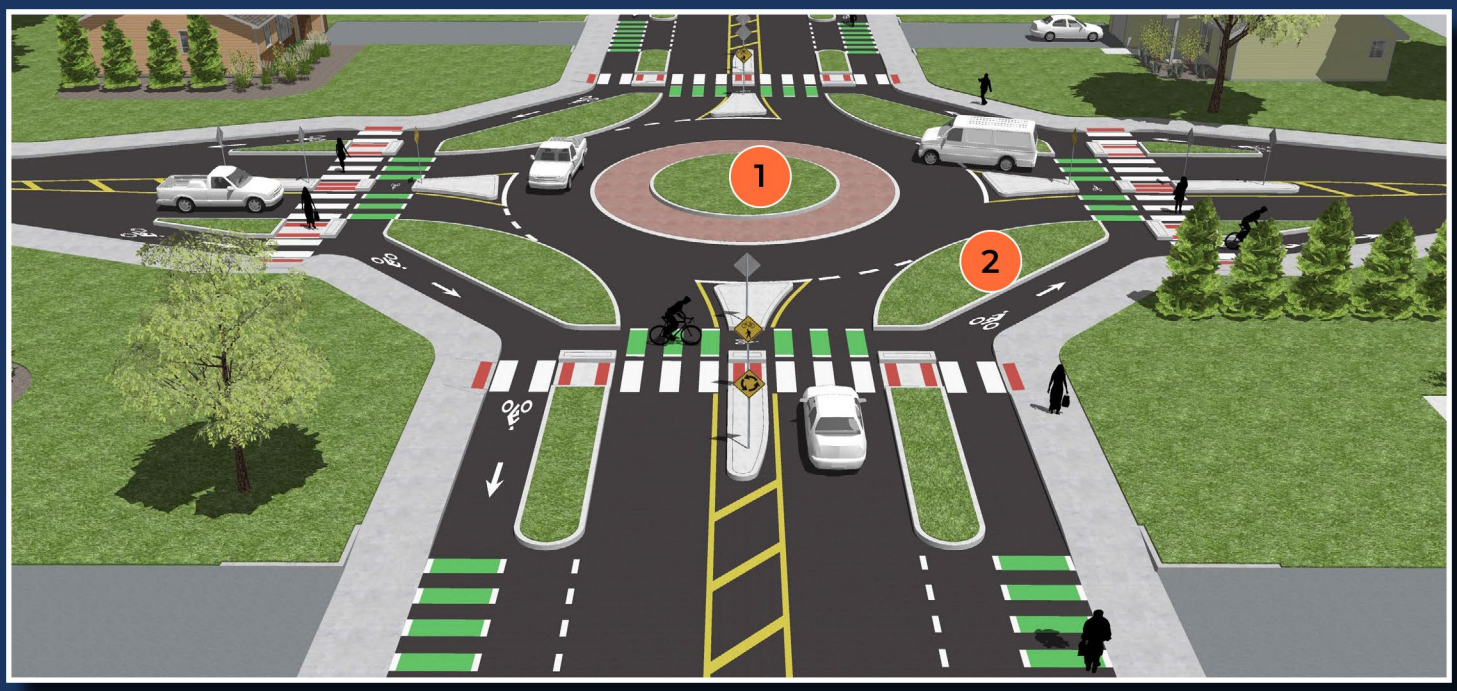
RECOMMENDATIONS

1. Consider 10'-wide travel lanes along these roadway types. When using buffered bike lanes, on-street parking can be removed to allow space for bicycle lanes if the parking is not highly used or if the project objectives favor bicycle lanes over on-street parking. Parking may also be restricted and replaced with traffic calming elements such as chicanes or chokers to calm traffic.

2. A wider sidewalk and narrower furnishing zone provide more room for pedestrians and increase accessibility for those with mobility limitations. Biofiltration systems and plantings can also be considered for these street types to capture, slow, and treat stormwater runoff before it is discharged to the downstream storm system. Biofiltration systems may be installed in buffer areas, medians, or bulb-outs.

3. Shared use paths or separated bike lanes are generally favored on high-volume suburban/rural residential roadways. If space does not allow a minimum 5'-wide bicycle lane, shared-lane markings (sharrows) can be considered in conjunction with other traffic-calming measures, such as bulb-outs or speed cushions.

Suburban/Rural Residential - High Volume (Option 2)



RECOMMENDATIONS

1. Roundabouts can be considered along Suburban/Rural Residential—High Volume Roadway's. A Roundabout is a circular intersection that moves traffic counterclockwise around a central island. They calm traffic and encourage drivers to reduce their speed through intersections. The design also reduces the need for direct left turns, common intersection crashes, thereby increasing the overall safety of the intersection.

2. Separated bike lanes can be accommodated through roundabouts making them comfortable for people walking and biking as well.

WEST HIGH STREET - FELTON, DE

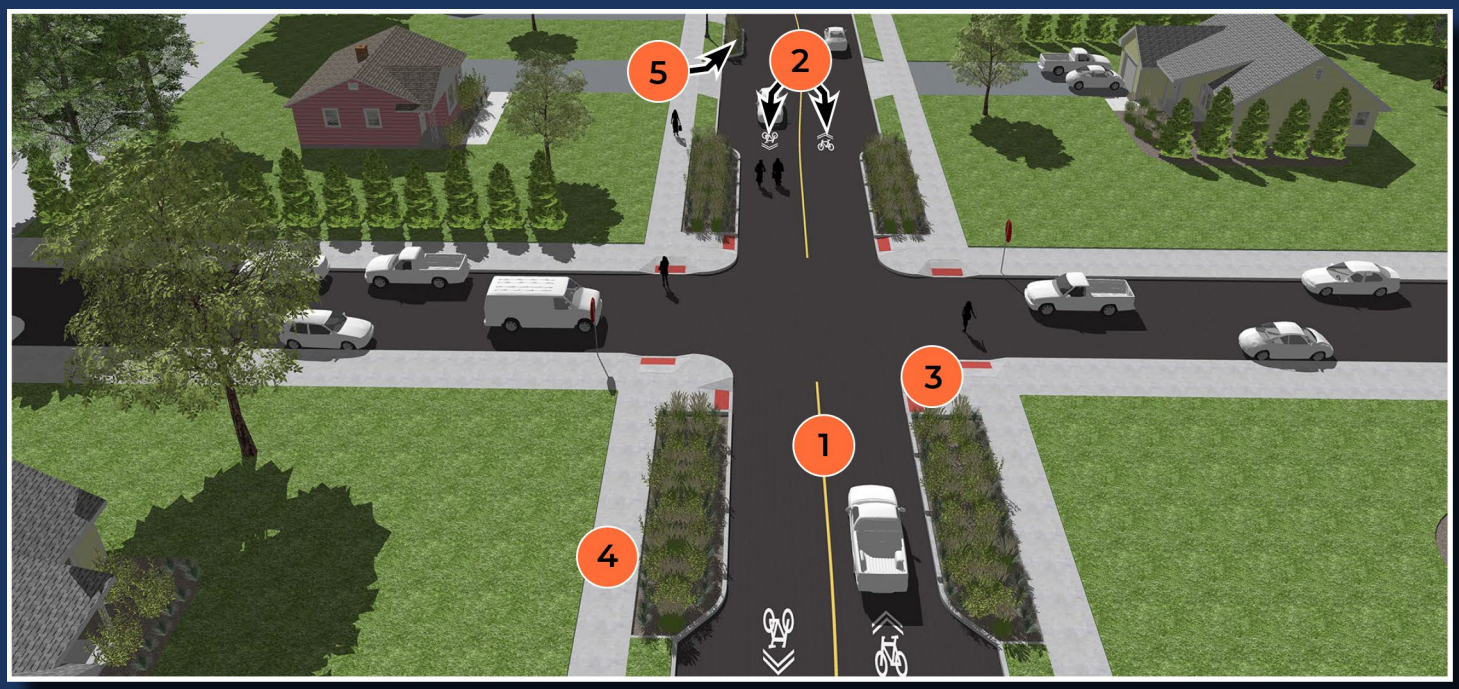
Suburban Residential - Low Volume

Representative Places in Delaware:

- Sunnyside Lane – Townsend, DE
- High Street – Felton, DE
- Wolcott Street – Harrington, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Local Streets
Target Design/Posted Speed	20 to 30 mph
Annual Average Daily Traffic (AADT)	1,000 or less AADT
Land Use Context (Development density and typical uses)	Primary land use is low-density detached residential
Development form (Building form, typical setbacks, and parking)	• Subdivision development • Low-rise structures with medium setbacks and residential, detached structures • Typically off-street parking
Delaware State Investment Level	Typically Investment Level 2 or 3
Mobility	Often primarily provide local residential access and mobility for a mixture of pedestrian, bicycle, and motor vehicle traffic

Suburban Residential - Low Volume



RECOMMENDATIONS

1. Consider 10'-wide travel lanes along these roadway types. On-street parking can be removed to allow space for bicycle lanes, sharrows, or traffic calming measures if the parking is not highly used. Along roadways where project objectives favor increased bicycle user comfort, stop signs can also be flipped to opposing streets to favor the bicycle users. When flipping stop signs, motor vehicle traffic volumes should also be a consideration.

2. Separated or buffered bike lanes are generally not appropriate along low-volume suburban residential roadways. Sharrows may be appropriate to emphasize certain streets as priority bicycle connections and to indicate preferred bicyclist positioning in the roadway, but are not always appropriate.

3. Pedestrian bulb-outs (also called curb extensions) extend the sidewalk into the parking lane to narrow the roadway, decreasing the crossing length for pedestrians and providing additional space and visibility for pedestrians and traffic calming for turning vehicles.

4. A wider sidewalk and narrower furnishing zone provide more room for pedestrians and increases accessibility for those with mobility limitations. Biofiltration swales and plantings can also be considered for these street types to capture, slow, and treat stormwater runoff before it is discharged to the downstream stormwater system. Biofiltration swales may be installed in buffer areas, medians, or bulb-outs.

5. Chicanes, chokers, or other horizontal control measures can be considered to calm traffic and make shared lanes with sharrows a more comfortable and safe experience for bicyclists and motorists. More information on horizontal control measures can be found in the Delaware Traffic Calming Design Manual.

SEASHORE HIGHWAY - BRIDGEVILLE, DE

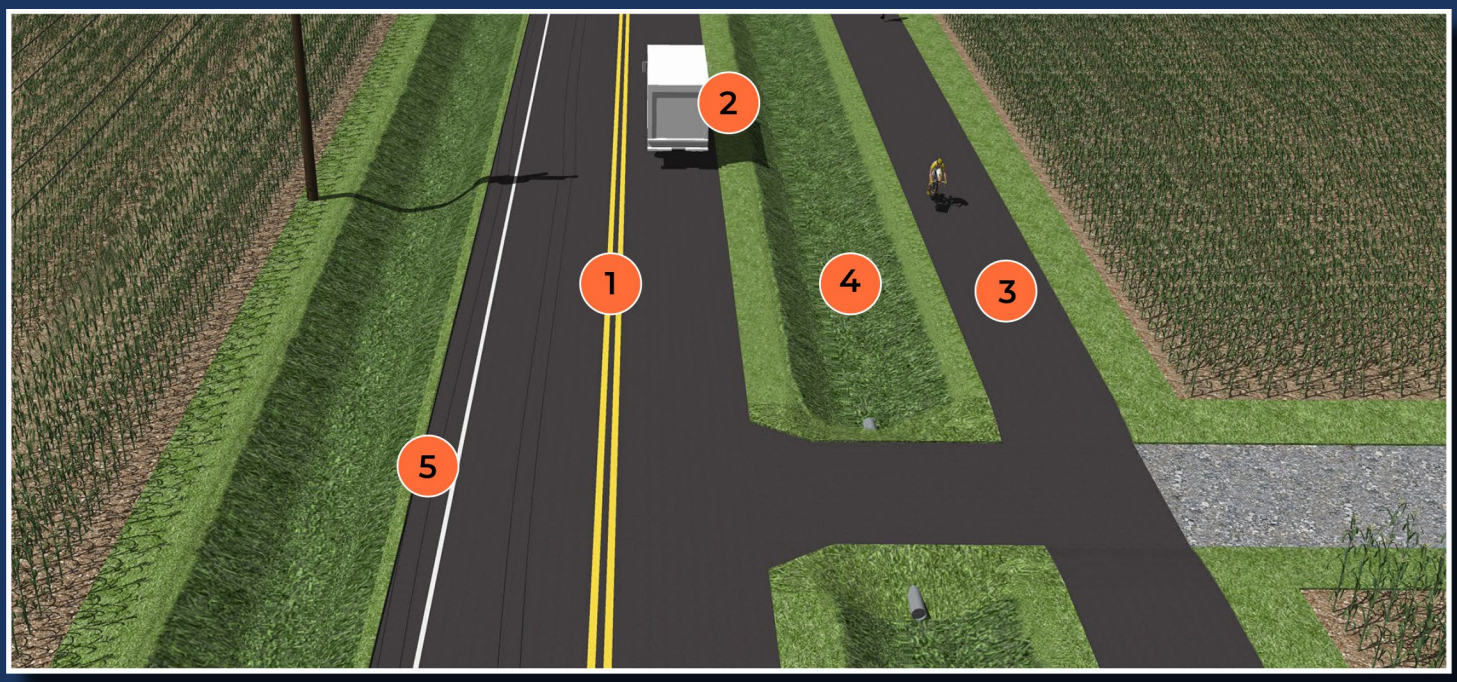
Low-Density Highway

Representative Places in Delaware:

- DE 404 (Seashore Highway) – Bridgeville, DE
- Millington Road – Clayton, DE
- DE 44 (Hartly Road) – Hartly, DE

STREET TYPE CRITERIA	
FHWA Functional Classification	Rural arterials and collectors
Target Design/Posted Speed	45 to 55 mph
Annual Average Daily Traffic (AADT)	15,000 AADT or less
Land Use Context (Development density and typical uses)	• Low-density scattered development in large-lot residential clusters • Agriculture, outdoor recreation areas, green space, and undeveloped land
Development form (Building form, typical setbacks, and parking)	• Large setbacks of sparsely scattered buildings • No on-street parking
Delaware State Investment Level	Typically Investment Level 3, 4, or Out of Play Area
Mobility	Balance the needs of high volumes of regional automobile traffic with the needs of residents and other roadway users (including recreational and commuting cyclists and pedestrians)

Low-Density Highway



RECOMMENDATIONS

1. Narrower travel lanes discourage speeding and provide more space for a shoulder/bicycle lane. Narrowing lanes to 11' can help calm traffic and allow wider shoulder space for bicycle use when shared-use paths are not feasible.

2. Consider grass shoulders along these types of roadways to calm vehicle speeds and reduce effective impervious surface area.

3. Consider shared-use paths along these types of roadways to provide accommodation for bicyclists and pedestrians. If lighting is included in the corridor design in accordance with the DelDOT Lighting Policy, shared-use paths can be lit by overhead lighting intended for the entire corridor and not just for the path. Lighting specific to an off-roadway bicycle and pedestrian ways may be considered when the path is expected to have night usage, and when an outside agency agrees to own, maintain, and fund the lighting system. Include crosswalks where shared-use paths cross intersecting streets. Typically, path user volumes and land uses do not yield a need for a shared-use path along each side of the roadway. The shared-use path should be placed along whichever side of the roadway better connects users into the surrounding active transportation network or destinations along the roadway. Coordination with property owners is needed to provide safe, non-motorized access from shared paths or sidewalks to their properties.*

4 A minimum 5’ (10’ preferred) grass buffer between the edge of the roadway and the edge of the shared-use path is desirable. This buffer area can also be used for stormwater conveyance. Designers should avoid directing stormwater from the roadway over the shared-use path through the use of stormwater management designs. Narrower buffer widths can be used for short distances where the 5’ width cannot be reasonably achieved. When a side path is placed along a high-speed highway, a separation greater than 5 ft is desirable for path user comfort. If greater separation cannot be provided, use of a crashworthy barrier should be considered. A 3’- to 5’-wide graded shoulder area should be provided on either side of the shared-use path.*

5 Shoulders used by bicycles should be kept free of debris and other obstructions.

*More information on shared use path design is found in the DelDOT SCDs and the AASHTO Guide for the Development of Bicycle Facilities.

Shared Street

Shared streets are roadways designed for slow travel speeds where pedestrians, cyclists, and motorists all share the right-of-way. There are typically no curbs on the edges of shared streets to separate vehicle, bicycle, or pedestrian traffic. Instead, the area is a flush surface between the building frontage areas on either side of the right-of-way. Bollards or pedestrian amenities are typically used in place of the curb line to help facilitate the movement of the mixed travel modes and keep vehicles away from the building frontage areas.

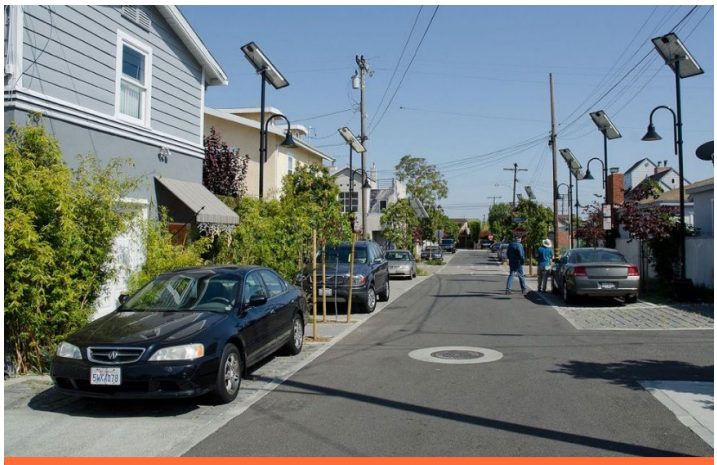
Shared streets usually have low vehicle volumes, high pedestrian/bicycle volumes, and a posted speed limit of 5 mph. Slow speeds are encouraged with traffic calming, signage, and use of distinctive materials, furnishings, and plantings. Street users generally negotiate the right-of-way cooperatively rather than relying on traffic controls, allowing the entire street to effectively function as a public space. Shared streets can be designed and managed in a variety of different ways to balance the needs of the particular street and its users.

In commercial areas, shared streets can significantly increase public space, adding vibrancy and activity with outdoor dining, public seating, art, and landscaping. In residential areas, shared streets become the extension of front yards and places to meet neighbors and help build communities.

An issue with shared streets is wayfinding for pedestrians with vision impairments without physical elements used for that.

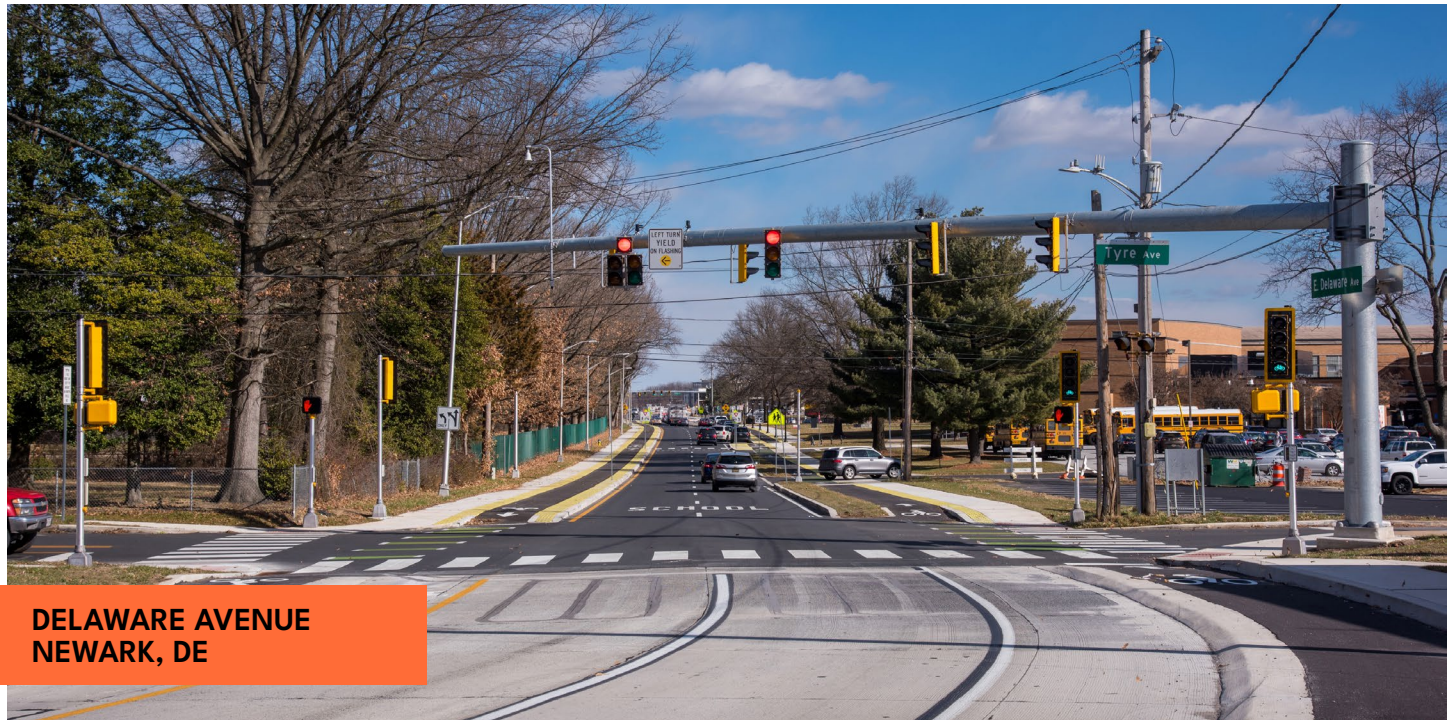
Although there are no shared streets in Delaware currently, DelDOT encourages consideration of this type of street design where the criteria on the following page apply and where the community is supportive of this type of street.

COMMERCIAL SHARED STREET IN BOSTON
(IMAGE CREDIT: NACTO)



RESIDENTIAL SHARED STREET IN SANTA MONICA
(IMAGE CREDIT: NACTO)

STREET TYPE CRITERIA	
FHWA Functional Classification	Shared Streets
Target Design/Posted Speed	5 to 15 mph
Annual Average Daily Traffic (AADT)	1,000 AADT or less
Land Use Context (Development density and typical uses)	Primary land use context includes high- to medium-density commercial, residential, and mixed uses
Development form (Building form, typical setbacks, and parking)	• Low- to mid-rise structures with minimal setbacks • Minimal building gaps • On-street parking common but not required, depending on the street needs
Delaware State Investment Levels	Typically Investment Level 1 but may be appropriate in other Investment Levels
Mobility	Shared streets accommodate pedestrians, bicyclists, and motorists in an environment that strongly prioritizes non-motorized transportation.



DELAWARE AVENUE
NEWARK, DE

Nonmotorized Street

Nonmotorized streets are designed primarily for pedestrians but may allow other nonmotorized users, such as bicyclists. Most often, nonmotorized streets are called pedestrian malls or pedestrian alleys. These streets are typically found in central business districts of cities and are generally adjacent to or host a high density of pedestrian or tourist destinations, such as shops and restaurants. Nonmotorized streets can be located either in the public right-of-way or on private property. Since motorized vehicles are not allowed on these streets, there is usually no posted speed limit. Emergency or maintenance vehicles are usually the only motorized vehicles allowed on nonmotorized streets and only during emergencies or maintenance activities.

The success of a nonmotorized street depends on the surrounding land use context. Nonmotorized streets usually have high pedestrian volumes and a high density of mixed uses directly adjacent to them. Where nonmotorized streets are in tourist destinations, they will likely attract many tourists and will be difficult to pass through unimpeded, even on foot. For this reason, bicycles may not be allowed on some nonmotorized streets.

The vast majority of DelDOT-owned or -operated streets will not fit this street type. However, locally owned streets and alleys could be considered for conversion to nonmotorized streets. These types of streets can significantly increase public space, adding vibrancy and activity with outdoor dining, public seating, art, and landscaping, and can also be used to create important pedestrian connections.

PENNY LANE MALL IN REHOBOTH BEACH, DE (IMAGE CREDIT: VISITDEBEACHES.COM)

CHURCH STREET IN BURLINGTON, VT (IMAGE CREDIT: NEWENGLAND.COM)

STREET TYPE CRITERIA	
FHWA Functional Classification	Local Streets, generally, but could be other classifications, depending mostly on land use context.
Target Design/Posted Speed	N/A
Annual Average Daily Traffic (AADT)	Streets that could be considered for this street type should have very low existing traffic volumes, and traffic should be rerouted from these streets without major impacts to the surrounding network.
Land Use Context (Development density and typical uses)	Primary land use context includes high-density commercial, residential, and mixed uses
Development form (Building form, typical setbacks, and parking)	• Low- to mid-rise structures with minimal to no setbacks • Minimal to no building gaps • No parking, private driveways, or garage access from street
Delaware State Investment Levels	Typically Investment Level 1 but may be appropriate in other Investment Levels
Mobility	Nonmotorized streets accommodate pedestrians and sometimes bicyclists in an environment that strongly prioritizes pedestrian transportation.

4. Design Considerations

DESIGN CONSIDERATIONS BASED ON USERS

Complete Streets are streets designed for all modes of transportation, including users of all ages and abilities, pedestrians, bicyclists, drivers, and freight handlers. The anticipated street users' needs and abilities should be taken into consideration when determining design details such as sidewalk and shared-use path widths, types of bicycle facilities, roadway design speed, signal timing and spacing, location and frequency of pedestrian crossings, number of vehicular travel lanes, intersection width, lighting, and freight delivery areas, among other design considerations.

ELKTON ROAD
NEWARK, DE

Pedestrian User Considerations

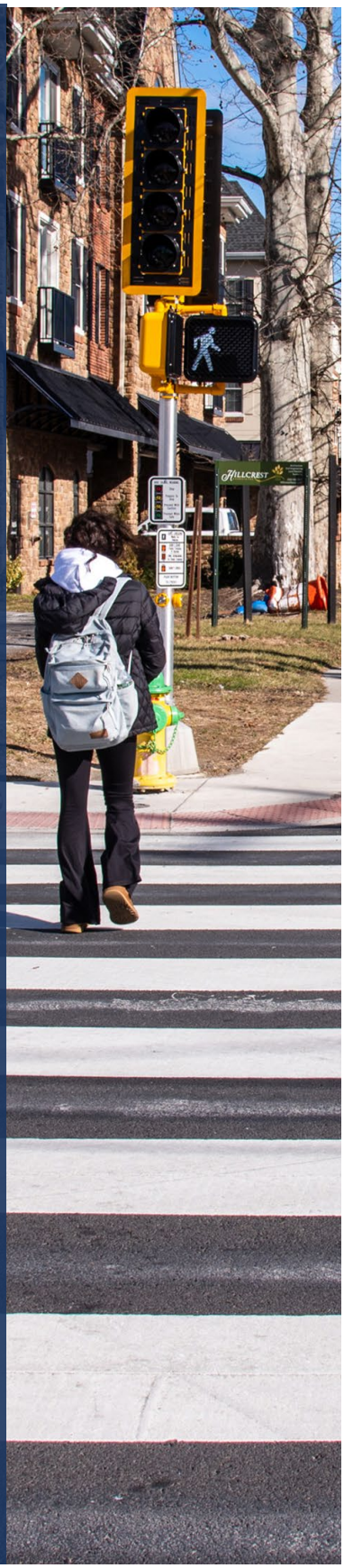
Pedestrians are among the most vulnerable roadway users, but not every pedestrian has the same needs. When it comes to street design, several pedestrian-related characteristics can influence roadway design, such as walking speed, walkway capacity, the needs of persons with disabilities, and the age of pedestrians. The characteristics of the anticipated pedestrian users are especially important to consider also in terms of the context of the roadway and the expected levels of pedestrian activity. For example, for roadways where pedestrian activity is anticipated to be high, wider sidewalks and crosswalks could be considered along with longer pedestrian crossing signal times. Pedestrian origin and destination patterns, as well as potential trip lengths, should help inform appropriate crosswalk spacing and frequency to ensure safe and direct pedestrian access.

Understanding the needs of pedestrian users is particularly important when designing roadway crossings and signal timings. Simple designs, accommodations for slower walking speeds, leading pedestrian intervals, median refuge islands at wide intersections, and amenities such as benches can greatly improve the pedestrian experience for all pedestrians, including seniors and people with disabilities. Likewise, it is important to consider the needs of people with varying abilities, such as continuously paved level surfaces on both sides of the roadway, a pedestrian network that allows multiple and direct routes to destinations, pedestrian origins, and destinations that are close to each other, and short crossing distances. These needs are generally met through pedestrian access routes (PAR) which must be kept clear from obstructions, such as movable objects like trashcans.

For more information on designing for pedestrian users with disabilities, refer to the DelDOT Pedestrian Accessibility Standards, Facilities in the Public Right of Way.

For additional information on designing for older drivers and pedestrians, refer to the following guides:

- NACTO Designing for All Ages & Abilities
- FHWA Highway Design Handbook for Older Drivers and Pedestrians
- FHWA Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians



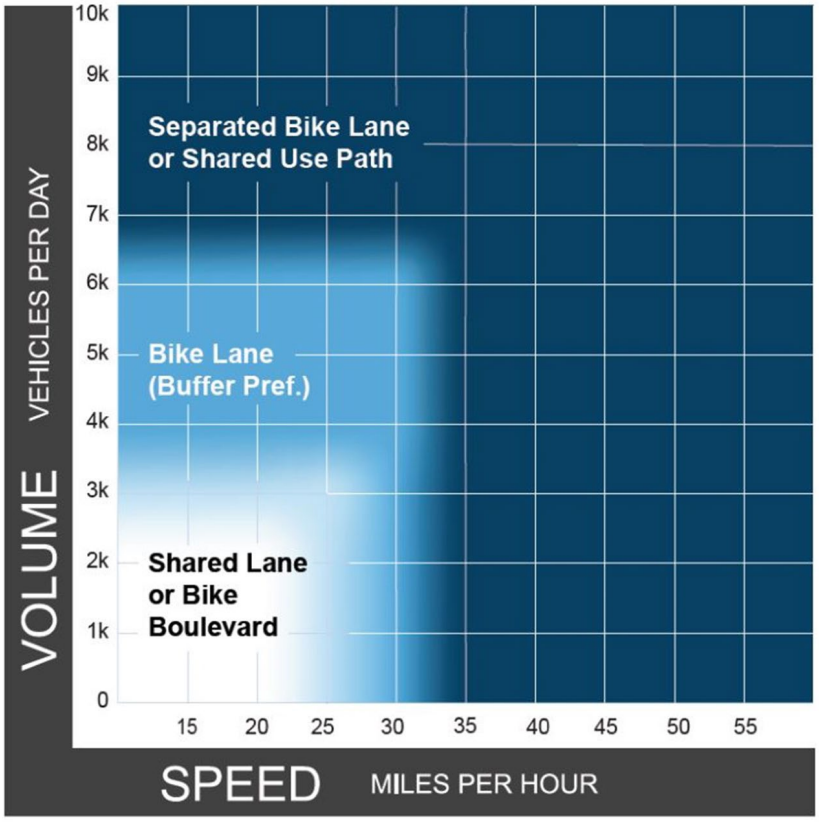
Bicycle User Considerations

Like pedestrians, people riding bicycles (bicyclists) are also considered vulnerable roadway users. Bicycle facilities should be designed for bicycle users of all ages and abilities and be as low-stress as possible. Low-stress bicycle networks produce a comfortable experience for bicyclists through a connected system of low-speed local roads, off-street trails, and on-street bicycle facilities. While a small fraction of the population will tolerate sharing a road with heavy or fast traffic, most cyclists are considered "interested but concerned" riders, meaning that the average bicyclist is willing to accept only a low degree of traffic stress.

DelDOT has created a bicycle level of traffic street (LTS) model that can be used to identify gaps within Delaware's non-motorized transportation network. It provides a basis to plan for and prioritize future active transportation investments. Generally, DelDOT strives to provide an LTS 1 or 2 for bicycle facilities in urban and suburban settings, with LTS 1 in dense urban areas. For rural settings, DelDOT strives for a LTS 3 or better. For more information on DelDOT's LTS model visit: https://udel.maps.arcgis.com/apps/MapJournal/index.html?appid=0281bffd-6e8d46849f95a000c182bff4

Some bicycle design considerations are common to all roadway contexts and bicyclist abilities, such as the need for bicycle parking. However, for the considerations that depend on roadway context, AASHTO has created the following chart (Figure 1) to provide guidance in choosing bicycle facility designs that create an all-ages and abilities bicycling environment, based on a street's vehicle volume per day and speed. This chart should be applied as a flexible design resource in identifying appropriate bicycle facility types. In some cases, a bicycle facility may fall short of all ages & abilities criteria but still substantively reduce traffic stress. The inability to meet the criteria is a reason to avoid implementing a bikeway and should not prohibit the construction of facilities that do not fully meet the criteria.

Figure 1: Bicycle Facility Selection Chart (Source: AASHTO)



Note: The above figure reflects guidance from the American Association of State Highway and Transportation Officials (AASHTO) on how to create all ages and abilities bicycle facilities. While DelDOT refers to this guidance as an aid in identifying appropriate facility types it is worthwhile to mention that shared-use paths could often be used in lieu or in addition to protected or buffered bike lanes in many of these scenarios.

Vehicle Type and User Considerations

Personal vehicles, emergency vehicles, buses, truck traffic, freight vehicles, and their drivers should also be considered when designing Complete Streets. Curbside requirements and parking for vehicles also need to be considered when designing Complete Streets and balancing roadway user needs.

Vehicle operational needs should be considered when identifying potential design treatments to ensure that vehicles will be able to travel effectively and operate within the roadway. While it is important to account for larger vehicles and their turning movements, the challenges for these types of vehicles (especially emergency vehicles) will be infrequent. It is important to balance these challenges with the safety of the most vulnerable roadway users. The safety and comfort of daily street users should not be superseded by designing for infrequent challenges by large vehicles. Roadway safety for vulnerable users and everyday personal vehicle drivers can be inadvertently reduced by creating streets designed for large vehicles, as wider road widths encourage higher vehicle speeds and create longer pedestrian crossing distances.

One strategy to balance these needs is accommodating larger vehicles at intersections by narrowing turning radii by moving the stop bar on the receiving street back or by using mountable curb extensions (truck aprons) free from signs and other obstructions to allow for wider turns. Standard curb extensions (bulb-outs) are always preferable in slowing turning vehicles and reducing pedestrian exposure at intersections. However, in instances where typical curb extensions are not practical due to larger vehicles turning movements, mountable curb extensions (truck aprons) are another option to consider. If truck aprons are used, they should be designed so that the pedestrian refuge areas will not be in the path of turning vehicles.

Another strategy to consider when trying to better balance large vehicles and pedestrian safety at intersections is to reevaluate the necessity of right-turn lanes, which create longer crossing distances for pedestrians and create more potential conflict points with vehicles. While many existing turn lanes are necessary to mitigate congestion they should be reviewed during project design for necessity to better balance the street for all users.

TRUCK APRON

DESIGN CONSIDERATIONS BY ZONE

DESCRIPTION OF ZONES

Active Zone

The active zone describes the area of public right-of-way that is dedicated to pedestrian/bicycle travel and other forms of active transportation. It is comprised of the following five subzones: **the frontage zone, the pedestrian access route (PAR), the furnishing zone, the bike zone, and the buffer zone.**

As shown in the graphics on the next page, the active zone may include a furnishing zone and a buffer zone (left side of the graphic) where separated bicycle facilities are planned. Conversely, the active zone could consolidate the furnishing, and buffer zone into the same space (right side of the graphic) when separated bicycle facilities do not exist.

The considerations for sidewalk cafés, planters, street furniture, street trees, etc., within the frontage zone and the furnishing zone should be discussed and documented in a municipal agreement. The agreement should include allowance for these features in the DelDOT right-of-way as well as a long-term maintenance agreement to keep these types of elements and amenities safe, operational, and aesthetically pleasing.

Roadway Zone

The roadway zone is the area of public right-of-way that is primarily meant for motorized vehicle travel. However, the roadway zone can be used by pedestrian/bicycle travel and other forms of active transportation when separated facilities are not provided or when nonmotorized users are not excluded from traveling within the roadway lanes or shoulders. The roadway zone comprises the following three zones: the curb zone, the travel way zone, and the median zone.

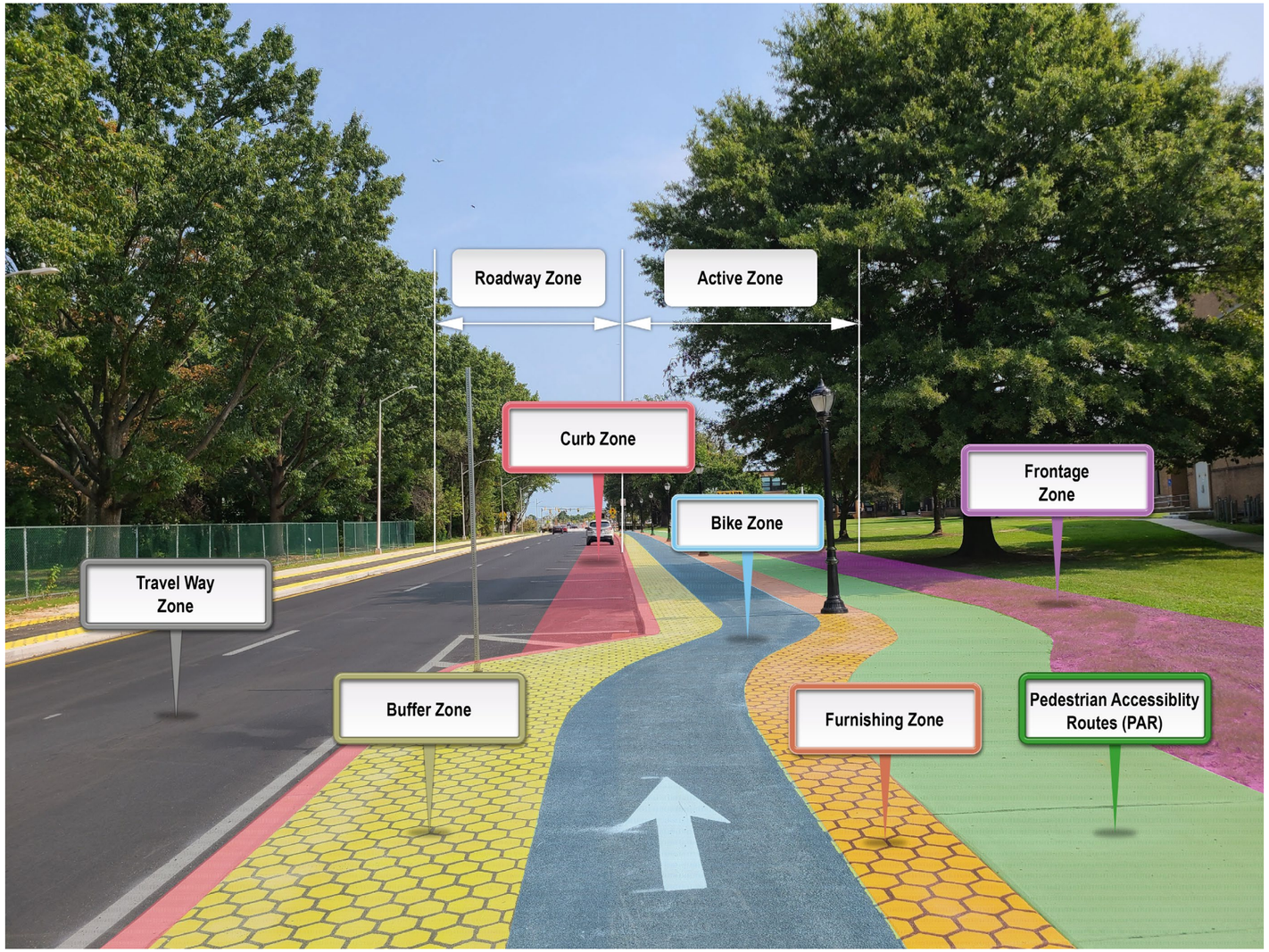
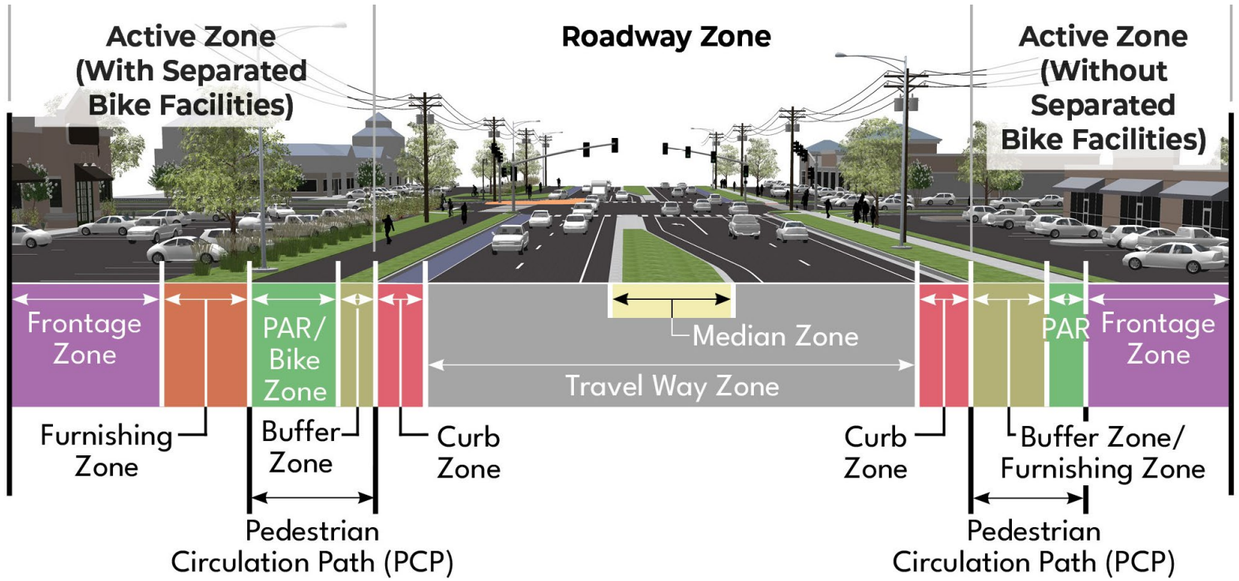
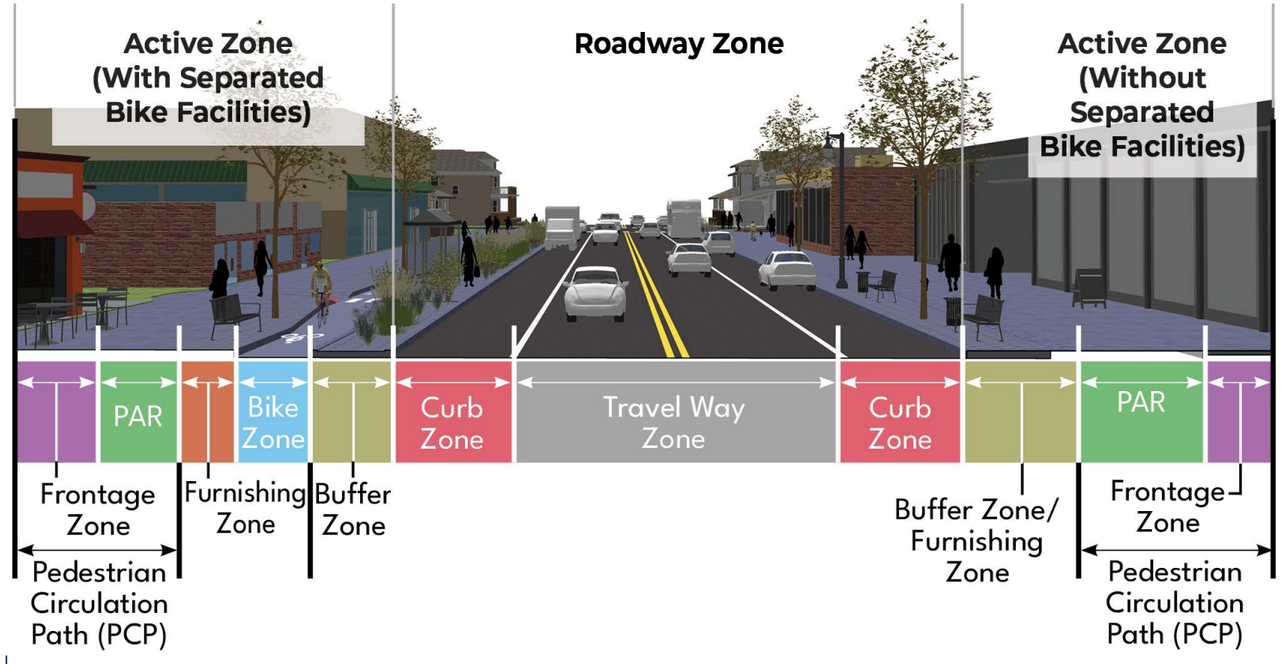


FIGURE 2: ZONES

Higher Volume Roadway Typical Section with Median



Higher Volume Roadway Typical Section without Median



Frontage Zone – In locations where buildings are adjacent to the sidewalk, the frontage zone provides a linear shy distance between passing pedestrians and buildings, walls, or other structures that would encroach upon the pedestrian access route (PAR). The frontage zone can be eliminated when the pedestrian access route is adjacent to open areas.

Pedestrian Access Route (PAR) – This portion of the pedestrian circulation path provides pedestrians with a safe, convenient, continuous, and unobstructed pedestrian route that connects the accessible components of a pedestrian network.

Furnishing Zone – The furnishing zone delineates space for objects that would otherwise obstruct pedestrian movement. It can also provide a buffer between pedestrians and the adjacent bike zone. The furnishing zone can be combined with the buffer zone when protected bicycle facilities are not provided to establish a buffer between pedestrians and the adjacent roadway zone.

Bike Zone – In locations where a separated bicycle facility is provided, the bike zone provides a dedicated space for bicycle travel separated from pedestrians and motorized vehicles in the roadway zone. The bike zone can be eliminated when a separated bicycle facility is provided, which includes when a shared-use path is provided for shared pedestrian and bicycle use.

Buffer Zone – The buffer zone is located between the face of the curb or edge of pavement (curb zone) and the pedestrian access route (or bike zone when present). The buffer strip provides pedestrians and bicyclists with a separation from moving traffic and therefore a greater level of comfort. This area typically has a contrasting surface such as grass or landscaping or is paved in a contrasting material, color, or pattern to distinguish it from the pedestrian access route. The buffer zone is not required but is desirable along streets with high bicycle and pedestrian volumes or where increasing non-motorized user comfort is a project objective.

Curb Zone – In locations where curbs are present, the curb zone refers to the space between the active zone and the travel way zone. Historically, this space has been reserved for the exclusive use of on street parking and vehicle loading/unloading. However, the curb zone has evolved to serve new uses, including transit facilities and amenities, bike share, car share, freight loading, food trucks, ride-hailing, delivery trucks, and other competing uses that may fluctuate between uses and users at different times. Thoughtful planning of curbside uses within the curb zone is essential to provide or result in a safe, high-functioning Complete Street.

Travel Way Zone – The travel way zone is the area that includes travel lanes used primarily by personal vehicles, transit, emergency vehicles, and delivery/freight vehicles. In many locations, bicycle users, pedestrians, and other active transportation users also use the travel way zone, such as when separated facilities are not provided when nonmotorized users are permitted to travel within the travel lanes and shoulders, or at intersections and other crossings.

Median Zone – When present, the median zone is in the center of the travel way zone and may include a median, turn lanes, center transit lanes, street trees or other landscaping, permeable surface or stormwater management features, gateway and placemaking features, and/or traffic signs. The median zone serves multiple purposes including enhancing safety by reducing conflicts, traffic calming, improving traffic operations, meeting environmental requirements, and beautifying the street through landscaping and green stormwater infrastructure. The municipal agreement may be needed for the maintenance of median features, especially landscaping.

DESIGN ELEMENTS FOR CONSIDERATION

Active Zone Design Elements for Consideration

The following table provides an overview of the various design considerations for each zone and what street types these design considerations are most appropriate for. Each design element includes a letter and a color showing the applicability of that element based on the street type as follows:

- H = High Priority
- E = Encouraged
- A = Allowed
- N = Not Appropriate

			Downtown Urban Core	Main Street	Office & Light Industrial	Commercial Strip Corridor	Urban Residential	Suburban/Rural Residential - High Volume	Suburban/Rural Residential - Low Volume	Low Density Highway
ACTIVE ZONE	**Frontage Zone**	Sidewalk signs (sandwich boards)	E	E	N	A	N	N	N	N
		Sidewalk cafés	E	E	N	A	N	N	N	N
		Storefront planters	E	E	A	A	A	N	N	N
	Pedestrian Access Route (PAR)		H	H	H	H	H	H	H	H
	Furnishing Zone	Pedestrian-scale lighting	E	E	A	N	A	N	N	N
		Street furniture	E	H	A	A	A	N	N	N
		Street trees/or other landscaping	H	H	E	E	E	E	E	N
		Transit facilities and amenities	H	H	E	E	E	E	A	A
		Wayfinding signage	E	E	A	A	A	A	A	A
	Bike Zone	Buffered bicycle lanes	H	H	A	A	A	E	A	N
		Paved shoulders	A	A	E	E	A	E	E	H
		Shared lanes*1	N	A	N	N	A	N	N	N
		Shared use paths	N	N	H	H	N	H	N	H
		Striped bicycle lanes*2	E	E	A	N	E	A	A	N
		Separated bicycle lanes	H	H	A	A	A	E	A	N
		Two-way separated bicycle lanes	A	A	N	N	A	A	N	N
	Buffer Zone	Bicycle parking	H	H	H	H	H	N	N	N
		Biofiltration swales	H	H	E	A	A	E	A	H
		Corridor lighting	H	H	E	H	E	E	E	A
		Grass or planted landscaping	E	E	A	A	A	A	A	N
		Mailboxes	N	A	A	A	A	A	A	A
		On-street electric vehicle charging	E	E	N	N	E	N	A	N
		Overhead utilities	A	A	A	A	A	A	A	A
		Rain gardens	H	H	E	A	A	E	A	A
		Street furniture	E	E	A	E	A	N	N	N
		Street signs	A	A	A	A	A	A	A	A
		Street trees	H	H	E	E	E	E	N	N

Legend
- H = High Priority
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			Downtown Urban Core	Main Street	Office & Light Industrial	Commercial Strip Corridor	Urban Residential	Suburban/Rural Residential - High Volume	Suburban/Rural Residential - Low Volume	Low Density Highway
ACTIVE ZONE	**Curb Zone**	Bus pull-off areas	E	A	E	E	A	A	A	A
		Curbside deliveries/loading zone	H	H	A	N	H	A	N	N
		Floating bus islands	A	A	A	A	A	A	N	N
		On-street parking (including ADA parking)	H	H	N	N	H	A	A	N
		Parklets	A	A	N	N	N	N	N	N
		Transit bus lanes (including queue jumper lanes)	A	N	N	A	N	N	N	N
		Transit facilities and amenities	H	H	H	H	H	H	A	A

Notes:

*1 – Along high-speed, high-volume corridors with anticipated higher than occasional long-distance bicycle volumes, it may be more appropriate to provide separated facilities for bicycle travel.

*2 – Striped bicycle lanes may not be appropriate on roads with very low motor vehicle volumes or very low speeds. Conversely, on roads with high motor vehicle volumes or speeds, it may be more appropriate to exclude bicycle lanes and provide a shared-use path instead for bicycle and pedestrian usage.

FLOATING BUS ISLAND – E. DELAWARE AVE NEWARK, DE

Roadway Zone Design Elements for Consideration

The table below shows the design elements that can be considered within the roadway zone of a street.

Legend
- H = High Priority
- E = Encouraged
- A = Allowed
- N = Not Appropriate

				Downtown Urban Core	Main Street	Office & Light Industrial	Commercial Strip Corridor	Urban Residential	Suburban/Rural Residential - High Volume	Suburban/Rural Residential - Low Volume	Low Density Highway
ROADWAY ZONE	Travel Way Zone	Corridor Traffic Calming	Chokers/neckdowns	A	A	A	N	A	A	A	N
			Chicanes	A	A	A	N	A	A	A	N
			Lateral shifts	A	A	A	N	A	A	A	N
			Median island/center island narrowing	A	A	A	A	A	A	A	N
			Midblock Crossings	A	A	A	A	A	A	A	N
			On-street parking	E	H	A	N	H	A	A	N
			Pedestrian refuge islands	A	A	A	A	A	A	A	N
			RRFB (Rectangular Rapid Flashing Beacon)	A	A	A	A	A	A	A	A
			Speed humps	A	A	A	N	A	A	A	N
			Speed cushions (pre-fab/permanent)	A	A	A	N	A	A	A	N
		Intersection Improvements	Bus queue jumps	A	N	N	A	N	A	N	N
			Corner extensions/bulb-outs	E	E	E	A	E	E	A	N
			Diagonal diverters	N	N	N	N	A	N	A	N
			Forced turn islands	N	A	N	N	N	A	A	N
			Intersection barriers	N	A	N	N	N	A	A	N
			Raised crosswalks/speed tables	A	A	N	N	A	A	A	N
			Raised intersections	A	A	N	N	A	A	A	N
			Realigned intersections	N	N	N	N	A	A	A	N
			Roundabouts	N	E	E	E	E	E	E	E
			Partial closures	N	N	N	N	A	N	A	N

Legend
- H = High Priority
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			Downtown Urban Core	Main Street	Office & Light Industrial	Commercial Strip Corridor	Urban Residential	Suburban/Rural Residential - High Volume	Suburban/Rural Residential - Low Volume	Low Density Highway
ROADWAY ZONE	**Median Zone**	Center transit lanes (including queue jumper lanes)	A	N	N	A	N	N	N	N
		Gateway and placemaking features	E	E	A	A	A	A	A	A
		Median	A	A	A	A	A	A	A	A
		Pedestrian median fencing	N	N	A	E	N	E	N	N
		Stormwater management infrastructure	A	A	A	A	A	A	A	A
		Traffic signs	A	A	A	A	A	A	A	A
		Trees or other landscaping	E	E	A	A	E	A	A	N
		Turn lanes	A	A	A	A	A	A	A	A

SIDEWALK OR PEDESTRIAN PATHWAY CONSIDERATIONS

Sidewalks are a vital part of the transportation system and fundamental to facilitating the movement of people through urban, suburban, and rural communities. Sidewalks should be part of a continuous network and connected with crosswalks and other safety elements at roadway intersections. They should be safe and comfortable facilities that provide accommodations for people of all ages and abilities. Sidewalk material and width are often determined by its context, surrounding land use, mix of activities, and travel needs. While typically ubiquitous along streets in urban environments, sidewalks in rural areas are less common, often being more informal and fragmented, and serving a specific function such as linking neighborhoods to a school, park, or other major pedestrian destination.

Sidewalk and Buffer Widths

Sidewalk width should support the surrounding street context, land uses, and current and future anticipated pedestrian demand. DelDOT's standard sidewalk width is 5 feet when a buffer strip is provided. The buffer strip should be at least 4 feet, but additional width should be provided on higher speed, higher volume roadways to increase the pedestrian's sense of safety and comfort along the facility. A buffer zone width of 7 feet will allow for the installation of curb ramps outside the pedestrian access route in most circumstances. At locations where no buffer strip is provided, the standard sidewalk width should be 6 feet, exclusive of the curb. These widths are appropriate for low-volume pedestrian traffic facilities. At locations where high-volume pedestrian traffic is anticipated, such as central business districts, stadiums, and schools, additional width should be added to the pedestrian access route to accommodate the anticipated extra pedestrian volume.

If a sidewalk or pedestrian pathway is constructed or altered, it should meet the requirements of the Americans with Disabilities Act (ADA). For more guidance on pedestrian accessibility requirements, consult the **DelDOT Pedestrian Accessibility Standards Manual**.

SIDEWALK IN NEW CASTLE, DE

SHARED-USE PATH CONSIDERATIONS

When planning and designing a shared-use path, it is important to understand the project area context, potential users, how many people will use the path, and the future relative mix of modes. Shared-use paths are typically used by bicyclists and pedestrians, as well as other active transportation/micromobility modes. If a shared-use path is constructed or altered, it should meet the requirements of the Americans with Disabilities Act (ADA). Trails outside the road right-of-way used solely for recreational purposes are not required to meet the requirements of the ADA, however, if a trail serves both a recreational and transportation-related purpose then it must comply with the requirements of the ADA. For more guidance on pedestrian accessibility requirements, consult the DelDOT Pedestrian Accessibility Standards Manual.

In certain rare circumstances, shared-use paths may only need to be provided on one side of a street based on the surrounding land use and pedestrian and bicycle generation points. However, usually, shared-use paths should be provided on both sides of a road, such as where there are pedestrian/bicycle destinations on both sides of a road, high pedestrian/bicycle traffic volumes, difficulty crossing the road due to road widths or lack of marked/signalized crossings, or when providing shared-use paths on both sides of the road would logically connect to other pedestrian or bike infrastructure.

The below information summarizes best practices and guidance from the 2012 AASHTO Guide for the Development of Bicycle Facilities, hereafter referred to as the 2012 AASHTO Bike Guide, regarding the planning and design of shared-use paths, unless otherwise noted.

Shared-Use Path Width

In general, the minimum shared-use path width should be 10 feet. Additionally, graded buffers that are at least 3 to 5 feet wide, with a maximum cross-slope of 1V:6H or flatter should be provided. A minimum 2-foot graded shoulder area should be provided for horizontal clearance from lateral obstructions such as bushes, large rocks, bridge piers, abutments, and poles.

In areas where there will be higher volumes of users (greater than 300 total peak hour users) or a greater mix of pedestrians and bicyclists (greater than 30% of total users being pedestrians), wider shared-use path widths – between 11 and 14 feet – should be considered. Wider paths should be used when the potential users include children and people using larger means of active transportation, such as adult tricycles, motorized wheelchairs, or means that require a larger clear area, such as roller skates. The minimum necessary width for a bicyclist to pass a user traveling in the same direction when there is an adjacent user traveling in the opposite direction is 11 feet. Wider paths are also encouraged where larger maintenance vehicles will be used to maintain the shared-use path. In physically constrained locations, a minimum shared-use path width of 8 feet is allowable.

Shared-Use Path Buffer Width

In general, shared-use paths should be a minimum of 10 feet from the edge of the travel lane when there is no curb along the roadway.

The shared-use path shall be a minimum of 5 feet from the back of the curb when there is a curb along the roadway. If the minimum separation is not feasible, then curbing should be considered with a minimum 3-foot-wide separation from the back of the curb to the edge of shared-use path or if necessary a crashworthy barrier should be considered.

If the buffer width is less than 3 feet, a physical barrier or railing should be provided between the shared-use path and the roadway. On higher-speed roads, buffer widths greater than 5 feet should be used or, if not feasible, crashworthy barriers should be considered. Crashworthy barriers are not typically appropriate along low-speed roadways or urban areas.

SHARED-USE PATH – ELKTON ROAD NEWARK, DE

Separating Pedestrian and Bicycle Users

According to the 2012 AASHTO Bike Guide, in general, pedestrians and bicyclists can coexist on a single, unstriped shared-use path even in areas with high user volumes. However, DelDOT generally only makes this assumption for shared-use paths that are at least 10 feet in width to ensure that passing space is provided. In higher-use areas or on shared-use paths with higher peak hour and/or seasonal volumes, or other operational challenges such as sight distances the use of the centerline can help clarify the direction of travel and organize shared-use path traffic.

Separation of pedestrians from bicycle users may be appropriate for shared-use paths with higher volumes (more than 300 total users in the peak hour) and a typical mix of pedestrians (approximately 30 percent). The **Federal Highway Administration (FHWA) Shared Use Path Level of Service Calculator**[1] determine when separation is most appropriate. When separation is necessary, pedestrians typically walk in a bi-directional walking lane on one side of the shared-use path, while people on bicycles are provided with directional lanes. This solution should only be used when a minimum shared-use path width of 15 feet is provided, with at least 10 feet for two-way bicycle traffic, and at least 5 feet for pedestrians. If this type of separation is included on a trail adjacent to a scenic view (e.g., adjacent to a lake, river, or lookout), the pedestrian lane should be placed on the side with the view.

When separation of pedestrians and bicycle users is provided on a shared-use, it can be beneficial to include measures to help people with vision impairments differentiate the pedestrian walkway from the space meant for bicycle use. Such measures can include:

- Landscaped buffer between the pedestrian and bicycle space
- Materials with a visual contrast between the pedestrian and bicycle space (e.g., concrete contrasted with asphalt, or use of pavement markings)
- Directional indicators such as a raised surface or textured area between the pedestrian and bicycle space. If raised surfaces are used it should be designed so as not to become a tripping hazard.

1 FHWA. Shared Use Path Level of Service – A User's Guide. FHWA-HRT-05-138. Federal Highway Administration, U.S. Department of Transportation, Washington, DC, 2006.

BIKE LANE CONSIDERATIONS

In most circumstances where right-of-way is fixed or constrained, such as in dense, urban environments, bike lanes are likely the most practical means of providing bicycle facilities to a street.

DelDOT Bicycle Level of Traffic Stress

Bicycle level of traffic stress (LTS) refers to the relative level of comfort a bicyclist can expect on a given segment of road. The concept was developed by the Mineta Transportation Institute which found that most bicyclists are "interested but concerned" when it comes to traveling by bike.

There are four LTS levels – LTS 1 through LTS 4 – with 1 being the lowest amount of stress and 4 being the highest. LTS 1 is used for roads or bike facilities that are suitable for bicyclists of all ages and abilities, from children to adults. LTS 2 is the level of traffic stress that most adults will tolerate. LTS 3 and 4 represent greater levels of stress only tolerable by the most experienced and confident bicyclists.

All new DelDOT bicycle network improvements qualify as low-stress. More information on DelDOT's Bicycle LTS can be found **here**.

Bike Lane Width

According to the 2012 AASHTO Bike Guide, under most circumstances, bike lanes should be 5 feet wide. When the bike lane is directly adjacent to a curb, guardrails, or any other vertical surface, 5 feet is the minimum width. In areas with a narrow street parking lane and high vehicle turnover, wider bike lanes (6 to 7 feet) are desirable to avoid conflicts between bicyclists and opening car doors. In areas with high bicycle traffic, wider bike lanes (6 to 8 feet) allow for bicyclists to pass one another without leaving the bike lane. High-speed (greater than 45 mph) or high-volume roads also warrant wider bike lane widths.

Separated Bike Lanes

Separated bike lanes are facilities for exclusive use by bicyclists that are located within or directly adjacent to the roadway and are physically separated from motor vehicle traffic by a vertical element. Separated bike lanes can use a variety of vertical separation elements separating the bike lanes from the roadway, including but not limited to raised curbs or medians, bollards, on-street parking, landscaping, or planters. Separated bike lanes are sometimes referred to as protected bike lanes. Separated bike lanes can be one-way or two-way bicycle facilities.

One-Way Separated Bike Lane Widths

One-way separated bike lanes should have a minimum width of 5 feet. Wider-separated bike lanes provide additional comfort and space for bicyclists and should be considered where a high volume of bicyclists is expected. Widths of 7 ft and greater are preferred as they allow for passing or side-by-side riding. Additional care should be taken with wider lanes such that the separated bike lane is not mistaken for an additional motor vehicle lane.

Two-Way Separated Bike Lanes Widths

Two-way separated bike lanes should have a preferred combined width of at least 12 ft. A minimum width of 8 feet is appropriate in constrained locations. DelDOT generally constructs 10–foot wide two-way separated bike lanes, using 8 feet only in constrained locations. There is often not enough right-of-way to construct 12-foot-wide separated bike lanes. While there is not abundant United States-based guidance on bike lane widths for two-way separated bike lanes there are examples from outside of the country that can be a helpful guide.

DELAWARE AVENUE, NEWARK DE

For example, in the Netherlands the CROW Design Manual for Bicycle Traffic[2] includes the below chart as guidance to determine two-way separated bike lane widths based on bicycle volumes.

FIGURE 3: EXCERPT FROM THE CROW DESIGN MANUAL FOR BICYCLE TRAFFIC

Rush Hour Intensities (two directions, bikes per hour)	Cycle Track (Two-Way Separated Bike Lane) Width
0 – 150	6.5 feet
150 – 750	10 feet
> 750	13 feet

2 CROW. Record 25: Design Manual for Bicycle Traffic. CROW, The Netherlands, 2006.

DELAWARE AVENUE
NEWARK, DE

Separated Bike Lane Buffer Widths

Both one-way and two-way separated bike lanes should include a buffer between them and any motor vehicle travel or parking lanes. Vertical elements in the buffer are critical as they provide added comfort and safety that make separated bike lanes attractive and well-used facilities. The separation type(s) should consider the presence of on-street parking, overall street and buffer width, cost, durability, aesthetics, traffic speeds, emergency vehicle and service access, and maintenance. In certain circumstances, emergency vehicle access may need to be provided through low or mountable curbs or non-rigid means. The spacing and width dimensions that follow are suggestions; narrower buffer widths may be used so long as the vertical elements can be safely accommodated under the conditions of that roadway. A combination of several different buffer treatments may also be used. The below chart is meant to help guide buffer type and width considerations for separated bike lanes. This information is based on the FHWA Separated Bike Lane Planning and Design Guide[3].

FIGURE 4: SEPARATED BIKE LANE BUFFER WIDTHS AND TYPE

Buffer Type	Width
Delineator posts	3 feet preferred
Bollards	1.5 – 3 feet preferred
Concrete barrier	3 feet preferred
Raised median	16 inch minimum preferred
Raised buffer	2 feet preferred
Planters	3 feet typical
Parking stops	1 – 2 feet typical
Striped buffer adjacent to parked cars	3 feet minimum striped buffer, 7–8 feet on-street parking lane typical

3 FHWA. Separated Bike Lane Planning and Design Guide. Federal Highway Administration, U.S. Department of Transportation, Washington, DC, 2015.

Choosing Between One-way or Two-way Separated Bike Lanes

Bike lanes in the United States typically are one-way facilities. However, with the increase in separated bike lanes, there is also an emergence of two-way or bi-directional bike lanes being constructed. These two-way separated bike lanes are sometimes referred to as "cycle tracks". They are physically separated bike lanes that allow bicycle movement in both directions on one side of the road. There are several design factors to consider when deciding between one-way and two-way bike facilities:

Roadway conditions and constraints – It is generally better to provide one-way separated bike lanes over two-way separated bike lanes when there is enough space to do so. However, when there is a need for two-way bicycle travel within a separated bike lane and there is not enough space to have two separated bike lanes on each side of the roadways, a two-way separated bike lane can be considered.

Driver expectations – As with shared-use paths, care must be taken when implementing two-way separated bike lanes to avoid conflicts between drivers who do not expect to see bicyclists riding in an unexpected direction. When drivers are making right or left turns across two-way separated bike lanes, they may not expect bicycle traffic traveling in the opposite direction of the nearest vehicle lane. The same applies to cars turning out of driveways onto the road with bicycle facilities. On roads with many driveways that cannot be consolidated, one-way bike lanes may be safer for bicyclists.

Network connectivity – When there are existing bicycle infrastructure connections or a high density of bicycle destinations on one side of a road, two-way separated bike lanes may be a logical bike facility, but careful attention to intersection design is needed to reduce potential conflicts.

Intersection Efficiency & Signals - Two-way separated bike lanes often require dedicated bicycle signals at signalized intersections to manage potential conflicts and enhance safety. While bicycle signals support predictable movements for cyclists, they can introduce additional signal phases that may affect intersection efficiency and vehicle level of service. In corridors with high traffic volumes or limited signal flexibility, it is important to consider these operational impacts. If there is enough width available, one-way separated bike lanes on each side of the road may be a more efficient option, as cyclists can utilize the same signal patterns as vehicles, often eliminating the need for separate bicycle signals.

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TRANSITION ZONES

A roadway project area may include various roadway classifications, land uses, speed limits, etc., as it traverses a corridor. This means that a variety of different street types could be appropriate throughout a project area, and in these situations, transition zones should be considered. A transition zone is an area between street types designed to alert roadway users to the changing conditions of the roadway and allow them to adjust their behaviors and expectations accordingly, especially in areas where deceleration or yielding is required.

The transition area includes the perception/reaction area and the deceleration area. The perception/reaction area is where a driver is first made aware of a changing condition to the roadway. This area typically is where land use may also begin to change. The transition from a higher speed zone to a lower speed zone typically includes visual cues to alert the driver of an upcoming change in speed or changing conditions in the roadway. These cues may include:

- Signage, including warning signs such as “reduce speed ahead” signs
- Texture or pavement markings
- Lane narrowing which can be highlighted with the use of a wider outside stripe or rumble strips
- Lane elimination
- Horizontal deflection, such as splitter islands, chicanes, or roundabouts
- Vertical traffic calming such as speed humps and speed cushions
- Curb changes, from flush paved shoulders to curbed roadway
- Architectural elements, including gateway signing, lighting, and landscaping

A combination of elements is often more effective for reducing speeds than an individual design element.

The deceleration area is the portion of the transition zone where drivers are expected to decelerate to an operating speed that matches the context of the area being approached. The deceleration area should have a noticeable change in roadway characteristics. The length of the transition zone should be long enough for drivers to slowly and comfortably adjust their speed. It shouldn’t begin too far away from the center of the community, so drivers can alter their speed and comply with the speed reduction.

There are two main design concepts to take into consideration when creating an effective transition zone. The first design concept is the “gateway”, which marks the end of the transition zone, consisting of physical features within the roadway and roadside, forcing drivers to obey the posted speed limits. These physical features can include raised medians, sidewalks, shared-use paths, bike lanes, curbs, etc. These features will help narrow down the roadway so that it does not look as open. The addition of pedestrian and bike facilities will help indicate an increase in pedestrian activity in the area.

The second design concept is “optical width”. The optical width concept is based on the relationship between the width of the road and the height of vertical elements nearby, which influences the drivers perception of the speed. When the roads width is greater than the height of the objects nearby, speeds seem to be higher. When the road width is less than the height of nearby objects, speeds are lower. One way this could be accomplished is by planting the right kind of trees in the transition.

Figure 5: Transition Zones