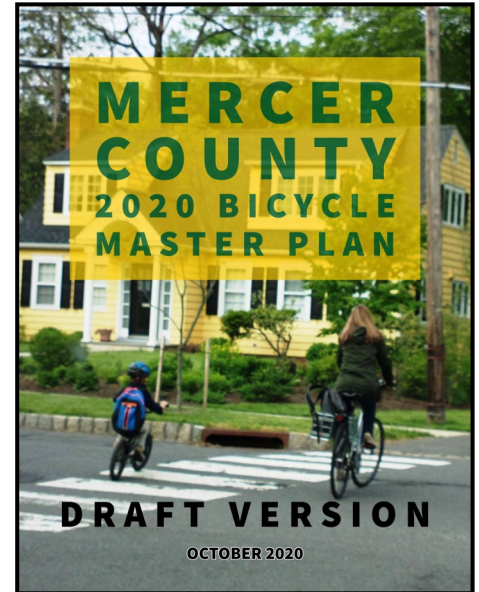




BICYCLE MASTER PLAN EXECUTIVE SUMMARY

This plan is a sub-element of the Mercer County Master Plan Mobility Element and serves to enhance the County road network, as directed in the Mercer County Complete Streets Resolution (Resolution No. 2012-249) adopted April 26, 2012. With this Resolution, the Mercer County Board of Chosen Freeholders expressed support for the County Executive's "Complete Streets" policy for the planning, design, construction, maintenance, and operation of new and retrofitted transportation facilities to enable safe access and mobility, not only for motorists, but also for pedestrians, bicyclists, and transit users of all ages and abilities. This Plan offers guidance to project development in the County's capital program. Its goal is to enhance the safety and convenience of bicycle travel on the County's road network and thereby improve the quality of life for everyone who lives and works in Mercer County.



GENERAL PROJECT INFORMATION

Merger County's strategy for improving the cycling network focuses on improvements for safety and accommodation along approximately 180 centerline miles of roadway under County jurisdiction. These roads serve as critical corridors for intra-county (600 routes) and inter-county (500 routes) mobility. By addressing bicycle mobility on these routes, the County hopes to provide strategies that complement municipal plans and forge new connections. The plan builds upon roughly 15 years of work of the County Planning Department, the Mercer County Bicycle and Pedestrian Task Force (MCBPTF), and careful review of municipal plans and studies.

The Mercer County Bicycle Master Plan provides recommendations for bicycle facilities to be considered for every County route segment. Based on a wide-ranging review of best practices nationwide, and on facility standards developing within the State of New Jersey, particular recommendations for specific segments were deemed most practical given cartway and right-of-way limits, posted speeds, traffic volumes, truck and bus routes, adjacent land use, and more. Recommended facilities are not proposed projects nor are they final recommendations. County Planning and Engineering staff will study locations in greater detail and consider location-specific design alternatives as scheduled capital projects advance, and may propose new projects to close critical gaps or create longer corridors. Final facility designs and implementation schedules will be determined case by case, at the final discretion of the County Engineer.

Goals

In order to achieve this vision, the County of Mercer has outlined a C5 strategy, similar to that in NJDOT's *Complete Streets Design Guide*, for developing and integrating bike facilities throughout the County. These 5 goals will guide the County's efforts:

Continuous: Create a network of continuous facilities that do not require bicyclists to walk their bikes or weave in and out of vehicular traffic.

Complete: Create a complete and thorough network of on and off-road bike facilities.

Connected: Provide bicycle access to destinations such as schools, employment centers, neighborhoods, shopping centers, trails, parks and other major attractors.

Comfortable: Create a safe ride where people do not have to fear riding on our facilities.

Convenient: Create facilities that are easy to use by all age groups.

Bicycle Master Plan Objectives

In order to advance these goals, this study has achieved four objectives:

Consider roadway conditions of all County Routes, including: Posted Speeds, Traffic Volumes, Existing Cartway Widths, Adjacent Land Use, Environmental Conditions, Constraints and Pinch Points, Truck Routes, Bus Routes, and Street Activity.

Demonstrate conceptual designs and identify opportunities, constraints and costs associated with implementation.

Identify and separate road segments into **short term, medium term and long term project horizons** based on necessary infrastructure, right-of-way considerations, and fiscal constraints.

Specific Goal Targets

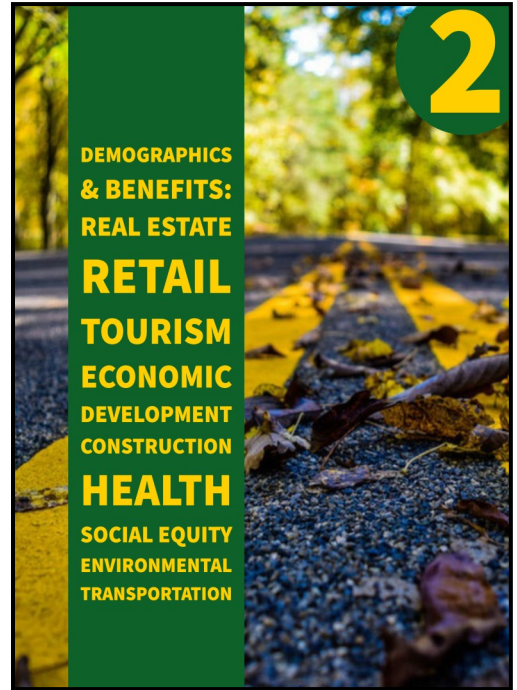
- ◆ Build at least 30 miles of bike facilities by end of 2025.
- ◆ Double the bicycle commuting mode share in Mercer County by 2030.
- ◆ Improve safety for pedestrians and bicyclists by reducing bicycle & pedestrian crashes on County roads by 50% by 2030.
- ◆ Encourage biking and walking events to promote healthy, active living and to enjoy the associated economic and environmental benefits.
- ◆ Enhance the connectivity of adjacent off-road and on-road bikeways and walking trails.
- ◆ Achieve a minimum of Level of Traffic Stress 3 rating on improvement projects, targeting LTS 1 & 2.
- ◆ Establish a working relationship with local planners, engineers and officials as well as with NJDOT staff for efficient project advancement and coordination.

BICYCLE MASTER PLAN PURPOSE AND NEED

The main purpose of this project is to assist in the implementation of our Complete Streets Policy, which aims to accommodate all modes of transportation and users of all ages, abilities and incomes. At this time, every municipality in the County, as well as the State of New Jersey has adopted similar Complete Street Policies.

Cycling is an important mode for County residents. For many, cycling is an enjoyable recreational activity, For others it is a primary travel mode for commuting and errands. The Princeton area in particular has a high concentration of commuters who exclusively ride their bicycles to work and school. In other parts of the County, cycling is less a choice than a necessity. For households living below the poverty line or households with only a single vehicle, the option of cycling may be critical. And walking or cycling may be the only way for young people with working parents to get to extracurricular activities.

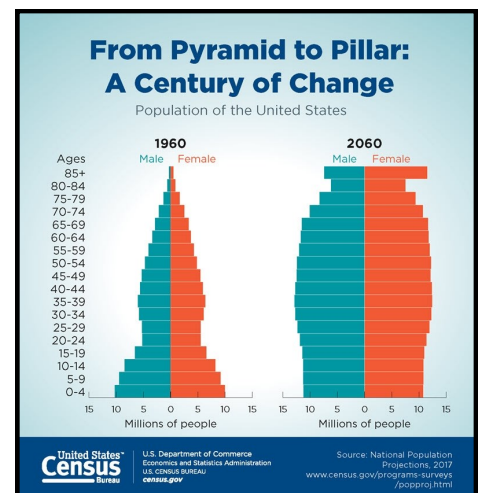
To support the case for implementing bicycle facilities, Chapter 2 of the Bicycle Master Plan cites numerous positive impacts on real estate, retail, tourism, and economic development activity. That chapter also describes benefits to public health, social equity, environmental justice, the environment, and how cycling may contribute to pavement preservation, crash reduction, and congestion reduction.



BICYCLE MASTER PLAN ANALYSIS

Anticipating an aging population, this Plan takes an ‘8 to 80 design’ approach, which is based on the premise that if a community is accommodating for eight year olds and 80 year olds, then that community is accommodating to everyone. To do so, Planning staff adopted a facility selection method similar to that in the NJDOT *2017 Complete Streets Design Guide*. This method is primarily driven by traffic speeds and volumes, as are most best practices today in the United States. The premise is that, as volumes and speeds increase, the level of “traffic stress” for cyclists increases. More than just a feeling, crashes at higher speeds result in exponentially higher fatality rates for cyclists. This means that high speed and high volume roads need greater separation from traffic, with wider bike lanes and buffers, or physical separation on a side path.

Chapter 3 applies this method to every segment of roadway under the jurisdiction of the County to assign a facility type, and assigns codes to indicate planning-level estimates of design and construction costs. Types and costs are indicated in maps and tables.



BICYCLE FACILITY RECOMMENDATIONS

While Chapter 3 provides a facility recommendation based on the County Bicycle Facility Selection Table and road characteristics, Chapter 4 recommends design considerations for the various facility types. The designs and recommendations to be considered are derived from design and policy manuals from both local agencies and national organizations, including the Federal Highway Administration. These manuals offer guidance on standards, best practices, and strategies for design and construction of bicycle facilities.

It is important to note that there is significant room for flexibility in highway and roadway design. In particular, the often used *AASHTO Policy on Geometric Design of Highways and Streets* (the ‘Green Book’) is not a detailed design manual but a guidance document to be used to make better-informed decisions. There is a significant range of roadway conditions within Mercer County so a “one size fits all” approach will not work. Context sensitive solutions must be used to reflect the location and community. As a result, a range of design reference and guidance documents will be used to design and implement bicycle facilities throughout the County.

Despite flexibility in geometric design, the County must comply with the Federal Highway Administration’s Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD is adopted by reference in accordance with Title 23, United States Code, Section 109(d) and Title 23, Code of Federal Regulations, Part 655.603, and is approved as the national standard for designing, applying, and planning traffic control devices, including roadway striping and signage. As the MUTCD and other federal guidance changes, design recommendations may vary during the life of this plan.

Mercer County Bicycle Facility Selection Table

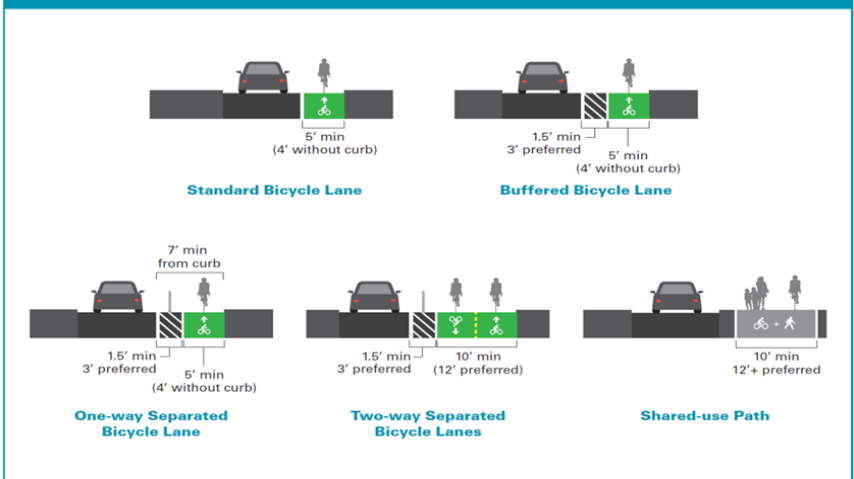
| ADT | USLIMITS2 Recommended Speed | | | | | | |
|---------------|-----------------------------|-------------|----------|-----------|---------|--------|-----|
| | ≤ 20 | 25 | 30 | 35 | 40 | 45 | ≥50 |
| ≤ 2,500 | A B C D E F | A B C D E F | C D E F | C D E F | C D E F | D* E F | F |
| 2,500–5,000 | B C D E F | B C D E F | C D E F | C D E F | D* E F | D* E F | F |
| 5,000–10,000 | B C D E F | B C D E F | C D E F | C* D E F | D* E F | D* E F | F |
| 10,000–15,000 | C* D E F | C* D E F | C* D E F | C* D* E F | D* E F | D* E F | F |
| 15,000–30,000 | C* D E F | C* D E F | C* D E F | D* E F | E F | E* F | F |
| ≥30,000 | F | F | F | F | F | F | F |

- A: Shared Street/Bicycle Boulevard
- B: Shared-lane Markings
- C: Bicycle Lane
- C*: Bicycle Lane (After careful consideration)
- D: Buffered Bicycle Lane
- D*: Buffered Bicycle Lane (After careful consideration)
- E: Separated Bicycle Lane
- E*: Separated Bicycle Lane (After careful consideration)
- F: Shared-use Path

1. If USLIMITS2 data not available, use posted speed
2. Bicycle boulevards are preferred at speeds ≤25 mph
3. Shared-lane markings are not a preferred treatment with truck percentages greater than 10%
4. Buffered Bike Lanes may include Rumble Strips if designed to Mercer County Bike Friendly Standards.

Source: Mercer County Department of Planning, Trenton, New Jersey

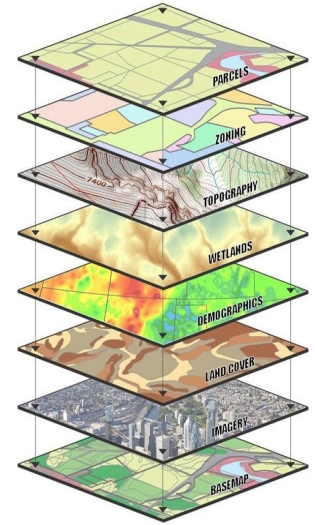
Bikeway Treatments and Minimum Requirements



Above: Mercer County selection table as well as NJDOT graphic showing most common types of bicycle facilities available.

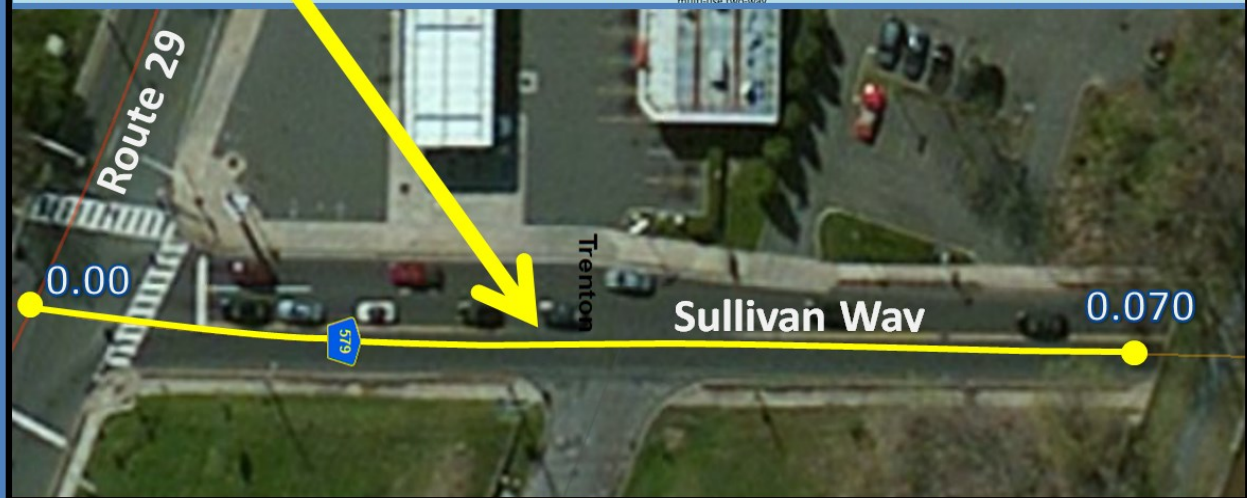
GIS ANALYSIS

Mercer County's bicycle facility selections in Chapter 3 were based on a careful analysis of the roadway conditions and surrounding land use in order to provide context sensitive recommendations. To support this analysis, 21 different environmental, land use, and transportation data sets, and three aerial imagery sources were compiled within a geographic information system (GIS), which is a framework for gathering, managing, and analyzing spatial data. With frequent reference to Google Streetview imagery, these data allowed staff to visualize each segment of road and nearby infrastructure, as well as nearby environmental assets and constraints. Measurements in GIS were compared to field samples and found to be within six inches, plus or minus. With these data, staff was able to make a good faith determination of what facility to recommend for each segment and to estimate implementation costs. In total, approximately 931,957 feet or 176.5 miles of roadway were analyzed, in 50'-250' segments.



Above: Simplified visualization of overlapping GIS data.

| SRI | MP_Start | MP_End | Fac_Type | Posted_Speed | Proposed_Speed | Approximate_AADT | Improvement_Code | Design_Code | Cartway_Width | Comments | Proposed_Parking | Length(ft) | CONcost | DEScost | TOTcost | LFcost | Truck_or_BusRoute |
|--|----------|--------|----------|--------------|----------------|------------------|------------------|-------------|---------------|---|------------------|------------|---------|---------|---------|--------|---------------------|
| Sullivan Way / Trenton-Harbourton Road / Harborton-Rocktown Road | | | | | | | | | | | | | | | | | |
| 00000579 | 0.000 | 0.070 | 1 | 35 | 30 | 12,500 | 2 | 2 | 28'-36" | Sharrow to underpass | No Parking | 370 | 739 | 739 | 1,478 | 4.00 | Bus and Truck Route |
| 00000579 | 0.070 | 0.092 | 5 | 35 | 30 | 12,500 | 110 | 20 | 22' | D&R Underpass... Build | No Parking | 116 | 12,778 | 2,323 | 15,101 | 130.00 | Bus and Truck Route |
| 00000579 | 0.092 | 0.195 | 3 | 35 | 30 | 10,000 | 55 | 20 | 28'-32" | Need to widen out to 38' | No Parking | 544 | 29,911 | 10,877 | 40,788 | 75.00 | Bus and Truck Route |
| 00000579 | 0.195 | 0.370 | 3 | 25 | 25 | 8,000 | 55 | 20 | 32'-34" | Need to widen out to 38' | No Parking | 924 | 50,820 | 18,480 | 69,300 | 75.00 | Bus and Truck Route |
| 00000579 | 0.370 | 0.800 | 3 | 40 | 35 | 8,500 | 85 | 20 | 26'-30" | Need to widen out to 38' | No Parking | 2,270 | 192,984 | 45,408 | 238,392 | 105.00 | Bus and Truck Route |
| 00000579 | 0.800 | 0.908 | 3 | 40 | 35 | 8,500 | 55 | 20 | 32'-34" | Need to widen out to 38' | No Parking | 570 | 31,363 | 11,405 | 42,768 | 75.00 | Bus and Truck Route |
| 00000579 | 0.908 | 0.943 | 4 | 40 | 35 | 10,000 | 85 | 50 | 40'-42" | Need to widen out to 50' | No Parking | 185 | 15,708 | 9,240 | 24,948 | 135.00 | Bus and Truck Route |
| 00000579 | 0.943 | 0.990 | 4 | 40 | 35 | 10,000 | 55 | 20 | 46'-48" | Need to widen out to 50' | No Parking | 248 | 13,649 | 4,963 | 18,612 | 75.00 | Bus and Truck Route |
| 00000579 | 0.990 | 1.090 | 3 | 40 | 35 | 9,000 | 3.4 | 2 | 36'-40" | Diet Lanes to 11'-11.5' | No Parking | 528 | 1,795 | 1,056 | 2,851 | 5.40 | Bus and Truck Route |
| 00000579 | 1.090 | 1.160 | 3 | 35 | 35 | 9,000 | 85 | 20 | 36'-38" | Need to widen out to 50' for 3 12' lanes, 5' bike | No Parking | 370 | 31,416 | 7,392 | 38,808 | 105.00 | Bus and Truck Route |
| 00000579 | 1.160 | 1.350 | 3 | 40 | 35 | 9,000 | 4 | 2 | 38'-40" | Diet Lanes to 12' and put | No Parking | 1,003 | 4,013 | 2,006 | 6,019 | 6.00 | Bus and Truck Route |
| 00000579 | 1.350 | 1.416 | 3 | 40 | 35 | 9,000 | 4 | 2 | 40'-45" | Diet Lanes to 12' and put | No Parking | 348 | 1,394 | 697 | 2,091 | 6.00 | Bus and Truck Route |
| 00000579 | 1.416 | 1.635 | 4 | 40 | 35 | 9,000 | 20 | 8 | 40'-43" | Redirect all bike traffic to multi-use two-way | No Parking | 1,156 | 23,126 | 9,251 | 32,377 | 28.00 | Bus and Truck Route |



Above: Within our geographic information system (GIS), we utilized NJDOT 2014 centerline information to break up each route into segments based on identified AADT, speeds, pavement cartway, pinch points, and other relevant information. The entire Mercer County Bikability network is as a result based on the 2014 Standard Route Identifier (SRI) and Linear Referencing Systems (LRS). Each segment as a result can be looked at individually, which is much more helpful when determining costs and improvements. In addition to the improvement and design codes provided for each segment, a field for additional comments was included to provide more detail.

IMPLEMENTATION AND MAINTENANCE

The final Chapter of the Bicycle Master Plan focuses on implementation and maintenance. This chapter outlines how the County can incorporate bicycle facilities that do not require changes to geometry or motor vehicle operations into our resurfacing projects. Initially a bicycle facility may appear simply as a wider shoulder. The County will consider formally designating bicycle routes when practical extents are achieved, such as when longer continuous segments and connections are possible. For larger projects on longer timeframes, which may require traffic signal alterations, right-of-way, or geometric changes, the County may either design facilities in-house or work with outside contractors to develop design plans for construction.

Long-term maintenance must also be considered. Just like regular vehicle lanes, bike lanes must be kept clear of debris, free of hanging vegetation, free of standing water, free of parked vehicles and free of snow and ice in winter. The County will also need to work with towns to educate residents and pass parking and debris ordinances, where necessary to keep bicycle lanes clear. When adding bicycle facilities, it is important to understand that, as the network is built out, maintenance may require additional machinery and manpower to keep lanes in a good state of repair.

PLANNING BOARD & LAND DEVELOPMENT

Chapter 5 also discusses how Complete Streets, and bicycle facilities in particular, should be incorporated into the County's Land Development process. The New Jersey County Planning Act (N.J.S.A 47:20-1, et seq.) authorizes counties to balance the desires of private developers with the general welfare and safety of the traveling public. Through the County Land Development process, the Planning Board may require the installation of bicycle and pedestrian facilities on County highways or require that accommodations to be made for future projects. Where municipal streets provide potentially desirable bicycle access to the County network, the Planning Board may recommend consideration of bicycle improvements on those streets.

The parent document of this element, the Mobility Element of the County Master Plan, identifies five roadway types or 'access levels' for Mercer County highways, with desirable typical sections (DTS) that define right of way requirements to accommodate travel by motor vehicle, bicycle, foot, and wheelchair, with elements that include shoulders or on-street parking, bicycle lanes, sidewalks, roadside buffers, as well as vehicular travel lanes and medians or center left two way turn lanes. These DTS assignments define right-of-way dedications required for approval of subdivision and site plans. In most cases, the Master Plan DTS will accommodate bicycle facilities as recommended in this sub-element. However, where high-speed, high-volume roads result in the recommendation of a side path or shared use path, the Planning Board may require its inclusion in a subdivision or site plan. While this plan provides specific, data-driven facility-type recommendations for every County Highway, based on current best practices and standards, final design decisions and implementation schedules are at the discretion of the County Engineer.