PASSAIC COUNTY

NEW JERSEY

RICH HISTORY • BRIGHT FUTURE

MOVING PASSAIC COUNTY

TRANSPORTATION ELEMENT OF THE PASSAIC COUNTY MASTER PLAN

FINAL PLAN - APPENDICES

OCTOBER 2012

Prepared By:
Passaic County Department of Planning and Economic Development
with assistance from
Parsons Brinckerhoff

NJTPA
NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

175 Years 1837-2012 PASSAIC COUNTY RICH HISTORY • BRIGHT FUTURE

PARSONS BRINCKERHOFF

2012

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This report has been prepared as part of the North Jersey Transportation Planning Authority's Subregional Studies Program, with financing by the Federal Transit Administration and the Federal Highway Administration of the U.S. Department of Transportation. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The NJTPA and the County of Passaic are solely responsible for its contents.

APPENDIX A
COMPLETE STREETS GUIDELINES

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Passaic County Complete Streets Design Guidelines

Purpose

The purpose of **Complete Street Design Guidelines** is to provide standards and guidance to planners, engineers, developers, and other interested parties in the preparation and design of roadway facilities under Passaic County jurisdiction.

The basis of these guidelines is formed from two policy documents: The **Complete Streets Policy** document, adopted in 2009 by the New Jersey Department of Transportation (NJDOT), serves as the planning basis of the guidelines; *A Policy on Geometric Design of Highways and Streets,* published by the American Association of State Highway and Transportation Officials (AASHTO), serves as the engineering basis of the guidelines. The guidelines are intended to be used by planners, developers, designers and engineers, as well as the general public in understanding intent and mechanism for implementing Complete Streets throughout Passaic County. The guidelines are not meant to be all inclusive with regard to the design of these facilities, but rather to outline design priorities and preferences that reflect the local land use goals and promote better transportation access for all users, including pedestrians and bicyclists.

The guidelines should be used in conjunction with all other applicable standards and policies, including Passaic County Land Development Review Resolutions, Stormwater Management Policies, Development Agreement Resolutions, New Jersey Highlands Regional Master Plan, and any other applicable regulations.

The Complete Streets Guidelines should be used with the **Transportation Element of the Passaic County Master Plan** to determine priorities for bicycles and pedestrians, freight movement, public transportation access, motor vehicle access, and scenic and historic assets on specific County roadways.

What are "Complete Streets"?

Complete Streets are streets for everyone. They are designed to provide safe access for all users including motor vehicles, pedestrians, bicycles, and transit riders. It also includes mobility for persons of all ages and abilities. Complete Streets make it easy to cross the street, walk to shops, bicycle to work, and operate motor vehicles safely.

Roadway Classification Definitions

A new County Roadway Classification System provides the framework for implementation of a Complete Streets approach in Passaic County. These classifications have been developed in conjunction with the Passaic County Planning and Engineering departments, which have set goals for the design, function and appearance of County roadways. County roadways are grouped by common land use characteristics and development goals communicated during the public outreach process. Groupings are further defined by current and future needs to access transportation services. The classification standards represent the simplest and most unique set of requirements to facilitate both land use and transportation needs. The County roads have been categorized into five street types shown on Maps 1 and 2 at the end of the guidelines:

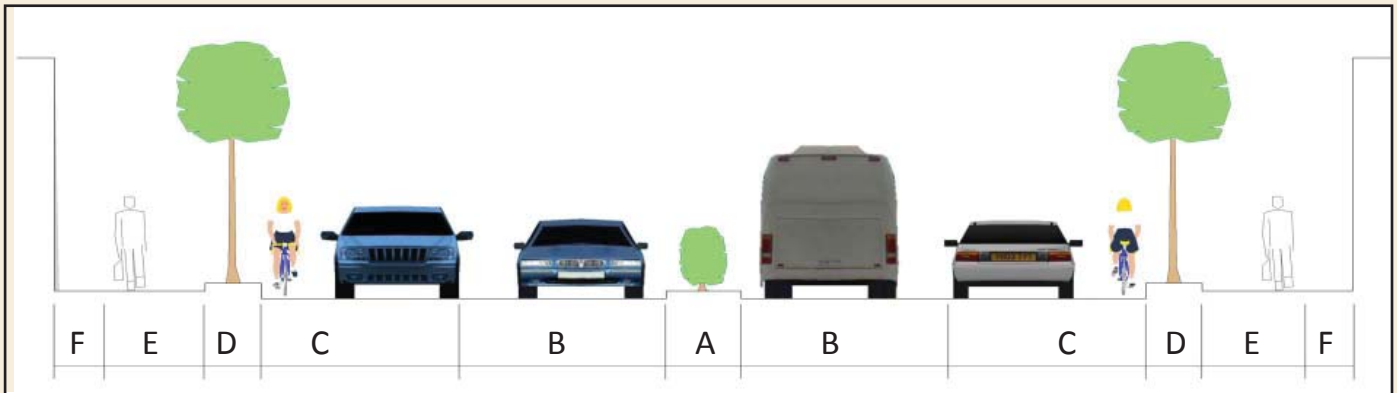
- **Regional Street**
- **Highlands Regional Street**
- **Downtown Street**
- **Community Street**
- **Neighborhood Street**

Some of these types encompass multiple functional road classifications as defined by AASHTO, and are represented in the NJDOT Straight Line Diagrams. It should be noted that several roadway corridors are currently not classified and are distinct. It is not the intent of this document to change the AASHTO classification, but to define the standards that guide transportation improvements that are balanced with the needs of the surrounding communities.

Green Streets

The section on "Green Streets" provides guidance on how structural and non-structural measures can apply to all County Roadway Classifications. These measures can aid in reducing the quantity of stormwater that enters drainage systems during storm events, decrease the impacts of "heat island effect" in urban areas and beautify communities with continuous tree-lined streets. Appendix B outlines detailed guidance on potential Green Streets applications.

Figure 1.1 - Complete Streets Roadway Design Elements

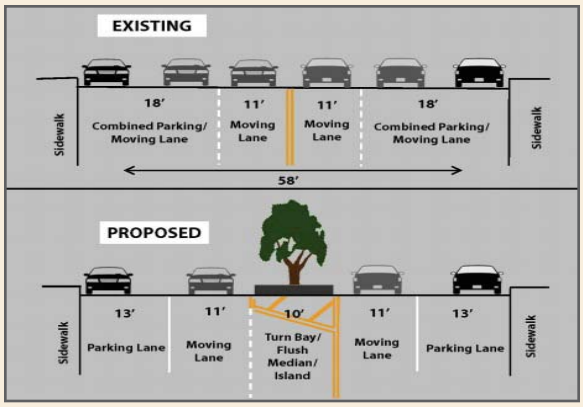


A. Median
B. Travel Lane
C. Shoulder or Dedicated Bicycle Lane
D. Curb Zone
E. Sidewalk Zone
F. Frontage Zone

Roadway Design Elements and Priorities

The Complete Streets standards utilize a consistent set of typical design elements to which priorities and technical specifications are applied. Figure 1.1 depicts the typical design elements along each County roadway. While each of the County Roadway Classifications use a distinct set of standards to achieve different priorities, there are some general priorities that should be applied to all County roadways. Below are key design priorities and guidelines that warrant consideration for new and reconstructed County roadway facilities. A brief general description for each design element is provided along with general goals and priorities for countywide application. These elements are further defined with specific applications for each of the five roadway classifications. Where practical, the designer shall incorporate these standards into project design plans. For those elements not identified, AASHTO requirements shall govern for the given AASHTO roadway classification.

Travel Lanes and Medians – Vehicular travel lanes widths shall be minimized as much as possible on all County roadways. Considerations will be made through the design process on any road or through the process of "Road Diets" that narrow travel lanes on existing roadways. Minimizing lane widths will help reduce speeds and promote traffic-calming. Road diets also reduce pedestrians crossings and increase shoulder widths to provide a buffer for pedestrians as well as roadway width for bicycle mobility. Minimizing travel lanes also reduces the amount of land required for road improvement, which can impact the cost of capital improvements as well as the stormwater quantity and quality with a



"Road Diets" allow for more Complete Streets elements, including medians and shared travel lanes
Photo courtesy of Streetblogs.net

Medians provide an opportunity to beautify roadways and add safety measures, such as pedestrian refuges
Photo courtesy of Humantransport.org

Medians can also be used to protect turning movements on busy roadways and allow easier flow-through traffic
Photo courtesy of Sitelines.org

smaller footprint of impervious surfaces. According to AASHTO, most lane widths should be a minimum of 11 feet. Ten-foot lane widths maybe utilized for turn lanes and or travel lanes where ten-foot lanes already exist and do not present hazards to the motorist, bicyclist and pedestrian. Ten-foot lanes can also be used where roadway widening will result in adverse impacts to surrounding properties, environmental resources or significant project costs. Narrow and variable lane widths may also be considered as a traffic-calming measure. The use of lane widths less than 11 feet requires review and approval by Passaic County. Travel lanes wider than 11 feet should only be considered along roadways with considerable bus and truck traffic. Priority freight routes, as well as potential Bus Rapid Transit (BRT) lines, are identified in the **Moving Goods and People** and **Public Transportation** sections of the **Transportation Element**.

Medians and pedestrian refuge islands provide a safe way to separate traffic, provide safe crossings for pedestrians, and create green boulevards along County roads. Where right-of-way is available, and accident history does not reflect the potential for head-on collisions, the use of median islands shall be considered. Median islands are highly recommended for four-lane roadways/ boulevards to separate traffic where practical. Landscaped medians shall also be considered to complement land use characteristics, such as a "Main Street" or downtown shopping area, and provide a potential avenue for additional street trees and green infrastructure. The use of concrete "Jersey Barriers" between travel lanes is not a preferred treatment. Median islands shall be designed in a manner to provide shelter for crossing pedestrians between opposing travel lanes.

Shoulders / Bicycle Facilities – Paved shoulders shall be provided for all County roads between the Travel lane and the streetside curb wherever possible. Shoulders along county roadways provide a buffer between vehicle traffic and pedestrians, provide space for potential bicycle facilities, and enhance safety. At a minimum, shoulder widths shall be bicycle compatible in accordance with AASHTO guidelines and provide opportunities for shared lanes or dedicated bicycle lanes. Shoulders may be provided through "Road Diets" wherever possible. The roadway along planned bicycle routes shall provide sufficient width for future bicycle facilities as identified in the **Bicycle Pedestrian and River Access** section of this plan. Shoulders, bike lanes and shared lanes along bicycle routes shall be properly

Bicycle parking or bicycle lockers should be considered when designing any transportation facility
Photo courtesy of One Speed Go

Way-finding and pavement markings should follow the Complete Streets guidelines along all County roadways
Photo courtesy of BikeWalkLee Blog

delineated and signed, and provide continuity for the safety of bicyclists and drivers alike. Any new facilities should aim to connect existing or planned bicycle facilities to create a countywide network. These connections can be to on- or off-road bicycle and pedestrian facilities. Consideration will be given to amenities (bicycle racks and lockers) at locations such as Central Business Districts (CBD), train stations, junctions with off-road trail systems, and attractions highlighted in the **Scenic and Historic Byways** section of the **Transportation Element**.

Parking – Parking is a major issue along any roadway, especially those with sections that pass through downtowns, and function as "Main Streets", business districts and as tourist attractions. In some cases on-street parking serves several purposes, such as customer parking for retailers or employees, providing a buffer between busy pedestrian areas and traffic, or an area to stop and enjoy scenic or historic attractions. In other cases, on-street parking creates conflicts with traffic along Regional Streets that do not serve major commercial areas. This variation in needs is accounted for in the County Roadway Classification System and serves as the basis for different approaches on this important issue. In all instances the need for way-finding and organized access to parking is a priority. The County should work with municipalities to provide shared access to parking wherever possible. Standards should also promote land uses that locate parking in the rear of buildings instead of the front to better organize traffic flow and minimize conflicts between pedestrians and automobiles. Considerations should be made for delivery truck access to businesses in areas such as downtowns and CBDs. Backing out onto County roadways from private driveways or parking is expressly prohibited except along Neighborhood Streets.

Streetside Features – The area from the curb to the building or property line is referred to as the Streetside. The Streetside is made up of three areas, the Curb Zone, the Sidewalk Zone, and the Frontage Zone. This is a critical component of the Complete Streets Guidelines as it provides

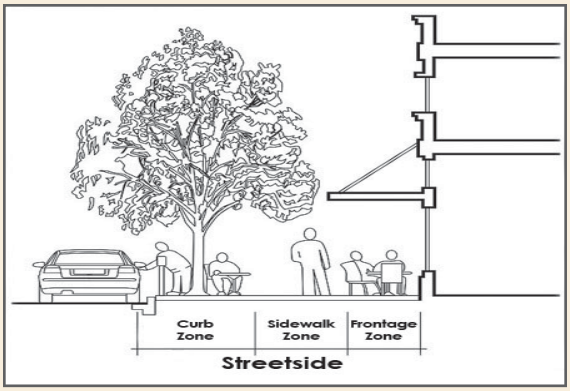
Off-street parking located behind buildings provides easier access for pedestrians and mass transit services
Photo courtesy of Passaic County Planning

Surface parking lots should be screened along all County roadways
Photo courtesy of Passaic County Planning

safe access for pedestrians, creates an attractive environment for Passaic County residents and visitors that promote downtowns and commercial areas, links public transportation to jobs, and provides a link to recreational facilities and housing. The Frontage Zone provides a transition space between properties and the sidewalk. The Curb Zone allows for a transition between parking and the sidewalk. It provides a place for street trees or other plantings.

Within commercial centers, streetscaping should be implemented or refurbished to complement the context and character of the commercial district and follow local streetscape standards if they exist. Consideration shall be given to features such as awnings and signage that hang into the Frontage Zone or Sidewalk Zone. This should be of particular significance within historic districts. All improvements should be coordinated with local historic preservation ordinances, historic commissions and/or local historians.

Each County Roadway Classification calls for different curb and sidewalk considerations, but a continuous sidewalk should be provided along County roadways wherever possible in the Sidewalk Zone. Sidewalk widths should provide enough access for pedestrians with disabilities and be based on the street classification and pedestrian activity level. The recommended minimum width for any sidewalk is five (5) feet. During the design phase, consideration will be made for street furniture, public transportation facilities such as bus shelters or kiosks, and decorative lighting in the Curb Zone. If needed the space or footprint for such facilities should be made available until the necessary resources become available to install such improvements.



The Streetside is made up of three zones that service distinct roles in each of the Roadway Classifications
Photo courtesy of Institute of Transportation Engineers

Streetside elements connect the land uses to transportation resources while defining the look and feel of communities
Photo courtesy of National Resource Defense Council

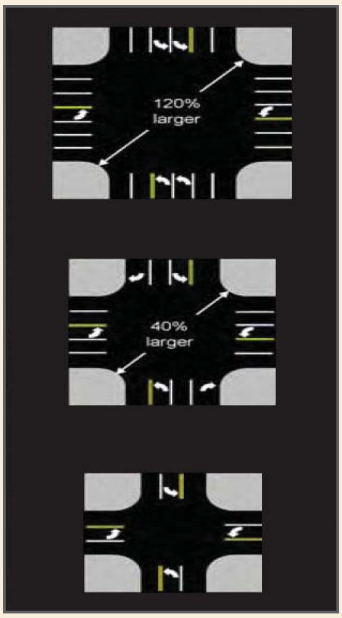
Street trees are a critical feature along any roadway and should be included in the beginning of any design process
Photo courtesy of Local Ecologist

Street trees should also be a part of every pedestrian area along a County road, with specific treatments based on the road classification and local regulations that pertain to streetscape elements. Consideration will be made in the design phase for the space needed to properly plant and maintain trees in tree pits in the Curb Zone or Frontage Zone. Tree planting species should follow the recommendations in the Passaic County Community Forestry Plan when adopted. Tree species native to New Jersey should be used.

Lighting should reflect the context of the surrounding land use and follow the recommendations of the specific road classification. Pedestrian-scale lighting is of particular importance at intersections, pedestrian crossings, public transportation facilities, and recreational facilities.

Intersection Designs – Pedestrians shall be encouraged to cross at signal controlled intersections. Signalized intersections and minor cross streets should be properly delineated for pedestrian crossings. Crosswalks shall be ADA compliant and signalized intersections shall include countdown pedestrian signal heads. At intersections within commercial districts and areas conducive to pedestrian traffic, crosswalks should be properly signed and striped, and the use of longitudinal thermoplastic stripes should be considered to delineate crosswalks. Ideally, signalized intersections should have lighting in commercial areas. Where feasible, traffic-calming measures should be implemented on the approaches to these highly walkable areas.

Public Transportation – The majority of Passaic County roads have access to bus or rail facilities, making safe and efficient public transit access essential. Roadway designs should consider bus access on and off the roadway facility, including sufficient shoulder widths or bus turnouts, where appropriate. The optimum solution for public transit providers is to have the buildings and residences they serve as close to the roadways on which they operate. These types of solutions can be suggested through the County Development Review Process. The Passaic County Planning Board and Passaic County staff will work with municipalities to promote these solutions in local zoning ordinances. All public transit facilities should be made bicycle-friendly with amenities such as bicycle racks and lockers. Bus access and operations should be made as efficient and safe as possible. Bus shelters should be installed



Turn lanes, through lanes and lane widths all have an impact on intersection size. Reducing the size of intersections helps calm traffic and reduce the distance pedestrians need to travel at road crossings.

Image courtesy of Knoxville TPO Complete Streets Guidelines

whenever possible with high bus ridership or a history of pedestrian crashes. All consideration should be made for future bus shelters when designing roadways or during the development review process. If possible bus shelters should have a consistent design throughout the County or along specific corridors. The *NJTPA Bus Stop Safety Toolbox* also provides more detailed guidance on how to design facilities that allow safer connections for pedestrians using public transportation.

Traffic-Calming Measures / Safety – Where deemed appropriate and necessary to calm traffic, the use of roundabouts shall be considered along County roads, such as the one on Allwood Road in the City of Clifton. Roundabouts should only be considered along roadways where they will operate safely and efficiently, and will not inhibit pedestrian access. Other traffic-calming measures shall also be considered where excessive speeds are encountered. Simple techniques for traffic-calming such as "Road Diets" have been proven to work within Passaic County and can serve as a model for future improvements. Other measures such as curb bulb-outs, shifting traffic lanes, and reducing the size of traffic lanes should all be investigated for new and existing roads. For Downtown Streets, pedestrian safety and access shall take precedence.

Utilities – Where practical, utility facilities along Downtown Streets shall be installed underground. Implementation of structural and non-structural features affiliated with "Green Streets" should be investigated wherever possible. These measures can help alleviate the quantity of stormwater during storm events, reduce the effects of heat islands, and improve the aesthetics of County roads. Guidance on "Green Streets" can be found in the corresponding section of County Roadway Classification section with specific emphasis on Community Streets.

Implementation of Complete Streets Standards for Engineers

Relevance of Complete Streets Guidelines to Functional Roadway Classifications

The design of roadways shall be in accordance with the AASHTO classifications and definitions as defined in "A Policy on Geometric Design of Highway and Streets". It is not the intent of this document to reclassify County facilities, but rather to prioritize standards that conform to a future "Vision of Use" that are complimentary to existing and future land use initiatives. The roadway's AASHTO classifications shall govern for all roadway design requirements.

Passaic County Engineering Policies

Roadway reconstruction shall comply with standards and guidelines that govern roadway facilities, including but not limited to the latest editions of *A Policy on Geometric Design of Highway and Streets, Manual on Uniform Traffic Control Devices for Streets and Highways, NJDOT Local Aid Handbook* and other documents deemed appropriate by Passaic County. AASHTO's policies that govern highways represent nationwide standards which may not be suitable on some County routes, especially those that lie within urban environments.

Design Exceptions

Situations may arise where deviations from these standards are warranted to provide the least disruptive, most efficient and cost-effective design solutions. In these situations, sound engineering judgment and an assessment of crash history must demonstrate that past safety concerns in the project setting do not exist. The proposed improvements must not result in unsafe travel conditions for bicyclists and pedestrians, or inhibit traffic operations which currently exists. Implementation of non-standard design elements shall be approved by Passaic County and warrant the preparation of a Design Exception for Controlling Substandard Design Elements (CSDE) as defined by NJDOT. A Design Exception Report shall be prepared for all substandard CSDE and be justifiable and mitigated in accordance with NJDOT guidelines.

Applicability of Design Guidelines

Passaic County warrants implementation of Roadside Design treatments and guidelines in accordance with the *AASHTO Roadside Manual* (ARM). Where practical, the Designer shall utilize standard roadside treatments as outlined in this manual, *NJDOT Roadway Design Manual* and Standard Details. It should be noted that the *AASHTO Roadside Design Manual* is not intended to be used as a standard or a policy statement. AASHTO notes that the ARM is to be used by each agency as a reference from which to build roadside design criteria. Consideration as to the use and implementation of these standards including Clear Zone width shall be implemented in situations that best suit the location in which they are used.

Roadway facilities and design speeds must take into account the intended land use setting as well, complete streets guidelines and/or any planned improvements (i.e., greenways, bicycle routes, streetscape plans, forestry plans, visioning studies, or redevelopment plans). The designer shall take these initiatives into consideration in the creation of roadside design measures and demonstrate that safety or accident history are not present that would justify implementation of the ARM. Roadside treatments will be reviewed on a case-by-case basis and approved by the County.

Roadway Classification Design Matrix

A Roadway Classification Design Matrix sets the ranges for the major design elements for each roadway classification category. The Roadway Classification Design Matrix is presented for each of the five (5) classifications on pages 10 through 21. The individual Roadway Classification sections contain a subset of this matrix, which outlines the design priorities for each Typical Design Element. As designers consider developing or updating roadway facilities, they should use the matrix along with the typical cross-sections, and guidance provided for each Roadway Classification.

VISION CLASSIFICATION	AASHTO CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	GRADES		CROSS SLOPE		NUMBER OF LANES		LANE WIDTHS	
		AASHTO	AASHTO	AASHTO	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
REGIONAL STREET	URBAN COLLECTOR	30 mph or higher (posted 25-40 mph based on actual data)	2,000-12,000	Designed for LOS D	Minimum 0.30% Desirable 0.50% (or more) Maximum based on design speed and type of terrain (Max. 5% where sidewalks are present)		1.5% - 3%		1 lane in each directoin plus shoulders/parking (which could be converted to through lanes in the future)		10-12ft (12ft in industrial areas)	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.
	URBAN MINOR ARTERIAL	30-60 mph (posted 25-45 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	Minimum 0.30% Desirable 0.50% (or more) Maximum based on design speed and type of terrain (Max. 5% where sidewalks are present)		1.5% - 3%		1 lane in each directoin plus shoulders/parking (which could be converted to through lanes in the future)		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.
	URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-55 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	Minimum 0.30% Desirable 0.50% (or more) Maximum based on design speed and type of terrain (Max. 5% where sidewalks are present)		1.5% - 3%		1 lane in each directoin plus shoulders/parking (which could be converted to through lanes in the future)		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.

1. Posted speed is 10 mph less than the design speed
2. Taken from the Civil Engineering Reference Manual

COMPLETE STREETS CLASSIFICATION	PARKING LANES		MEDIANS		SHOULDERS		SIDEWALKS		DRIVEWAYS/ACCESS		BORDER AREA		INTERMODAL - BIKE LANES[3]	
	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
REGIONAL STREET	Parking lanes parallel to curb where street width is available. Residential areas = 7-8ft Commercial areas = 8-11ft	On street parking is not recommended.	Streets with 4 or more lanes should include width for median treatment (1) paint stripe separation, 2-4ft (2) narrow raised curb, 2-6ft (3) raised curb, 10-16ft (4) paint stripe with space for left-turns 10-16ft (5) raised curb with space for left-turns 18-25ft.	Median islands should be considered.	Based on ADT and ranges from 2-8ft. For 2,000+ ADT shoulders should be a minimum of 8ft.	Paved shoulders shall be provided.	Located on both sides of street for access to schools, parks, shopping areas, transit stops, and commercial areas; at least one side of street for residential areas (both sides desired). Minimun width 4ft in residential areas, 4-8ft in commercial areas.	Sidewalk should be continuous, and provided on both sides of the street if possible.	Regulated as to width of entrance, placement with respect to property lines and intersecting streets, angle of entrance, vertical alignment, and number of entrances.	Driveways are acceptable.	8-11ft, used for sidewalk, underground and above-ground utilities such as traffic signals, parking meters, and fire hydrants.	Curb zone and sidewalk should be a minimum 9' in border area.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible . On low volume roads shared lanes shall be utilized.
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking is not recommended.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands are highly recommende d for 4 lane roadway/ boulevard.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be continuous, and provided on both sides of the street if possible.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are acceptable.	8-11ft, used for sidewalk, underground and above-ground utilities such as traffic signals, parking meters, and fire hydrants.	Curb zone and sidewalk should be a minimum 9' in border area.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible .
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking is not recommended.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands are highly recommende d for 4 lane roadway/ boulevard.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be continuous, and provided on both sides of the street if possible.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are acceptable.	8-11ft, used for sidewalk, underground and above-ground utilities such as traffic signals, parking meters, and fire hydrants.	Curb zone and sidewalk should be a minimum 9' in border area.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible .

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

VISION CLASSIFICATION	AASHTO CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	GRADES		CROSS SLOPE		NUMBER OF LANES		LANE WIDTHS	
		AASHTO	AASHTO	AASHTO	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
REGIONAL BOULEVARD	URBAN MINOR ARTERIAL	30-60 mph (posted 25-45 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.
	URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-55 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.

1. Posted speed is 10 mph less than the design speed
2. Taken from the Civil Engineering Reference Manual

VISION CLASSIFICATION	PARKING LANES		MEDIANS		SHOULDERS		SIDEWALKS		DRIVEWAYS/ACCESS		BORDER AREA		INTERMODAL - BIKE LANES[3]	
	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
REGIONAL BOULEVARD	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking is not recommended.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands are highly recommended for 4 lane roadway/ boulevard.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be continuous, and provided on both sides of the street if possible.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are acceptable.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Curb zone and sidewalk should be a minimum 9' in border area.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible .
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking is not recommended.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands are highly recommended for 4 lane roadway/ boulevard.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be continuous, and provided on both sides of the street if possible.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are acceptable.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Curb zone and sidewalk should be a minimum 9' in border area.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible .

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

VISION CLASSIFICATION	AASHTO CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	GRADES		CROSS SLOPE		NUMBER OF LANES		LANE WIDTHS	
		AASHTO	AASHTO	AASHTO	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
HIGHLANDS REGIONAL STREET	URBAN COLLECTOR	30 mph or higher (posted 25-40mph based on actual data)	2,000-12,000	Designed for LOS D	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right of-way; usually 2 to 4 lanes in both directions.		10-12ft (12ft in industrial areas)	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.
	URBAN MINOR ARTERIAL	30-60 mph (posted 25-45 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.
	URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-55 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. Less than 11ft shall be approved by the County.

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VISION CLASSIFICATION	PARKING LANES		MEDIANS		SHOULDERS		SIDEWALKS		DRIVEWAYS/ACCESS		BORDER AREA		INTERMODAL - BIKE LANES[3]	
	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
HIGHLANDS REGIONAL STREET	Parking lanes parallel to curb where street width is available. Residential areas = 7-8ft Commercial areas = 8-11ft	On street parking is not recommended.	Streets with 4 or more lanes should include width for median treatment (1) paint stripe separation, 2-4ft (2) narrow raised curb, 2-6ft (3) raised curb, 10-16ft (4) paint stripe with space for left-turns 10-16ft (5) raised curb with space for left-turns 18-25ft.	Median islands should be considered.	Based on ADT and ranges from 2-8ft. For 2,000+ ADT shoulders should be a minimum of 8ft.	Paved shoulders shall be provided.	Located on both sides of street for access to schools, parks, shopping areas, transit stops, and commercial areas; at least one side of street for residential areas (both sides desired). Minimun width 4ft in residential areas, 4-8ft in commercial areas.	Sidewalk should be continuous, and provided on both sides of the street if possible.	Regulated as to width of entrance, placement with respect to property lines and intersecting streets, angle of entrance, vertical alignment, and number of entrances.	Driveways are acceptable.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Curb zone and sidewalk should be a minimum 9' in border area. Green Streets elements can be applied in border areas.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible . On low volume roads shared lanes shall be utilized. Bicycle lanes should utilize existing pavement or use pervious materials in shoulders along Highlands Regional Streets.
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking is not recommended.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands should be considered.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be continuous, and provided on both sides of the street if possible.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are acceptable.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Curb zone and sidewalk should be a minimum 9' in border area. Green Streets elements can be applied in border areas.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible . On low volume roads shared lanes shall be utilized. Bicycle lanes should utilize existing pavement or use pervious materials in shoulders along Highlands Regional Streets.
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking is not recommended.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands should be considered.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be continuous, and provided on both sides of the street if possible.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are acceptable.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Curb zone and sidewalk should be a minimum 9' in border area. Green Streets elements can be applied in border areas.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible . On low volume roads shared lanes shall be utilized. Bicycle lanes should utilize existing pavement or use pervious materials in shoulders along Highlands Regional Streets.

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

VISION CLASSIFICATION	AASHTO CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	GRADES		CROSS SLOPE		NUMBER OF LANES		LANE WIDTHS	
		AASHTO	AASHTO	AASHTO	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
DOWNTOWN STREET	URBAN MINOR ARTERIAL	30-60 mph (posted 25-45 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.	Two-way streets are encouraged. One-way streets in retail or commercial areas should be prohibited	10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. 12' maximum to accommodate high-volume of buses. Less than 11ft shall be approved by the County.
	URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-55 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas.	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.	Two-way streets are encouraged. One-way streets in retail or commercial areas should be prohibited	10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. 12' maximum to accommodate high-volume of buses. Less than 11ft shall be approved by the County.

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VISION CLASSIFICATION	PARKING LANES		MEDIANS		SHOULDERS		SIDEWALKS		DRIVEWAYS/ACCESS		BORDER AREA		INTERMODAL - BIKE LANES[3]	
	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
DOWNTOWN STREET	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking shall be provided.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands should be considered.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	5' minimum. 6' to 8' preferred. Sidewalk shall allow for the maximum availible width for pedestrian and merchant use.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways should be limited. Shared parking and access management should be utilized.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Curb zone and sidewalk are preferred to be a minimum 12' in border area. Curb zone should accommodate street trees, tree pits, bus stops, and signage.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Bicycles should share travel lanes with motor vehicles. Dedicated bicycle lanes must 6' minimum include an additional 4' buffer area between parked cars.
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On street parking shall be provided.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands should be considered.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Paved shoulders shall be provided.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	5' minimum. 6' to 8' preferred. Sidewalk shall allow for the maximum availible width for pedestrian and merchant use.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways should be limited. Shared parking and access management should be utilized.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Curb zone and sidewalk are preferred to be a minimum 12' in border area. Curb zone should accommodate street trees, tree pits, bus stops, and signage.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Bicycles should share travel lanes with motor vehicles. Dedicated bicycle lanes must 6' minimum include an additional 4' buffer area between parked cars.

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VISION CLASSIFICATION	AASHTO CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	GRADES		CROSS SLOPE		NUMBER OF LANES		LANE WIDTHS	
		AASHTO	AASHTO	AASHTO	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
COMMUNITY STREET	URBAN COLLECTOR	30 mph or higher (posted 25-40 mph based on actual data)	2,000-12,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas.	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. 12' maximum to accommodate high-volume of buses. Shared lanes should be minimum 14'. Less than 11ft shall be approved by the County.
	URBAN MINOR ARTERIAL	30-60 mph (posted 25-55 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas.	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. 12' maximum to accommodate high-volume of buses. Shared lanes should be minimum 14'. Less than 11ft shall be approved by the County.
	URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-55 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas.	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	10ft min. (10ft for turn lanes or low-speed roads). 11ft preferred. 12' maximum to accommodate high-volume of buses. Shared lanes should be minimum 14'. Less than 11ft shall be approved by the County.

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VISION CLASSIFICATION	PARKING LANES		MEDIANS		SHOULDERS		SIDEWALKS		DRIVEWAYS/ACCESS		BORDER AREA		INTERMODAL - BIKE LANES[3]	
	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
COMMUNITY STREET	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On-street parking shall be provided and striped. If shared bicycle lane is present, a 4' buffer should he incorporated in the "Door Zone".	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands should be considered.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Shoulders should be utilized for shared travel lanes or dedicated bicycle facilities were feasible.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be of sufficent width to accommodate pedestrian traffic. A 5' sidewalk is preferred.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are not limited.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Minimum 9' to accommodate sidewalk and curb zone.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Dedicated bicycle lanes are preferred. 4' where these is no parking and no curb, 5' where there is no parking and curb. Where there is parking, a 4' buffer area should be provided between the bicycle lane and the parked car. Shared lanes are also a preferred treatment and should be used in conjuction wtih a sharrow that also incorporates a 4' buffer area between bicyclists and parked cars.
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On-street parking shall be provided and striped. If shared bicycle lane is present, a 4' buffer should he incorporated in the "Door Zone".	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands should be considered.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Shoulders should be utilized for shared travel lanes or dedicated bicycle facilities were feasible.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be of sufficent width to accommodate pedestrian traffic. A 5' sidewalk is preferred.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are not limited.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Minimum 9' to accommodate sidewalk and curb zone.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Dedicated bicycle lanes are preferred. 4' where these is no parking and no curb, 5' where there is no parking and curb. Where there is parking, a 4' buffer area should be provided between the bicycle lane and the parked car. Shared lanes are also a preferred treatment and should be used in conjuction wtih a sharrow that also incorporates a 4' buffer area between bicyclists and parked cars.
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On-street parking shall be provided and striped. If shared bicycle lane is present, a 4' buffer should he incorporated in the "Door Zone".	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Median islands should be considered.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Shoulders should be utilized for shared travel lanes or dedicated bicycle facilities were feasible.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be of sufficent width to accommodate pedestrian traffic. A 5' sidewalk is preferred.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are not limited.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Minimum 9' to accommodate sidewalk and curb zone.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Dedicated bicycle lanes are preferred. 4' where these is no parking and no curb, 5' where there is no parking and curb. Where there is parking, a 4' buffer area should be provided between the bicycle lane and the parked car. Shared lanes are also a preferred treatment and should be used in conjuction wtih a sharrow that also incorporates a 4' buffer area between bicyclists and parked cars.

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VISION CLASSIFICATION	AASHTO CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	GRADES		CROSS SLOPE		NUMBER OF LANES		LANE WIDTHS	
		AASHTO	AASHTO	AASHTO	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
NEIGHBORHOOD STREET	URBAN MINOR ARTERIAL	30-60 mph (posted 25-45 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas.	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	One 14' drive lane can be shared by two-way traffic on these low-speed, low-volume roadways.
	URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-55 mph based on actual data)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas.	Provide the flattest grades practical while providing min. grades for adequate drainage. Maximum based on design speed and type of terrain, ranging from 5-11%		1.5% - 3%		Depends on traffic demand and availability of right-of-way; usually 2 to 4 lanes in both directions.		10-12ft, 12ft is most desirable, however may use 10ft in highly restricted areas having little or no truck traffic.	11ft min. (10ft for turn lanes). Less than 11ft shall be approved by the County.

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2. Taken from the Civil Engineering Reference Manual

VISION CLASSIFICATION	PARKING LANES		MEDIANS		SHOULDERS		SIDEWALKS		DRIVEWAYS/ACCESS		BORDER AREA		INTERMODAL - BIKE LANES[3]	
	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION	AASHTO	VISION
NEIGHBORHOOD STREET	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On-street parking shall be provided. Striping parking is not recommended. 7' minimum and 8' maximum width.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Medians are not recommended.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Shoulders ar not required on Neighborhood Streets.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be of sufficent width to accommodate pedestrian traffic.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are not limited.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	4' Minimum preferred.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible . On low volume roads shared lanes shall be utilized.
	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12ft should be provided; a min. of 8ft may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.	On-street parking shall be provided. Striping parking is not recommended. 7' minimum and 8' maximum width.	Medians are a desireable feature of arterial streets and should be provided where space permits (minimum 4ft width). To accomdate left-turn movements at intersections, the median should be at least 12ft wide.	Medians are not recommended.	Where four lanes are warranted, shoulders are desirable. The width of usable outside shoulders should be at least 8ft. The width of the inside shoulder on a divided arterial with two lanes in each direction should be 4ft wide.	Shoulders ar not required on Neighborhood Streets.	In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	Sidewalk should be of sufficent width to accommodate pedestrian traffic.	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.	Driveways are not limited.	Min. border is 8ft wide, but preferably 12ft or more. In residential areas, the border area should include a sidewalk and a buffer strip. In fully developed areas, the entire border area is usually devoted to sidewalk.	4' Minimum preferred.	For shared roadways, paved shoulders should be at least 4ft wide (5ft recommended from face of curb or guiderail), For exclusive bike lanes, the minimum width should be 4ft for roadways with no curb or gutter. If parking is permitted, the minimum width is 5ft. Where parking is permitted but a parking stripe or stall is not utilized, the shared area should be a minimum of 11ft without a curb and 12ft with a curb.	Shoulder widths shall be bicycle compatible . On low volume roads shared lanes shall be utilized.

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

Regional Streets

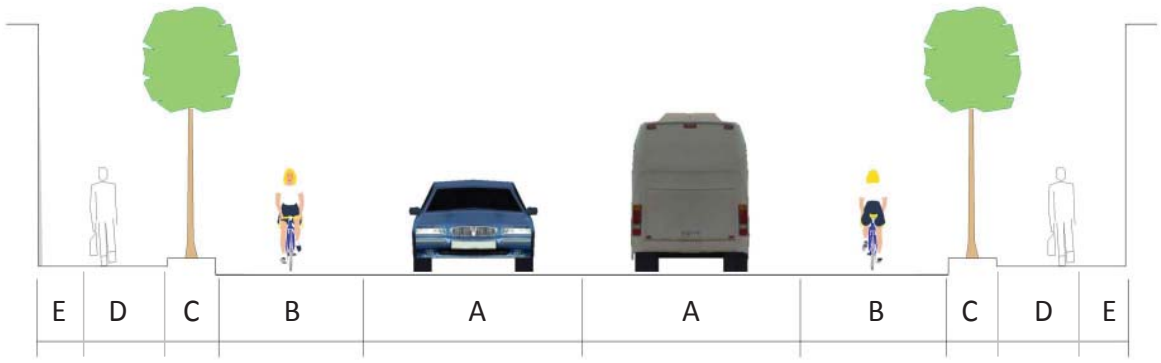
A **Regional Street** in Passaic County is a major travel route that handles the highest volume of traffic on County roadways, supporting all modes of transportation. Land uses along Regional Streets tend to be single-use but may have some mixed-uses in the more urbanized portions of the County. They are often used for longer intra-county trips and inter-county travel and provide access to major highways. They tend to be well served by public transit, including inter-county and interstate services, connecting major activity centers through the County. Regional Streets make up the majority of County roadways used for freight movement as highlighted in the Goods Movement section.

Regional Boulevards are similar to Regional Streets. However, travel speeds may be lower, parking may be permitted and raised medians are a preferred design treatment. Examples of Regional Streets and Boulevards in Passaic County are Paterson-Hamburg Turnpike in Wayne and Goffle Road in Hawthorne.

Design Priorities

Regional Streets should be designed to move traffic efficiently while considering safety and movement of all types of traffic, including pedestrians and bicycles. Design speeds are higher than the other county roadway classes. Shoulders, medians (Regional Boulevards) and bicycle facilities should be considered as key design elements to optimize both throughput and

Figure 2.1 - Regional Street Typical Cross-Section



A. Travel Lane – 10' Minimum, 11' Preferred, 14' Maximum (to accommodate trucks and buses)
B. Shoulder or Dedicated Bicycle Lane –8' Preferred (6' Minimum for Dedicated Bicycle Lane)
C. Curb Zone – 4' Minimum, 8' to 12' Preferred
D. Sidewalk Zone - 4' Minimum, 5' to 8' Preferred
E. Frontage Zone - 2' Minimum for Residential , 4' Minimum Preferred for Commercial

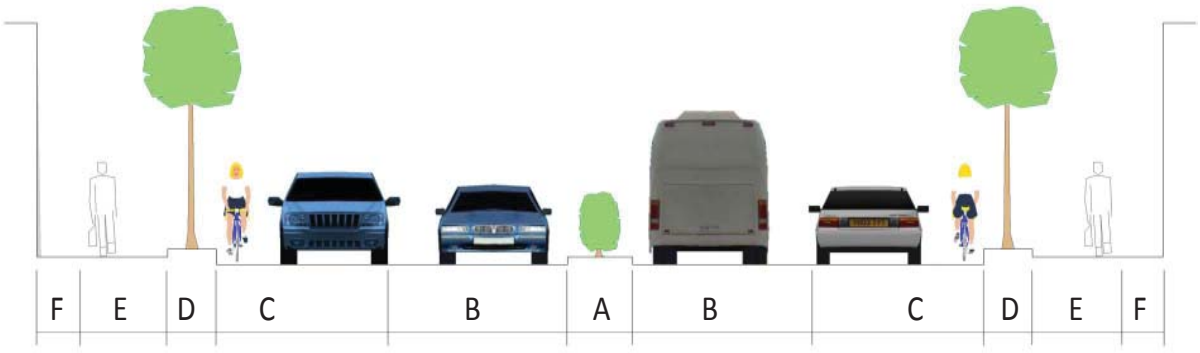
safety. Because of the higher design speeds and higher volumes, an emphasis is placed on having intersections clearly marked and highly visible for pedestrian safety. On-street parking is generally prohibited as this would reduce the capacity of the roadway. To the greatest extent possible, Regional Streets should be walkable, with continuous sidewalk facilities that provide access to and from public transportation and major activity centers. In addition, intersections and roadway facilities should be designed to accommodate the movement of larger trucks while still maintaining safety for all modes of transportation.

Figures 2.1 and 2.2 show a typical cross-section design of a Regional Street and a Regional Boulevard. Figure 2.3, at the end of this section, provides an overview table of design guidelines for each typical design element. The table is drawn from the Roadway Classification Design Matrix found at the end of the General Standards section of these guidelines.

Typical Design Elements

Travel Lanes – Travel lanes should be a minimum of 11 feet. The maximum travel lane width should be no greater than 14 feet and could be used to accommodate truck travel or wider truck turns at intersections. Ten-foot lane widths may be utilized for turn lanes and or travel lanes where roadway widening will result in adverse impacts to surrounding properties, environmental resources or significant project costs. However, the use of lane widths less than 11 feet need to be submitted to Passaic County for review and approval.

Figure 2.2 - Regional Boulevard Typical Cross-Section



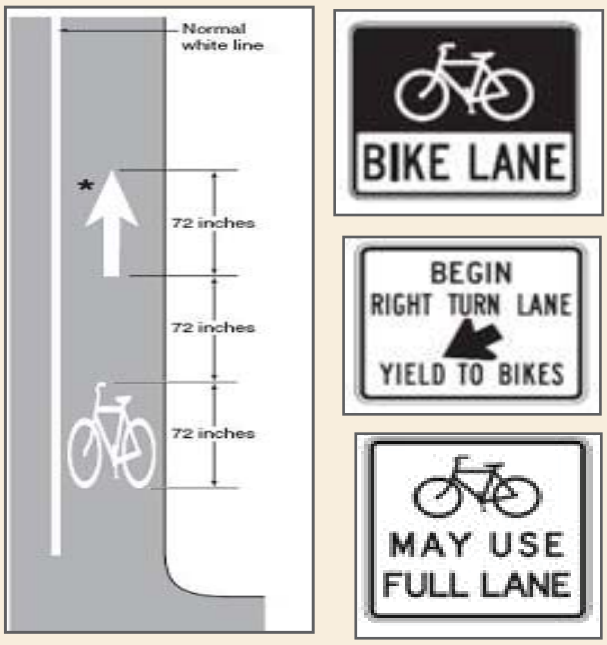
A. Median – 4′ Minimum striped/4′ to 6′ for Narrow Curb/ 10′ to 16′ for raised and planted or left turns
B. Travel Lane – 10′ Minimum, 11′ Preferred / 14′ Maximum (to accommodate trucks and buses)
C. Shoulder or Dedicated Bicycle Lane –8′ Preferred (6′ Minimum for Dedicated Bicycle Lane)
D. Curb Zone – Curb Zone – 4′ Minimum, 8′ to 12′ Preferred
E. Sidewalk Zone - 4′ Minimum, 5′ to 8′ Preferred
F. Frontage Zone - 2′ Minimum for Residential , 4′ Minimum Preferred for Commercial

The use of barrier curb and Jersey barriers between travel lanes is not a preferred treatment. Landscaped median islands are a preferred alternative.

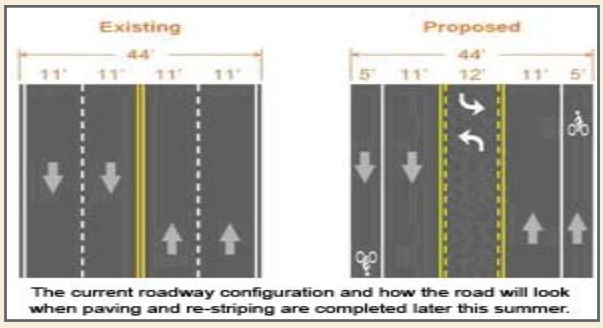
Medians are recommended for Regional Boulevards where there are four lanes of traffic. Raised medians (rather than painted) are preferred because they provide a physical separation between opposing traffic, offer refuge for crossing pedestrians and an area to introduce plantings. All medians should provide pedestrian refuge wherever possible. For this reason, closed medians (i.e., concrete Jersey barriers) are not recommended on Regional Boulevards.

Pedestrian refuge islands should be a minimum of eight (8) feet wide. Landscaped medians shall also be considered where the project setting allows and to complement land use characteristics. The minimum width for a landscape median (plants or street trees) should be 10 feet. Medians shall be a minimum of 11 feet where they are used as a buffer for turn lanes. There is no stated maximum width for a median as the other roadway features (travel lanes, curbs and sidewalks) will dictate the maximum median available within the right-of-way (ROW). Medians (splitter islands) should be used to lead into roundabouts to enhance separation of traffic as they enter the roundabout, provide a pedestrian refuge for crossings, and provide a visual queue that something is different in the intersection.

Shoulders / Bicycle Facilities – Paved shoulders are recommended in the design of Regional Streets. On these higher-volume, higher-speed facilities, a minimum shoulder width of eight (8) feet is preferred. To the extent possible, separate bicycle lanes should be provided. Bicycle lanes should be designed and installed to produce continuous bicycle treatments that create an expectation for both bicyclists and motorists



Bicycle lane pavement markings and examples of signage
Images courtesy of the FHWA - Manual on Uniform Traffic Control Devices (MUTCD)



An example of how narrowing lanes and using turn lanes allows for Complete Street elements on a Regional Street
Image courtesy of Virginia DOT

Medians can be used to organize traffic flows at major intersections or roundabouts
Photo courtesy of Ingham County Road Commission

alike. Dedicated bicycle lanes should be a minimum of six (6) feet.

Signs designating the bike lanes and potential conflicts should be clearly marked according to state and federal guidelines and described in the *Manual on Uniform Traffic Devices* (MUTCD).

Parking is prohibited on most Regional Streets and Boulevards. Parking should be sited behind buildings with way-finding to better organize access to parking facilities. Off-street or side-street parking and access is preferred to reduce the number of ingress/egress points along a Regional Street. This technique creates a more organized traffic flow and reduces vehicle conflicts on these faster moving roadways. Existing parking areas should be allowed to continue to be utilized. Backing onto the County roadways from private driveways is strictly prohibited.

Streetside Features – In urban areas, sidewalks and curbs are preferred on both sides of the street to allow access to transit services along these roads. Continuous sidewalks create walkable corridors along these regional facilities. Sidewalks should be a minimum of four (4) feet, but five (5) to eight (8) feet is preferred. Where sidewalks are present, pedestrian signals, signs, transit stops, and facilities shall be designed, constructed, operated, and maintained so that all pedestrians, including people with disabilities, can travel safely and independently.

The Curb Zone should range from four (4) to 12 feet to accommodate clearance for higher design speeds and to accommodate planting strips, planter boxes, bus shelters and street trees. The spacing of street trees should allow for growth of mature trees and create a canopy along the street.

Consideration should be given to "gateway" signage, as many Regional Streets act as the main access into various Passaic County municipalities.

The Frontage Zone on regional Streets should be a minimum of two (2) feet but could be as wide as four (4) feet to allow for street furniture or awning overhang for the businesses along the street.

Public Transit – Regional and local buses are expected to be a significant portion of the traffic volume, therefore public transit access is critical on Regional Streets. Roadways should be designed to consider bus access on and off the roadway facility, including sufficient shoulder widths or bus turnouts, where appropriate. Bus shelters should be included near commercial nodes, residential developments or areas with high foot traffic. Locating buildings as close to the street as possible will improve access to public transportation.

Designers should work with local municipalities, NJ Transit, the NJTPA, and the Transportation Management Associations (TMAs) to determine the appropriate location, footprint and design of bus shelters. Designs should also provide sufficient pedestrian and bicycle access to these facilities, as well as proper roadway delineations. All attempts shall be made to make bus access and operations as efficient and safe as possible. For more information on bus stop safety, the reader should refer to the North Jersey Transportation Planning Authority's (NJTPA) *Bus Stop Safety Toolbox (http://www.njtpa.org/Plan/Studies/documents/BusStopSafetyToolboxweb.pdf).*

Bicycle racks and/or lockers should also be considered at or near major bus stops, park-and-ride lots, schools or businesses as appropriate. Designers should work with local parking authorities as well as the other entities mentioned

to determine the location, design and size of bicycle facilities. Design of bicycle and public transportation facilities should be a routine part of the development review process.

Intersections are an important design feature of the Regional Street. When designed correctly they safely accommodate pedestrians, bicyclists and motorists. Traffic signals should be designed to optimize traffic flow on the Regional Street (usually the major street), while also considering the competing interests of the side streets. Intersections under stop or yield control should be designed to optimize flow along the Regional Street, while providing gaps to allow safe movements for side-street and non-motorized (bicycle and pedestrian) traffic.

When designing the turning radii at intersections, consideration will be given to areas with significant truck and bus traffic in order to ensure that there is sufficient room for safe turning movements.

The use of corner islands and right-turn slip lanes will be restricted whenever possible. These facilities increase the number of conflicts for pedestrians and promote unrestricted turn movements for vehicles. Consideration will be given to limit the turning radii at intersections, or adding a pedestrian island where these facilities already exist. These facilities can also be constructed to promote traffic-calming, provide safer pedestrian movements and control vehicle speeds through intersections.

Crosswalks provide a safe and visible area for people to cross streets. At-grade crosswalks are preferred and can be dyed or made of stamped materials, which also increases visibility to motorists. Crosswalks can be marked with paint but thermoplastic material is preferred as it is more durable and continues to provide visibility long after painted lines have faded away.

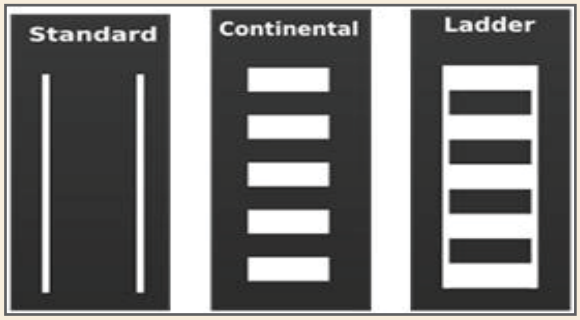


Image courtesy of the FHWA, MUTCD

Crosswalk markings and pedestrian refuges provide safer environments for pedestrians at intersections
Photo courtesy of Los Angeles County Bike Coalition

Photo courtesy of © BrokenSphere / Wikimedia Commons

Bus Shelters and bicycle racks should enhance transportation connections along Regional Streets
Photo courtesy of Ride PSTA

Figure 2.3 - Regional Streets Design Guildelines

ROADWAY CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	LANE WIDTHS	PARKING LANES
AASHTO	AASHTO	AASHTO	AASHTO	Min/Pref/Max	Min/Pref/Max
URBAN MINOR ARTERIAL, URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-45 mph)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	10' Minimum, 11' Preferred, 14' Maximum to accommodate truck travel and turning movements	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12' should be provided; a minimum of 8' may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.

FRONTAGE ZONE	CURB ZONE	SIDEWALK ZONE
Minimum/Preferred	Minimum/Maximum	Minimum/Maximum
2' Minimum for Residential uses and 4' Preferred for Commercial uses	The curb zone should be a minimum of 4' but can be wider to accommodate streetscape or Green Street features such as shade trees or tree beds.	Preferred: Located on both sides of street for access to schools, parks, shopping areas, transit stops, and commercial areas; at least one side of street for residential areas (both sides desired). Minimum width 4' in residential areas, 4-8' in commercial areas.

INTERMODAL - BIKE LANES[3]	MEDIANS	DRIVEWAYS/ACCESS
Minimum	Min/Pref/Max	Preferred
For shared roadways, curbside lane should be at least 11 feet but could be as wide as 14 feet; For exclusive bike lanes, the minimum width should be 4' for roadways with no curb or gutter.	Boulevards with 4 or more lanes could include width for median treatment: (1) painted stripe separation: 4' (2) narrow raised curb: 4'-6' (3) raised curb and planted: 10'-16' (4) painted stripe with space for left-turns: 10-16'	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.

1. Posted speed is 10 mph less than the design speed

2. Taken from the Civil Engineering Reference Manual

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

Figure 2.4 - Regional Boulevards Design Guildelines

ROADWAY CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	LANE WIDTHS	PARKING LANES
AASHTO	AASHTO	AASHTO	AASHTO	Min/Pref/Max	Min/Pref/Max
URBAN MINOR ARTERIAL, URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-45 mph)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	10' Minimum, 11' Preferred, 14' Maximum to accommodate truck travel and turning movements	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12' should be provided; a minimum of 8' may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.

FRONTAGE ZONE	CURB ZONE	SIDEWALK ZONE
Minimum/Preferred	Minimum/Maximum	Minimum/Maximum
2' Minimum for Residential uses and 4' Preferred for Commercial uses	The curb zone should be a minimum of 4' but can be wider to accommodate streetscape or Green Street features such as shade trees or tree beds.	Preferred: Located on both sides of street for access to schools, parks, shopping areas, transit stops, and commercial areas; at least one side of street for residential areas (both sides desired). Minimum width 4' in residential areas, 4-8' in commercial areas.

INTERMODAL - BIKE LANES[3]	MEDIANS	DRIVEWAYS/ACCESS
Minimum	Min/Pref/Max	Preferred
For shared roadways, curbside lane should be at least 11 feet but could be as wide as 14 feet; For exclusive bike lanes, the minimum width should be 4' for roadways with no curb or gutter.	Boulevards with 4 or more lanes could include width for median treatment: (1) painted stripe separation: 4' (2) narrow raised curb: 4'-6' (3) raised curb and planted: 10'-16' (4) painted stripe with space for left-turns: 10-16'	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.

1. Posted speed is 10 mph less than the design speed

2. Taken from the Civil Engineering Reference Manual

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

Highlands Regional Streets

Highlands Regional Streets are ideal for "Green Streets" (see the Green Streets Section). They serve the same type of transportation needs as a Regional Street except that it is located within the New Jersey Highlands Region, shown in Figure 3.1 on the following page. Highlands Regional Streets are characterized by single-use, low intensity development that transitions between residential, commercial and rural settings. In many cases, development is separated by large natural areas and winding roadways. They are major travel routes that handle the most diverse traffic modes including cars, buses, trucks, bicycles, and pedestrians. Highlands Regional Streets are characterized by intra- and inter-County travel, that result in longer regional trips. These streets are served by intra-county and inter-county/state bus travel so accommodations should be made to support easy transit access. Many of Highlands Regional Streets run adjacent to watershed properties, lakes and forests, providing some of the most scenic views in the Highlands Region. The scenic and historic character of many of these streets makes way-finding elements paramount to their function in moving Passaic County residents and tourists alike. Some examples of Highlands Regional Streets are Skyline Drive in Ringwood, Macopin Road in West Milford and Glenwild Avenue in Bloomingdale.

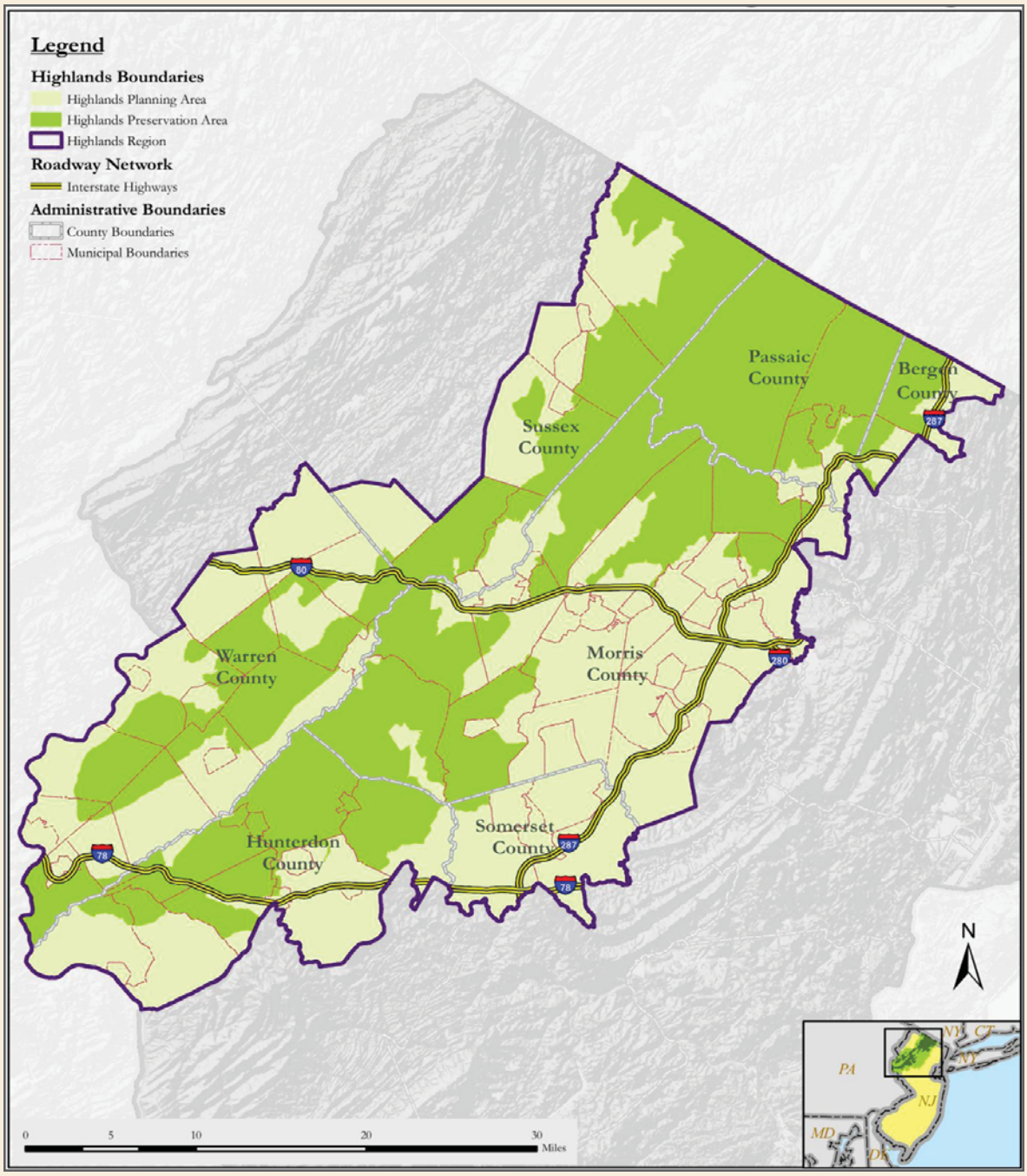
These streets require different specifications due to the development rules that are part of the *New Jersey Highlands Regional Master Plan* (HRMP), as well as the rural nature of some of these streets. The application of improvements on Highlands Regional Streets should minimize the amount of water runoff while enhancing access for pedestrians, bicyclists and motorists to make regional trips. The Highlands Water Protection and Planning Act establishes the protection and restoration of natural resources as priority goals. To that end, the HRMP provides policies and requirements for land use decisions to preserve vital environmental and scenic assets, support economic development, improve links to transportation, and enhance safety for all transportation modes. These policies are addressed in each of the typical design elements of Highlands Regional Streets in order to address these special considerations from project initiation through development.

Some transportation improvement projects, for example bridge replacements, operational traffic improvements and in-kind roadway reconstruction projects, are exempt from Highland Preservation rules provided they do not result in traffic capacity improvements, such as the inclusion of new lanes. Improvement projects will still abide by the Highlands Regional Streets design guidelines although it is recommended that all rules be thoroughly reviewed in advance of project design to determine conformity with the HRMP.

Design Priorities

Highlands Regional Streets should be designed to be "Green Streets" that protect water resources and minimize the adverse affects of surface water runoff using low impact development approaches. Design speeds are higher than the other county roadway classes so shoulders and/or bicycle facilities should be designed and installed where appropriate and where they do not introduce

Figure 3.1 - Highlands Region

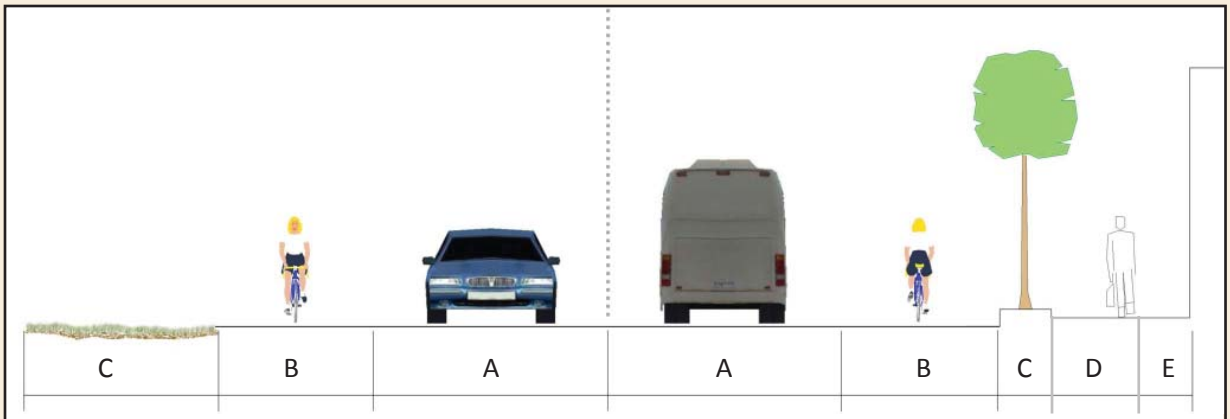


conflicts with motor vehicles, compromise safety or increase the impervious surface of a roadway. On-street parking is generally prohibited but provisions should be made for pull-off areas at scenic vistas along scenic and historic corridors (outlined in the *Scenic and Historic Byways* section). Although mostly in rural areas, to the greatest extent possible Highlands Regional Streets should create or maintain pedestrian connectivity between clusters of residential areas, commercial activities and public transportation. Because of the higher design speeds and higher volumes, intersections shall be clearly marked and highly visible for pedestrian safety. All intersection curbs must be compliant with the Americans with Disabilities Act (ADA) rules. Also intersections should be designed to accommodate turning radii for large trucks.

Because transit is an integral part of Highlands Regional Streets, design features like bus turnouts should be considered. Bus turnouts allow buses to load and unload while also allowing traffic to continue around the bus, thereby reducing traffic delay and increasing safety along Highlands Regional Streets.

Figures 3.2 shows a typical cross-section design of a Highlands Regional Street. Figure 3.8, at the end of this section, provides an overview table of design guidelines for each typical design element. The table is drawn from the Roadway Classification Design Matrix found at the end of the General Standards section of these guidelines.

Figure 3.2 - Highlands Regional Street Typical Cross-Section



A. Travel Lane – 10′ Minimum, 12′ Preferred , 14′ Maximum (for high volumes of truck and bus traffic)
B. Shoulder/Bicycle Lane - 8′ Preferred (6′ Minimum for Dedicated Bicycle Lane)
C. Curb Zone – 4′ Minimum, 8′ to 12′ Preferred (curb zone in rural areas ideal for Green Streets treatments)
D. Sidewalk Zone – 4′ Minimum, 5′ to 8′ Preferred
E. Frontage Zone – 2′ Minimum for Residential; 4′ Minimum for Commercial

Typical Design Elements

Travel Lanes – Travel lanes should be a minimum of 10 feet with an 11- or 12-foot lane preferred. Travel lanes can be as wide as 14 feet, but only to accommodate significant truck or bus traffic, particularly to enable larger vehicles to turn at intersections. The reader should refer to the **Moving Goods and People** section of the **Transportation Element** for major goods movement corridors in the Highlands region. Ten-foot lane widths may be utilized for turn lanes and or travel lanes where roadway widening will result in adverse impacts to surrounding properties, environmental resources or significant project costs. The use of lane widths less than 11 feet shall be approved by Passaic County. The use of barrier curb between travel lanes is not a preferred treatment. New impervious surfaces should not be created in the redesign of existing facilities. Utilizing methods such as "Road Diets" on existing streets can help control speeds through narrowing lanes. This technique also provides more space for a shoulder or bicycle facilities while limiting the amount of impervious surface and runoff in the Highlands Area.

Medians are not recommended for Highlands Regional Streets. Restrictions on widening roadways would minimize the size of the median and the opportunity for plantings, trees and Green Streets treatments. Green Streets treatments are better served in the existing natural areas along the Streetside of Highlands Regional Streets.

Shoulders / Bicycle Facilities – Continuous paved shoulders are recommended in the design of Highlands Regional Streets. On these higher volume higher speed facilities an 8-foot minimum shoulder is preferred. Minimizing lane widths on existing and planning improvements through "Road Diets" will allow for large shoulders and reduce the need to add new impervious surfaces.

Bicycle facilities should be provided where there is connectivity to existing on-road and off-road bicycle facilities, commercial nodes or residential areas. These facilities can be dedicated bicycle lanes, shared lanes or large shoulders. Regardless of treatment, bicycle facilities should be consistent along roadways to promote predictability and safety for both bicyclists and drivers. Separate bicycle lanes should be considered if the roadway is designated as a Bicycle and Pedestrian Priority Corridor under the Bicycle Pedestrian and River Access chapter of the Master Plan. Any dedicated bicycle lanes should be a minimum of six (6) feet, although an eight-foot bicycle lane is preferred along Highlands Regional Streets. Different configurations and pavement markings for dedicated bicycle lanes are shown in Figure 3.3. All bicycle facilities should be coordinated with local partners and consistent with existing municipal bicycle and pedestrian plans.

Off-road bicycle facilities adjacent to roads should be considered where existing traffic conditions, roadway configurations, and any other conditions create a threatening or dangerous environment for bicyclists. When designing or investigating off-road facilities all consideration should be given to using materials with pervious surfaces that decrease stormwater runoff.

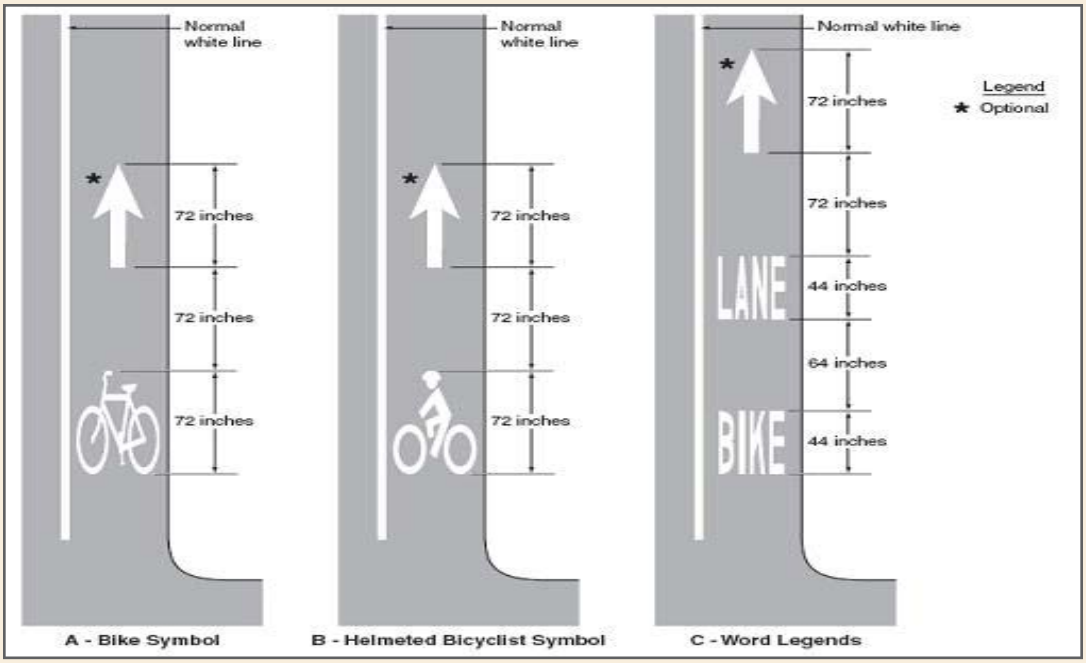
Signs designating the bike lanes and potential conflicts should be clearly marked according to the guidelines approved by the FHWA and described in the Manual on Uniform Traffic Devices (MUTCD).

Parking is prohibited on most Highlands Regional Streets. If there are businesses or residences along the street, off-street "shared parking" is strongly encouraged. Access to parking should be designed to minimize the amount of driveways along Highlands Regional Streets, thus reducing conflicts. Shared parking allows for a lower net parking requirement in commercial areas and reduces stormwater runoff in-line with the HRMP policies. Way-finding is suggested in order to better organize access to off-street parking facilities from Highlands Regional Streets. Consideration should be given to potential "pull-off" parking areas along Highlands Regional Streets that provide scenic vistas and exceptional views of the numerous lakes and watersheds in northern Passaic County.

Streetside Features – Sidewalks should be provided on at least one side of all Highlands Regional Streets adjacent to residential areas, commercial nodes or where conditions warrant pedestrian facilities. All bus stops or other transit facilities shall have sidewalks leading to commercial and residential destinations. Sidewalks should be designed to be (5) to eight (8) feet in width. The design of the Sidewalk Zone and Curb Zone should create a buffer between pedestrians and motorists, and meet all the service needs along the street frontage. Pervious/porous paving materials such as asphalt concrete, paving stones or bricks should be considered to allow precipitation to filter through the soil below and minimize stormwater runoff. Where sidewalks are present, pedestrian countdown signals, signs, transit

Figure 3.3 - Bicycle Pavement Markings

Image courtesy of USDOT



All bicycle lane configurations shown should be six (6) feet minimum in width

stops and facilities shall be designed, constructed, operated, and maintained so that all pedestrians, including people with disabilities, can travel safely and independently.

In the Highlands Area the design of curbs must be coordinated with drainage in mind. In areas where there is open drainage, curbs should not be constructed.

Green Streets – "Green Streets" elements along Highlands Regional Streets speak directly to the goals and policies of the HRMP. The following low-impact development approaches are examples of how to reduce the impacts of stormwater runoff on water quality and quantity. The Green Streets section of the Complete Streets Guidelines provides more examples and guidance on structural and non-structural techniques.

Tree box filters or tree pits are one way to reduce and filter stormwater runoff while making the surrounding environment more aesthetically pleasing. Figure 3.4 illustrates a typical tree pit. This application could be applied in areas where streetscape improvements are planned or currently exist. A continuous planting strip increases stormwater retention.

Other treatments such as vegetated swales (Figure 3.5) should also be considered in the design or redesign of Highlands Regional Streets. This application can apply to areas where excess Right-of-Way (ROW) currently exists. The design of vegetated swales should take into account the context of the land uses, access to the facility for maintenance, and net effect on stormwater runoff of the location and total watershed management area.

Figure 3.4 - Tree Pit Illustration
Images courtesy of Portland BES, 2004

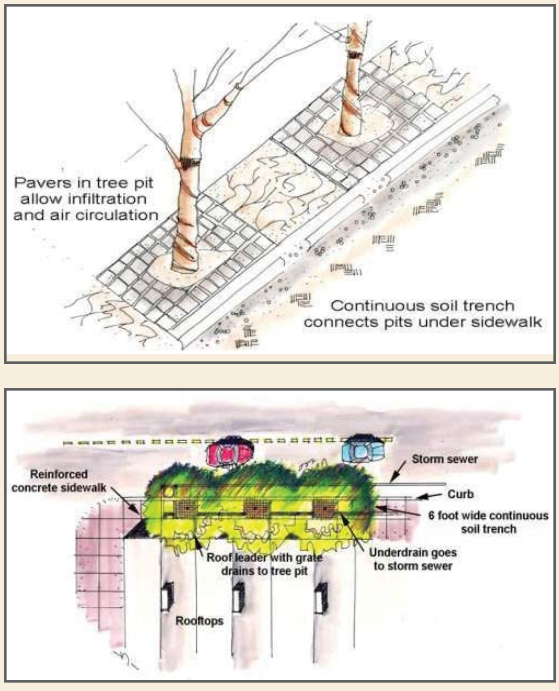
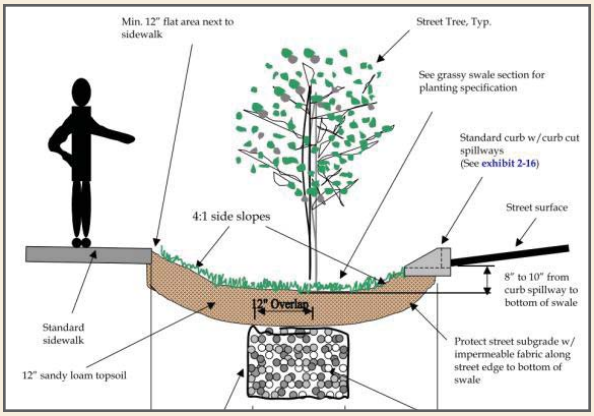


Figure 3.5 - Vegetated Street Swale
Image courtesy of Portland 2004 Stormwater Management Plan



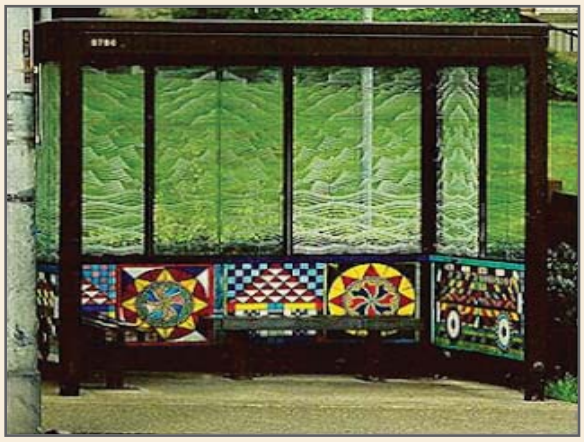
Public Transit – Regional and local buses are expected to be a significant portion of the traffic volume, therefore public transit access should be a high-level design feature on Highlands Regional Streets. Roadways should consider bus access on and off the roadway facility, including sufficient shoulder widths or bus turnouts, where appropriate. Bus shelters should be installed at all areas adjacent to commercial and residential areas. Designers should work with local municipalities, NJ Transit, the NJTPA, and Transportation Management Associations (TMAs) to determine the appropriate location and footprint of shelters. The type of shelter could promote a unified countywide design or relate to the surrounding context.

Designs should also provide sufficient pedestrian and bicycle access to these facilities, as well as proper roadway delineations. All attempts shall be made to make bus access and operations as efficient and safe as possible. Bicycle racks and/or lockers should also be considered at or near major bus stops, park-and-ride lots, and schools or businesses as appropriate. Designers should work with local parking authorities as well as the other entities mentioned to determine the location, design and size of bicycle facilities. For more information on bus stop safety, the reader should refer to the North Jersey Transportation Planning Authority's (NJTPA) *Bus Stop Safety Toolbox (http://www.njtpa.org/Plan/Studies/documents/BusStopSafetyToolboxweb.pdf)*.

Intersections are an important design feature of the Highlands Regional Street. When designed correctly they safely accommodate pedestrians, bicyclists and motorists. One of the key features at intersections are crosswalks. On these higher-speed roadways, crosswalks should provide a safe and visible area

Photo courtesy of Yambol Daily Picture

Photo courtesy of Passaic County Planning



Bus Shelters provide a safe environment for mass transit users and an opportunity to reflect the unique qualities of local communities
Photo courtesy of Larry Neilson Photography

for people to cross streets. The rural character of land uses along many Highlands Regional Streets dictates that crosswalks be provided where residential areas, commercial nodes, existing sidewalks, and public transportation facilities exist. Crosswalks can be marked in a standard style with parallel solid white-line markings, but ladder or continental style markings are preferred because they are more visible to motorists. Figure 3.6 shows an example of each of these patterns. At-grade crosswalks are preferred and can be colored, which also increases visibility to motorists. Crosswalks can be marked with paint, but thermoplastic material is preferred as it is more durable and continues to provide visibility long after painted lines have faded away. All crosswalks must be ADA compliant.

Pedestrian countdown signals shall be installed at new or redesigned signalized intersections. Figure 3.7 shows examples of countdown displays. Pedestrian lead phases and restrictions on right turns on red should be given consideration at intersections as a means of providing the time needed for safe pedestrian movements. Limiting right turns on red also provides a safer environment for the vision impaired. The Federal Highway Administration (FHWA) recommends a walking speed of no more than 3.5 feet of crosswalk per second of crossing time. Roundabouts may also be considered where conditions permit.

When designing the turning radii at intersections, consideration will be given to areas with significant truck and bus traffic in order to ensure that there is sufficient room for safe turning movements. Page 11 of the NJTPA's *Bus Stop Safety Toolbox* provides additional details on corner curb radii.

The use of corner islands and right turn slip lanes will be restricted whenever possible. These facilities increase the number of conflicts for pedestrians and promote unrestricted turn movements for vehicles.

Overall, intersections should be designed in conjunction with the rules of the *Highlands Regional Master Plan* with a goal of minimizing water runoff and impervious surfaces, and using environmentally designed drainage features to help achieve this goal.

Figure 3.6 - Types of Crosswalk Markings

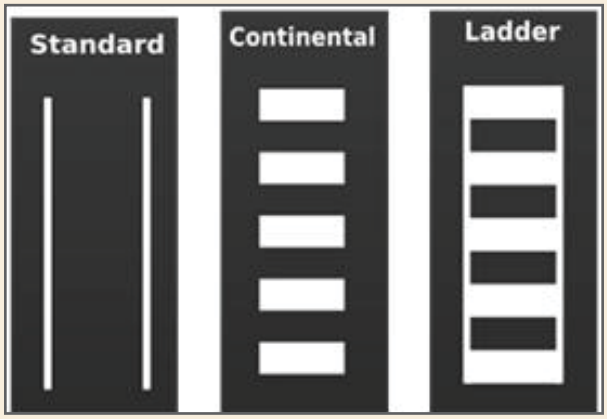


Figure 3.7 - Pedestrian Countdown Signal Indicators

Images courtesty of FHWA, MUTCD

Figure 3.8 - Highlands Regional Streets Design Specification

ROADWAY CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	LANE WIDTHS	PARKING LANES
AASHTO	AASHTO	AASHTO	AASHTO	Min/Pref/Max	Min/Pref/Max
URBAN COLLECTOR, URBAN MINOR ARTERIAL, URBAN PRINCIPAL ARTERIAL	30 mph or higher (posted 25-55 mph)	2,000-40,000	Designed for LOS D	10' Minimum, 11' Preferred, 14' Maximum to accommodate truck travel and turning movements	On street parking is generally prohibited.

FRONTAGE ZONE	CURB ZONE	SIDEWALK ZONE
Minimum/Preferred	Minimum/Maximum	Minimum/Maximum
2' Minimum for Residential uses and 4' Preferred for Commercial uses	The curb zone should be a minimum of 4' but can be wider to accommodate streetscape or Green Street features such as shade trees or tree beds. Appropriate plantings may be dependent on speed limit	Should be provided on at least one side of the street; minimum of 4 feet; constructed from pervious pavement materials

INTERMODAL - BIKE LANES[3]	MEDIANS	DRIVEWAYS/ACCESS
Minimum	Min/Pref/Max	Preferred
Paved shoulders should be at least 8' wide For exclusive bicycle use shoulders should be a minimum of 8' feet for roadways with no curb or gutter	Medians Are not recommended for Highlands Regional Streets	Regulated as to width of entrance, placement with respect to property lines and intersecting streets, angle of entrance, vertical alignment, and number of entrances.

1. Posted speed is 10 mph less than the design speed

2. Taken from the Civil Engineering Reference Manual

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

Downtown Streets

Downtown Streets are County roadway corridors characterized by mixed-use commercial and traditional downtown services and activities. Downtown Streets serve Central Business Districts (CBD) and Special Improvement Districts (SID) that use distinctive streetscape treatments such as lighting, signage or street furniture. Downtown Streets tend to be highly transit-oriented and experience high levels of pedestrian activity. These are typically high-volume, low-speed and undivided arterial roadways that have narrow lanes and are used by a mix of cars, delivery trucks and buses. Parking on Downtown Streets is curbside (parallel or angled) and often metered. Examples of Downtown Streets are Main Avenue in Passaic, Main Street in Paterson, Union Avenue in Totowa, Van Houten Avenue in Clifton, Wanaque Avenue in Pompton Lakes, and Paterson-Hamburg Turnpike in Bloomingdale.

Design Priorities

The primary function of a Downtown Street is to optimize both functionality and form of public space in a downtown or business district to support economic development and community activity. The streetside area is critical in this function as it provides amenities that create a pleasant pedestrian environment and define the physical character of the businesses that front along these streets. Design standards should accommodate existing and potential pedestrian traffic, street furniture, awnings and signage, outdoor dining areas, decorative lighting, shade trees and tree pits, and public transportation facilities. Standards should provide flexibility in order to enhance or compliment the character of the community and adhere to any local streetscape standards if they exist.

Providing a safe environment along Downtown Streets is another priority. Traffic-calming measures should

Photo courtesy of SJV Blueprint Implementation Handbook

Photo courtesy of Passaic County Planning

Downtown Streets share a number of common characteristics including walkability and streetscaping elements that combine form and function to allow both businesses and patrons to thrive

Photo courtesy of Passaic County Planning

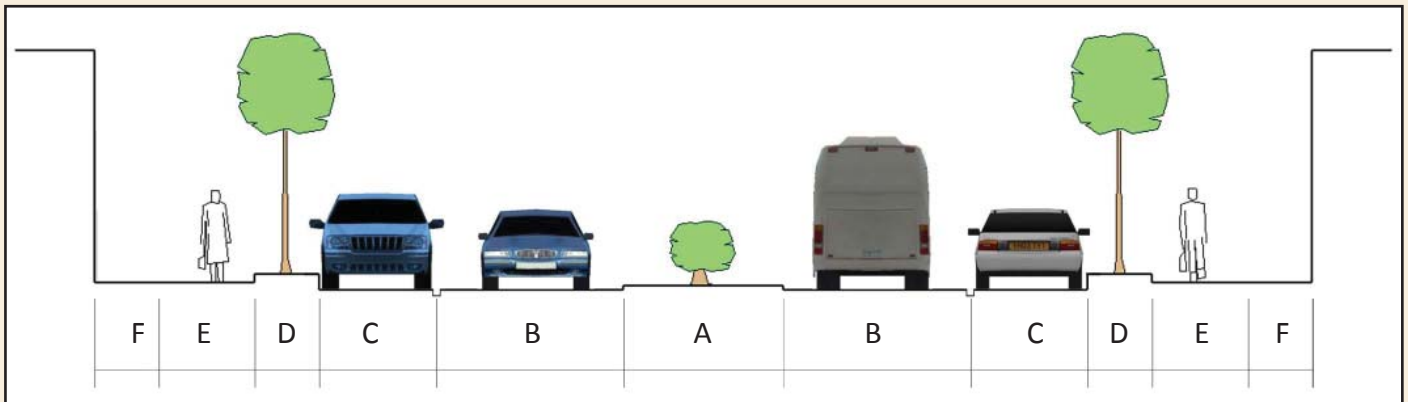
be implemented to maintain safe interaction between all modes of transportation. This includes designing intersections that promote safe pedestrian crossing, way-finding signage that clearly marks parking areas and access for local truck deliveries, and prioritizing access and safety at bus facilities. Minimizing driveways will prioritize the commercial buildings that front on Downtown Streets, consolidate parking and truck deliveries and reduce conflicts between pedestrians and vehicles.

Figure 4.1 shows a typical cross-section design of a Downtown Street. Figure 4.4, at the end of this section, provides an overview table of design guidelines for each typical design element. The table is drawn from the Roadway Classification Design Matrix found at the end of the General Standards section of these guidelines. The street is separated into discrete elements representing the key design features. The Frontage Zone provides a transition space between properties and the sidewalk. The Sidewalk Zone is of upmost importance in commercial districts and should maximize the ability for patrons to comfortably access businesses and, if possible, outdoor seating. The Curb Zone allows for a transition between parking and the sidewalk. It provides a place for street trees or other plantings.

Typical Design Elements

Travel Lanes – Travel lanes shall be a minimum of 10 feet but 11-foot travel lanes are preferred. The maximum travel lane width shall be no more than 12 feet. Twelve-foot lanes should only be

Figure 4.1 - Typical Downtown Street Cross-Section



A. Median – 6' Minimum for Pedestrians, 10' Minimum for planted, 16' Minimum for turning lanes
B. Travel Lane – Auto Only: 10' Minimum; 11' Preferred (to be shard with bicycles); 12' Maximum (to accommodate high volume of bus traffic)
C. Parking – 8' Minimum; 4' Buffer area if dedicated bicycle lanes installed adjacent to parking to accommodate "Door Zone"
D. Curb Zone – 4' Minimum/6' to 8' Preferred
E. Sidewalk Zone - 5' Minimum/6' to 8' Preferred
F. Frontage Zone - 2' Minimum for Residential , 4' to 8' Preferred for Commercial

used when considering safer access, travel and turning for trucks and buses. Downtown Streets accommodate the most needs of any street type, including a large number of pedestrians, frequent bus service, local deliveries, motor vehicle movements, and parked vehicles. As a result, Downtown Streets are often very constrained and do not offer enough space to provide dedicated bicycle facilities. On these lower volume and lower speed roads, it is expected that bicyclists and motorists can share the road. The appropriate signage needs to be in place to raise the awareness of motor vehicles to the presence of bicycles.

The minimum for turning lanes should be ten feet. Narrow and variable lane widths may also be considered as a traffic-calming measures. Streets that provide significant bus or truck access should be given consideration during the design process.

Traffic Calming - Traffic calming is one of the key goals along any Downtown Street. Slowing traffic allows for safer pedestrian movements, higher visibility for commercial businesses and easier navigation for buses and vehicles into parking areas. The use of bulb outs, curb extensions, chokers, raised cross walks, speed tables, and deflector islands should all be considered as traffic -calming measures. These techniques make for a more visually interesting street environment and more area to be used for streetscape elements, such as trees, bus shelters and outdoor dining areas in the Frontage Zone of the Streetside. Narrower travel lanes foster slower speeds and helping the driver become more aware of crossing pedestrian traffic. These facilities also provide an opportunity to enhance commercial areas with plantings or other decorative elements.

Curb extensions and chokers are two techniques that can be used to promote traffic-calming along a Downtown Street
Photos courtesy of Richard Drdul

Medians provide safety for pedestrians and motorists as well as a place for streetscaping features such as plantings
Photo courtesy of Richard Drdul

Medians are permitted for Downtown Streets where there are four lanes (including parking) and enough Right-of-Way (ROW) to accommodate them. Raised medians are preferred because they provide a physical separation between opposing traffic, offer refuge for crossing pedestrians, control left turns across opposing traffic, and provide for context sensitive streetscaping. By preference, medians should provide pedestrian refuge. For this reason closed medians (i.e., concrete Jersey barriers) are not recommended on Downtown Streets. Pedestrian refuge areas should be a minimum of six (6) feet wide.

Landscaped medians shall also be considered where the project setting allows and to complement land use characteristics. If the median contains landscaping (plants or street trees) it should be a minimum of 10-feet wide. Medians shall be a minimum of 16-feet where they are used as a buffer for turn lanes. In general, median plant materials should be "high-low" to provide for corridor visibility; i.e., high-branching trees and low-growing shrubs. There is no stated maximum width for a median as the other roadway features (travel lanes, parking, curbs, and sidewalks) will dictate the maximum median available within the ROW. Medians should incorporate "Green Streets" elements in order to minimize stormwater runoff.

Medians (splitter islands) should be used to lead into roundabouts in order to enhance separation of traffic as they enter the roundabout, provide a pedestrian refuge for crossings, and provide a visual queue indicating a downtown or central business district.

Shoulders / Bicycle Facilities – Shoulders are not recommended for Downtown Streets in order to accommodate on-street parking. Exclusive bicycle lanes are also not recommended along Downtown Streets. In general, on the lower speed (35 mph or less) Downtown Streets, bicycles and motor vehicles are expected to share the road. Share-the-road signage is a preferred treatment that reinforces existing traffic laws. Dedicated bicycle lanes must take into account the four-foot area occupied by open car doors between parked cars and bicyclists, known as the "Door Zone". Bicycle lanes can be installed, if sufficient ROW exists to create a four-foot buffer for the "Door Zone" , while providing a minimum five-foot bicycle lane.

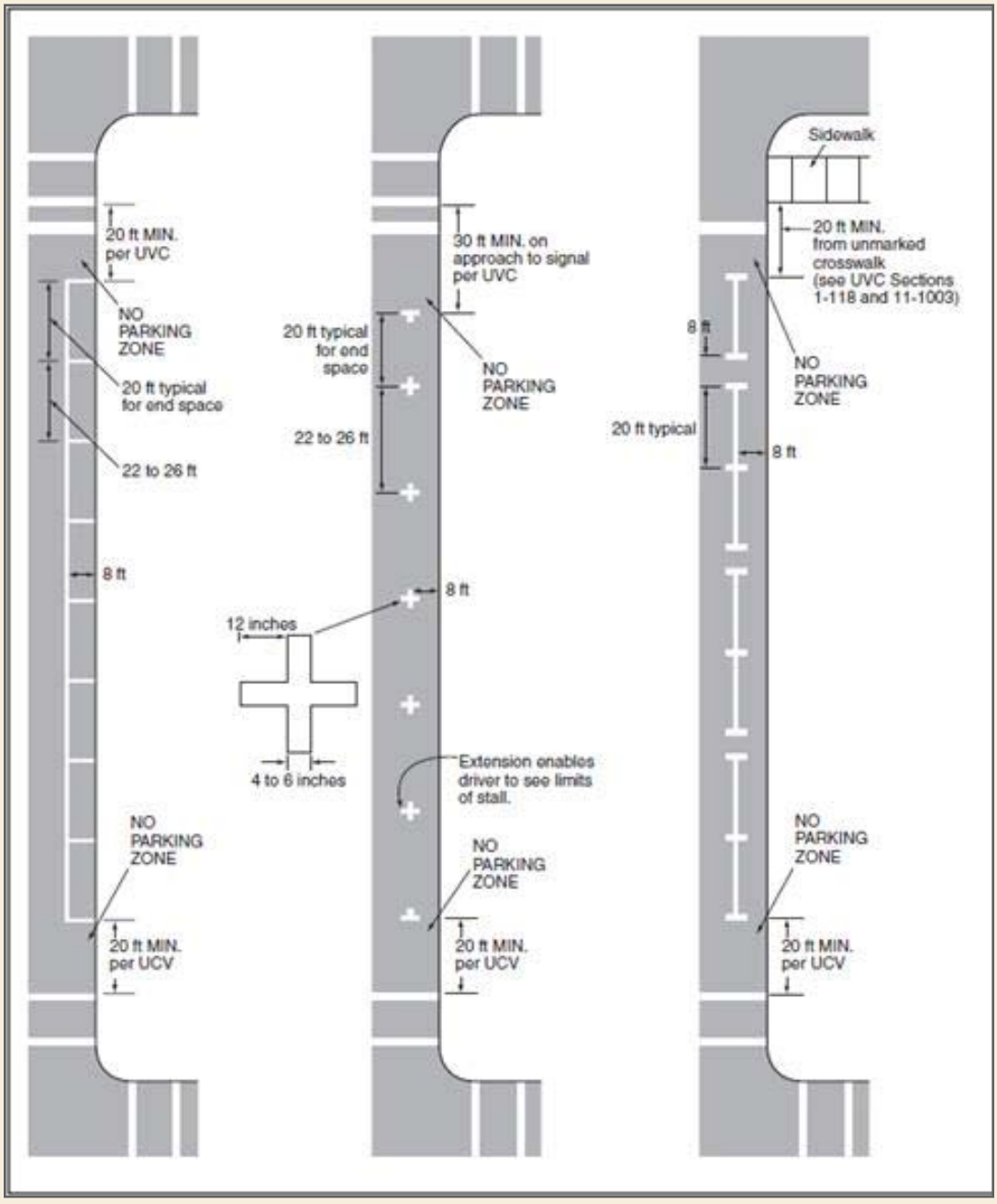
Parking shall be provided on Downtown Streets. Parallel parking is recommended. Parking stall boundaries should be clearly marked. Figure 4.2 shows several types of parking space markings and on-street parking layouts. Signs should be installed identifying all parking restrictions and conditions. All sign color, size and location should follow the *Manual of Uniform Traffic Control Devices* (MUTCD). Considerations should be made for delivery truck access to businesses along these facilities. Shared

Bicycles and Motor Vehicles should share the road on Downtown Streets. Dedicated Bicycle lanes should be designed to take into account the "Door Zone"
Photos courtesy of USDOT and VinnyR

Figure 4.2 - Typical Roadside Parallel Parking Space Markings and Layouts

(Areas in grey highlight the portion of the street utilized for parking configurations)

Image courtesy of USDOT



parking practices are strongly recommended along Downtown Streets. This allows more organized flow, less conflicts between pedestrians and vehicles, and it maximizes the development of land along these crucial commercial corridors. Backing onto County roadways from any private driveways is strictly prohibited.

Way-finding is also suggested in order to better organize access to parking facilities. Off-street parking should be sited behind the buildings and provide safe and efficient access to businesses and the street front.

Streetside Features – The Streetside along a Downtown Street serves the most purposes of any other road classification category. This area is the lifeblood of any downtown and serves as the face of the commercial businesses, direct access to public transportation, a civic space for residents and visitors, and the identity of a community. The Streetside is broken down into three zones: the Frontage Zone, the Sidewalk Zone; and the Curb Zone. Each of these zones is displayed in the typical cross-section in Figure 4.1.

The **Frontage Zone** is the area between the front of the commercial business or residential property and the sidewalk. Features in the Frontage Zone include awnings, canopies, hanging signs, furniture and allowable portable displays (i.e., menus and placards). The Frontage Zone can range from two (2) feet for residential properties, and four (4) to eight (8) feet for commercial properties, depending on density and type of land use. The Passaic County Planning Board should negotiate with applicants along Downtown Streets to promote and permit features such as awnings and signage, that may encroach onto the County ROW located in the Frontage Zone.

Streetside features such as awnings, hanging signs and outdoor dining should be accommodated along all Downtown Streets
Photos courtesy of Passaic County Planning

Bus shelters promote mass transit connectivity and provide an avenue to incorporate distinctive design elements of a Downtown
Photo courtesy of Mike's Transit Stop

The **Sidewalk Zone** is the area between the Frontage Zone and the Curb Zone. The sidewalk needs to be wide enough for pedestrians to walk and pass each other unimpeded by features from the Frontage or Curb Zones. The Sidewalk Zone can range from five (5) feet, although a six- to eight-foot sidewalk is preferred. Wider sidewalks should be considered to accommodate higher pedestrian volumes in more active areas.

The **Curb Zone** is the area between the Sidewalk Zone and the Parking or Travel Lane. It contains the most flexibility and includes features such as street trees, tree pits and other plantings, parking meters, signage, street furniture, bike racks, and bus shelters. The Curb Zone should be at least four (4) feet but a six-foot area is preferred in order to properly accommodate bus shelters and tree pits. Local streetscaping plans should be taken into consideration whenever designing or reviewing elements in the Curb Zone or Streetsde area.

Sidewalks and curbs shall be provided on both sides of the street. In addition to providing a protective area for walking, sidewalks link public transportation access to local commerce and residential communities. Downtown Street sidewalks shall provide for the maximum available width to accommodate two-way pedestrian travel, merchant zones, public transportation facilities and street furniture. Shade trees are of particular importance and should be allowed enough room to mature, provide shade on sidewalks, and minimize conflicts with overhead and underground utilities or infrastructure. The use of underground utilities is encouraged to allow for a more enhanced streetscape environment through removal of utility poles from the road side.

Intersections are an important feature of the Downtown Street. When designed correctly, they safely accommodate both pedestrians and motorists. One of the key features at intersections are crosswalks. Crosswalks provide a safe and visible area for people to cross streets. New Jersey State Law requires drivers to stop for pedestrians at crosswalks. Appropriate signage should be used to reinforce the law, including movable signs that can be placed in the roadway.

Signage should be used to raise awareness of "stop for pedestrian laws" at intersections along Downtown Streets
Images courtesy of USDOT, MUTCD

Pedestrian crosswalks can be marked in various patterns but they need to be highly visible to approaching motorists
Photo courtesy of Pattern Paving Products

Figure 4.3 Downtown Streets Design Guidelines

ROADWAY CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	LANE WIDTHS	PARKING LANES
AASHTO	AASHTO	AASHTO	AASHTO	Min/Pref/Max	Min/Pref/Max
URBAN MINOR ARTERIAL, URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-45 mph)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	10' Minimum, 11' Preferred, 14' Maximum to accommodate truck travel and turning movements	Parallel parking may be considered, however it is undesirable on high-speed roadways. 10-12' should be provided; a minimum of 8' may be used where it is unlikely that there will be a future need to use the parking lane as a through lane.

FRONTAGE ZONE	CURB ZONE	SIDEWALK ZONE
Minimum/Preferred	Minimum/Maximum	Minimum/Maximum
2' Minimum for Residential uses and 4' Preferred for Commercial uses	The curb zone should be a minimum of 4' but can be wider to accommodate streetscape or Green Street features such as shade trees or tree beds.	Preferred: Located on both sides of street for access to schools, parks, shopping areas, transit stops, and commercial areas; at least one side of street for residential areas (both sides desired). Minimum width 4' in residential areas, 5'-8' in commercial areas.

INTERMODAL - BIKE LANES[3]	MEDIANS	DRIVEWAYS/ACCESS
Minimum	Min/Pref/Max	Preferred
Bicycles should share 11' travel lanes with motor vehicles. Share-the-road sings should be posted along Downtown Streets. Dedicated bicycle lanes are permitted but must be a minimum 6' and provide an additional 4' buffer area between parked cars.	Boulevards with 4 or more lanes could include width for median treatment: (1) painted stripe separation: 4' (2) narrow raised curb: 4'-6' (3) raised curb and planted: 10'-16' (4) painted stripe with space for left-turns: 10-16'	While access to abutting property may be required, it should be regulated to limit the number of access points and their locations.

1. Posted speed is 10 mph less than the design speed

2. Taken from the Civil Engineering Reference Manual

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

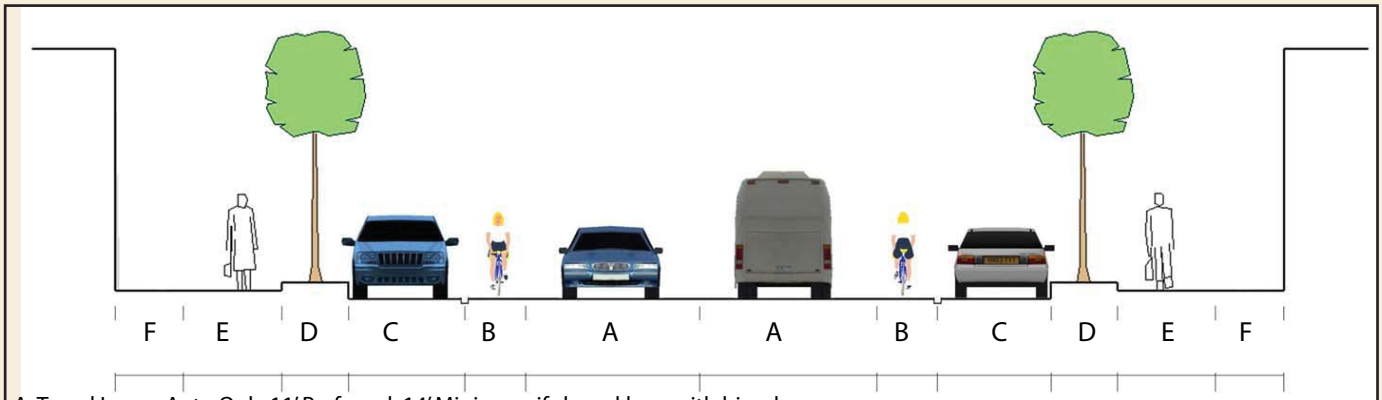
Community Streets

Community Streets provide connections for local communities to reach regional through-routes and local commercial and downtown centers. Traffic-calming allows all users to share the road safely and introduce a network of connected bicycle facilities throughout the County. Safe street crossings and access to mass transit for pedestrians shifts the focus from motor vehicles to people on these streets. Community Streets are the ideal for implementing the "Green Street". The Green Street is one that promotes more pedestrian and bicycle activity, green infrastructure to reduce flooding, and a continuous canopy of street trees. Figure 5.1 illustrates a typical cross-section design of a Community Street. Figure 5.4, at the end of this section, provides an overview table of design guidelines for each typical design element. The table is drawn from the Roadway Classification Design Matrix found at the end of the General Standards section of these guidelines. Examples of Community Streets are McBride Avenue in Paterson and Woodland Park, Passaic Avenue in Passaic, High Mountain Road in North Haledon, and Allwood Road in Clifton.

Design Priorities

The design of Community Streets shall take into consideration the mobility of all users, of all abilities, including the motorist, transit user, pedestrian, and bicyclist. On-street parking shall be maintained to provide access to local businesses and residences. The design should include features to enhance and compliment the character of the community and should adhere to local streetscape standards if they exist. Because of the density of uses, intersections shall be clearly marked for

Figure 5.1 - Community Streets - Typical Cross-Section



A. Travel Lane - Auto Only 11' Preferred, 14' Minimum if shared lane with bicycles
B. Shoulder/Bicycle Facility - 14' shared lane ; 4' with no parking and no curb, 5 with no parking and curb; 6' Minimum with parking
C. Parking - 8' Minimum, 11' Preferred (if shared with bicycle lane)
D. Curb Zone - 4' Minimum
E. Sidewalk Zone - 5' Preferred
F. Frontage Zone - 2' Minimum, 4' Preferred

pedestrian safety. All curbs must be Americans with Disabilities Act (ADA) compliant. Where feasible, traffic-calming measures should be implemented to promote safety for all modes of transportation. The curb, sidewalk and building frontage should be of sufficient width to accommodate pedestrian traffic, lighting, street trees and tree pits, and public transportation facilities.

Typical Design Elements

Travel Lanes and Medians – Drive lanes that do not provide bicycle access shall be a minimum of 10 feet but 11-foot travel lanes are more desirable. The maximum travel lane width shall be no more than 12 feet. The maximum lane width can be considered in areas with higher bus and truck traffic. The wider lanes allow buses and trucks to move safely with other motorists and other modes. Lanes that provide shared access between vehicles and bicycles should be at least 14-feet wide. Appropriate pavement markings (such as "sharrows") and signage that designate these as shared lanes should be used. Although Community Street speeds often do not warrant separating travel lanes, medians may be used to create a boulevard where space permits. Boulevards should include "Green Street" elements such as street trees that help create a more complete canopy.

Shoulders and Bicycle Facilities – Delineating travel lanes and parking areas helps enforce lower speed limits, promote traffic calming and provide room for bicyclists, although striped shoulders are not the preferred treatment along Community Streets. Exclusive bicycle lanes should be installed where space permits, along with proper signage and pavement markings. The minimum width of the bicycle lane where there is no on-street parking is four (4) feet where there is no curb and gutter, and five (5) feet where there is a curb. When there is adjacent on-street parking, bicycle lanes can be

Shared lane with "sharrow" and marked parking lane
Photo courtesy of CITYPHILE

Exclusive bicycle lane (painted)
Photo courtesy of BIKE NOPA

A bike box provides an area for bicyclists to jump ahead of cars when stopped at signalized intersections. This allows for safer interaction between vehicles and bicyclists
Photo courtesy of Doug Beghtel/The Oregonian

five (5) feet wide with the parking spots widened to take into consideration the space between an open door and a bicyclist know as the "Door Zone". Bicycle lanes can be painted green to add visibility to these facilities.

Shared travel lanes are also a preferred treatment for bicycle facilities along Community Streets where ROW width does not permit an exclusive bicycle lane. A "sharrow" is a pavement marking (shown in figure 5.2) that signifies that a roadway should be shared by motor vehicles and bicyclists. Share-the-road signage should be used in conjunction with "sharrows" to alert motor vehicles of the presence of bicyclists. "Sharrows" also provides a visual route for bicyclists to follow throughout the County. Figures 5.2 and 5.3 provide details on how to incoporate "sharrows" with parking and the proper dimensions of pavement markings.

Bicycle facilities should be continuous and as consistent as possible. The **Bicycle Pedestrain and River Access** section of the **Transportation Element** outlines priority corridors that can lead to a connected countywide system of bicycle and pedestrian facilities.

Parking – Parallel parking is recommended on Community Streets. It uses the least amount of space when compared to front-in angled parking and is safer when used with adjacent bicycle lanes. Parallel parking spaces should be a minimum of eight (8) feet. If there is a bicycle lane on the street then parking lanes may be 11 feet wide (from curb to the inside line) to help bicyclists avoid traveling within the "door zone" of parked cars. Parking-stall lane boundaries should be clearly marked where in the presence of shared or dedicated bicycle lanes. If there is enough roadway width then angled parking

Figure 5.2 - Sharrow Placement Alongside Parked Vehicles

Image courtesy of FHWA, MUTCD

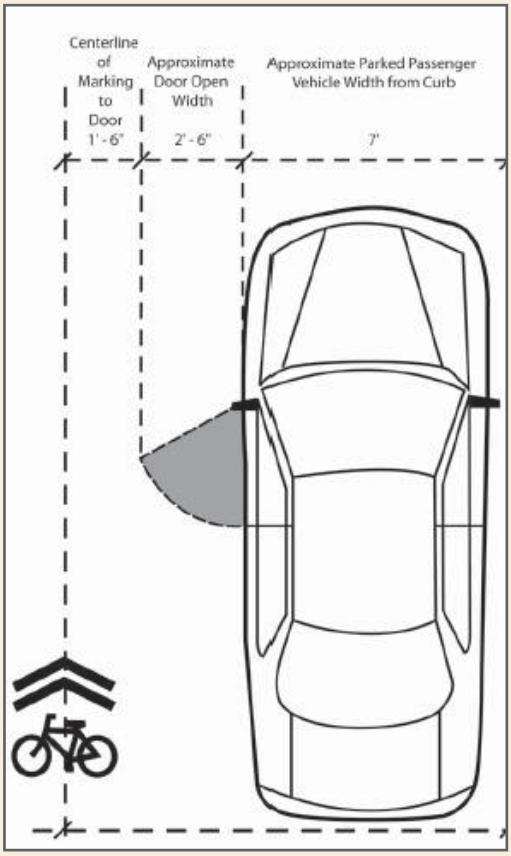
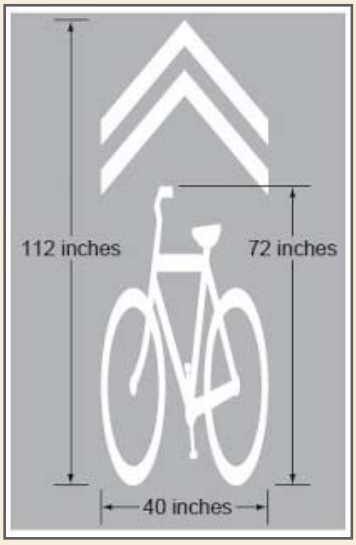


Figure 5.2 - Sharrow Dimensions

Image courtesy of NJDOT, NJ Bicycle Manual



may be considered to increase parking capacity. However, back-in parking is recommended when used in conjunction with bicycle lanes to provide for safer sight distances between motorists and bicycles.

Traffic Calming is a key goal along Community Streets. Slowing traffic allows for safer pedestrian and bicycle movements, higher visibility for commercial businesses and easier navigation for vehicles into parking areas and at intersections. The use of curb extensions, bump-outs, deflector islands, and chokers should be considered as traffic calming measures. These techniques make for a more visually interesting street environment and more area to be used for streetside features in the curb zone, larger sidewalks or enhanced storefront access. Curb bump-outs can also be used to narrow travel lanes approaching pedestrian walkways or intersections.

Signs can be used to enhance safety on Community Streets. Share-the-road or "stop for pedestrians" signs can be used as visual cues to motorists to alert them of bicycles or pedestrians sharing or entering the roadway.

Streetside Features – The streetside along a Community Street serves to facilitate a safe and pleasant environment for all users. Where sidewalks are present, pedestrian signals, signs, transit stops and facilities shall be designed, constructed, operated, and maintained so that all pedestrians, including people with disabilities, can travel safely and independently. Sidewalks and curbs should be provided on both sides of the street where appropriate. Where there are businesses, street furniture should also be part of the design feature. Streetside areas should be

Back-in angled parking with dedicated bicycle lane
Photo courtesy of SFMTA Livable Streets

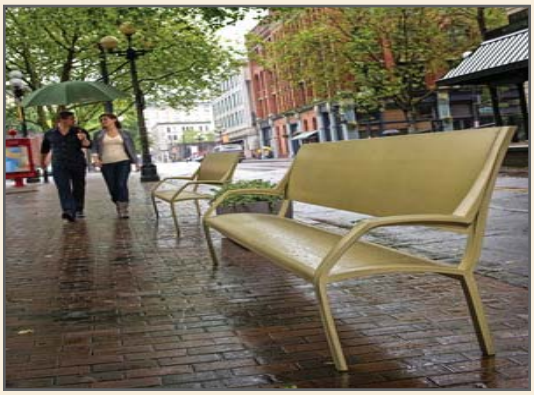
Curb extensions and deflector islands provide enough space to install bus shelters, green space and narrow intersection crossings
Photos courtesy of Streetsblog.com and Autoevolution

Signs can be used to alert motorists and increase safety on Community Streets
Images courtesy of FHWA, MUTCD

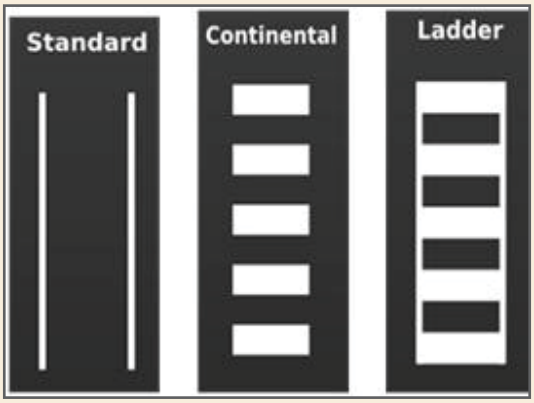
designed to accommodate features, such as bus shelters, municipal parking meters, as well as "Green Street" features including tree plantings, bio-swales and pervious pavement. The preferred width of the Streetside is at least eight (8) feet in order to accommodate the Sidewalk Zone and Curb Zone.

In addition to providing a protective area for walking, sidewalks link public transportation access to local commerce and residential communities. Shade trees are of particular importance on Community Streets as they will provide green corridors between communities and a pleasant environment to promote higher levels of pedestrian and bicycle activity. Street trees should be allowed enough room to mature, provide shade on sidewalks, and not conflict with overhead and underground utilities or infrastructure. The use of underground utilities is encouraged to allow for a more enhanced streetside environment and to eliminate utility poles from the road side.

Intersections are an important safety feature of Community Streets. When designed correctly they safely accommodate both pedestrians and motorists. One of the key features at intersections are crosswalks. Crosswalks provide a safe and visible area for people to cross streets. Crosswalks can be marked in a standard style with parallel solid white-line markings, but ladder or continental style markings are preferred as they are more visible to motorists. Crosswalks can be at-grade or raised, and can be colored or made of stamped materials, which also increases visibility to motorists. Crosswalks can be marked with paint but thermoplastic material is preferred as it is more durable and continues to provide visibility long after painted lines have faded away. All crosswalks must be ADA compliant.



The Curb Zone along the Streetside should be designed to accomodate street furniture, trees, signage and other amenities
Photo courtesy of Dwell



Types of Crosswalk Markings
Image courtesy of FHWA, MUTCD

Pedestrian crosswalks can be marked in various patterns but they need to be highly visible to approaching motorists
Photo courtesy of University of California, Berkley

Figure 5.4 - Community Streets Design Guidelines

ROADWAY CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	LANE WIDTHS	PARKING LANES
AASHTO	AASHTO	AASHTO	AASHTO	Min/Pref/Max	Min/Pref/Max
URBAN COLLECTOR, URBAN MINOR ARTERIAL, URBAN PRINCIPAL ARTERIAL	30 mph or higher (posted 25-40 mph)	2,000-12,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas.	11' desirable; 10' minimum if there is no bicycle access	Recommended: parking should be minimum of 8 feet 4' buffer area if a bicycle lane is located next to parking

FRONTAGE ZONE	CURB ZONE	SIDEWALK ZONE
Minimum/Preferred	Minimum/Maximum	Minimum/Maximum
The area covering commercial or residential frontages is preferred to be 2' to 4 '. Commercial frontages should lean towards the 4' width to cover awning overhangs and or restaurant furniture.	The curb zone should be a minimum of 4' but can be wider to accommodate streetscape or Green Street features such as shade trees or tree beds.	Located on both sides of street for access to schools, parks, shopping areas, transit stops, and commercial areas; at least one side of street for residential areas (both sides desired). Minimum 5' in width

INTERMODAL - BIKE LANES[3]	MEDIANS	DRIVEWAYS/ACCESS
Minimum	Min/Pref/Max	Preferred
4' minimum with no parking and no curb 5' minimum with no parking and curb 6' minimum with parking 14' minimum as shared travel lane 4' buffer should be provided between parked cars and bicyclists	Generally not recommended for Community Streets medians may be used to create a boulevard treatment where space permits	Driveways/Access points should be minimized as much as possible. Access should be designed to the rear or on side streets where possible. Minimum driveway widths for commercial properties should be 15 feet with reinforced concrete aprons.

1. Posted speed is 10 mph less than the design speed

2. Taken from the Civil Engineering Reference Manual

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

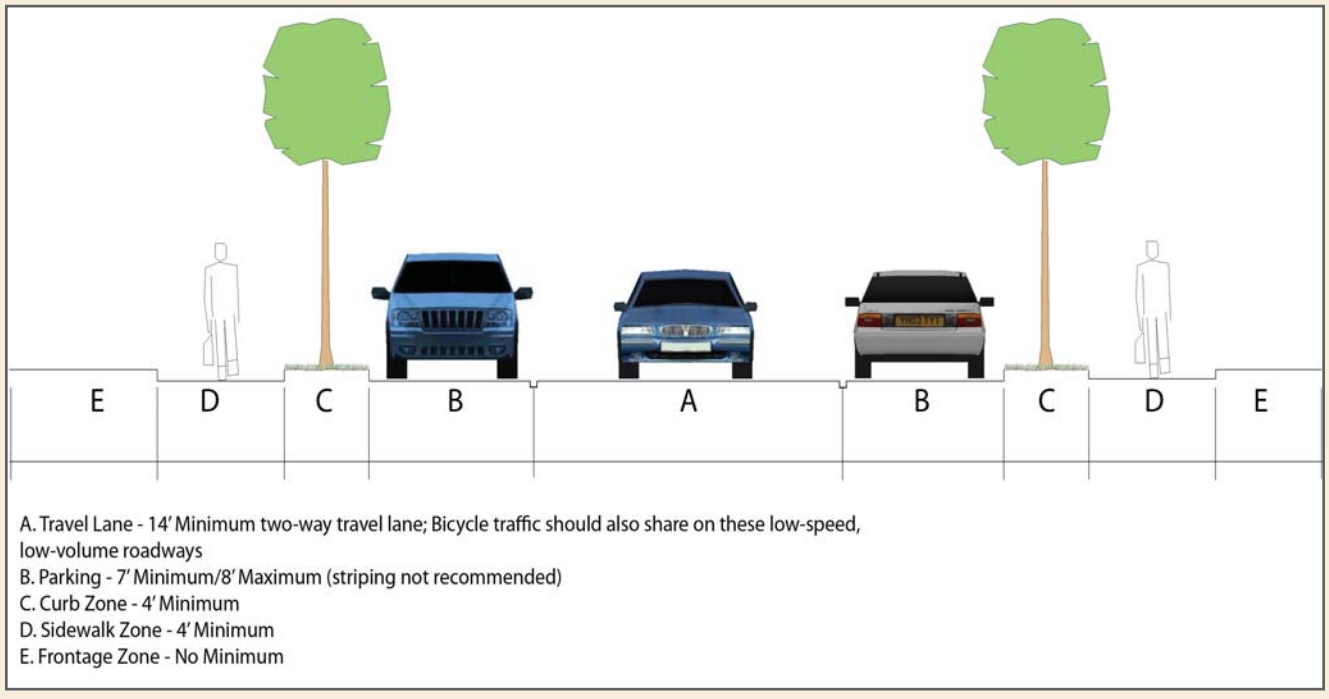
Neighborhood Streets

Neighborhood Streets are walkable roads that typically serve the residents or local businesses located along the street and no other users. These streets are not used as thorough fares or for anything except local trips. The nature of a neighborhood street requires little in the way of improvements that would promote intra-municipal trips or regional facilities. The improvements made on these streets are strictly for the residents or property owners directly along the street or in that neighborhood. Figure 6.1 shows the typical cross section of a Neighborhood Street. Figure 6.2, at the end of this section, provides an overview table of design guidelines for each typical design element. The table is drawn from the Roadway Classification Design Matrix found at the end of the General Standards section of these guidelines.

Design Priorities

Neighborhood Streets are low volume and low speed roadways that are designed to promote local neighborhood interaction through walking and bicycling. Street design is such that the travel lanes are narrow, which promotes lower speeds, and should be shared with bicyclists. On-street parking may be allowed on one or both sides of the street. Amenities such as street trees, grass beds and lighting may enhance the neighborhood character and should be designed with local streetscape priorities if they exist. Sidewalks can be installed on both sides of the street and should be continuous to enhance walkability on Neighborhood Streets.

Figure 6.1 - Typical Neighborhood Street Cross-Section



A. Travel Lane - 14' Minimum two-way travel lane; Bicycle traffic should also share on these low-speed, low-volume roadways
B. Parking - 7' Minimum/8' Maximum (striping not recommended)
C. Curb Zone - 4' Minimum
D. Sidewalk Zone - 4' Minimum
E. Frontage Zone - No Minimum

Typical Design Elements

Lanes and Medians – Because of the low volumes and low speeds, one 14-foot wide (minimum) travel lane can accommodate two-way traffic and bicyclists. These streets tend to require less right-of-way and width for the cartway. Also combined with the low speeds, medians are not recommended on Neighborhood Streets. Consideration must be taken to design the street so that emergency vehicle access is possible.

Exclusive **shoulders and bicycle facilities** are unnecessary as the roadway should be designed to accommodate the safe travel of bicyclists as part of the travel lanes/cartway.

On-street parking can be accommodated on either one or both sides of the street. Parking lanes should be a minimum of seven (7) feet with an eight-foot maximum. Parking spaces do not have to be delineated; however, parking restrictions should be marked by either paint or signs, whichever is more appropriate for the context of the street.

Sidewalks and curbs are standard for Neighborhood Streets. Sidewalks should be a minimum of four-feet wide, while the curb zone should be at least four-feet wide to allow for streetscaping features such as grass or trees.

When designed correctly, **intersections** safely accommodate both pedestrians and motorists. The design of crosswalks at intersections is dependent on the street context. Intersections can go from no pavement marking to raised intersections where there is an intersection with a higher-speed roadway.

All intersections must meet the current Americans with Disabilities Act (ADA) design guidelines. This involves adequate lane widths, restricted parking near intersections and parking enforcement.

Photo courtesy of airbnb.com

Photo courtesy of Bigelow Homes

Neighborhood Street design can be flexible and creative, combining safety with aesthetic features
Photo courtesy of Away Together

Figure 6.2 - Neighborhood Streets Design Specifications

ROADWAY CLASSIFICATION	DESIGN SPEED[1]	AVERAGE DAILY TRAFFIC (ADT)[2]	LEVELS OF SERVICE	LANE WIDTHS	PARKING LANES
AASHTO	AASHTO	AASHTO	AASHTO	Min/Pref/Max	Min/Pref/Max
URBAN MINOR ARTERIAL, URBAN PRINCIPAL ARTERIAL	30-60 mph (posted 25-45 mph)	12,000-40,000	Designed for LOS C, LOS D may be appropriate in heavily developed areas	One 14' drive lane can be shared by two-way traffic on these low-speed, low-volume roadways.	On-street parking shall be provided. Striping parking is not recommended. 7' minimum and 8' maximum width.

FRONTAGE ZONE	CURB ZONE	SIDEWALK ZONE
Minimum/Preferred	Minimum/Maximum	Minimum/Maximum
4' Minimum preferred.	The curb zone should be a minimum of 4' but can be wider to accommodate streetscape or Green Street features such as shade trees or tree beds.	Sidewalk should be of sufficent width to accommodate pedestrian traffic.

INTERMODAL - BIKE LANES[3]	MEDIANS	DRIVEWAYS/ACCESS
Minimum	Min/Pref/Max	Preferred
Bicycles shoudl utilize shared travel lane with motor vehicles.	Boulevards with 4 or more lanes could include width for median treatment: (1) painted stripe separation: 4' (2) narrow raised curb: 4'-6' (3) raised curb and planted: 10'-16' (4) painted stripe with space for left-turns: 10-16'	Driveways are not restricted.

1. Posted speed is 10 mph less than the design speed

2. Taken from the Civil Engineering Reference Manual

3. Taken from the AASHTO Guide for the Development of Bicycle Facilities

Green Streets

A Green Street is a transportation corridor that incorporates low-impact design elements and promotes non-vehicular forms of transportation. These streets are ideal for the installation of structural and non-structural green infrastructure facilities for stormwater management. Green Infrastructure is defined by the US Environmental Protection Agency as,

> *An array of products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services.*[1]

Low-impact development is a holistic view of green infrastructure in which an entire site, roadway, or region is designed to mimic natural processes, using multiple smaller green infrastructure design elements.

Goals and Objectives

Green Streets will provide various environmental, economic and public health benefits to the residents of Passaic County. The primary objectives of incorporating green infrastructure and low-impact development design elements in County capital planning are decreased infrastructure costs, better asset management, and improved quality of life for Passaic County residents.

Passaic County will promote Green Streets pilot projects in various municipalities and track their performance. This data and technical assistance from the U.S. Environmental Protection Agency ,Office of Sustainable Communities will lead to the development of a Passaic County Green Streets Program. The goals of Green Streets include:

Stormwater Management

Green Streets minimize impervious coverage, utilizing the natural water retention and absorption provided by native vegetation and permeable soils to reduce both stormwater runoff volumes and peak flows. This can minimize the rate and severity of flood events, and indirectly, the negative economic, societal and environmental impacts of flooding.

In Passaic County, where portions of the stormwater infrastructure is a combined sewer system, decreasing the volume of stormwater runoff into the system and delaying stormwater discharges can reduce the frequency of combined sewer overflow events, relieve an aging infrastructure system and improve water quality.

Maintain Drinking Water Supply

Green infrastructure allows stormwater to naturally infiltrate soils, improving the recharge rate for groundwater aquifers. According to the Environmental Protection Agency, groundwater provides approximately "40% of the water needed to maintain normal base flow rates in our rivers and streams."[1] Therefore, green infrastructure can replenish groundwater supplies through more rapid and effective infiltration of stormwater.

Improve Environment and Public Health

Green infrastructure provides environmental and public health benefits, including improving water and air quality as well as mitigating the impacts of heat islands. Low impact development encourages

1 http://www.epa.gov/npdes/greeninfrastructure

vegetation and street trees as design elements, which filter and absorb air pollution, capture and remove carbon dioxide from the atmosphere, and provide much needed wildlife habitat, recreational areas, and open space.

Southern Passaic County's dense concentrations of pavement and development absorb heat, creating a "heat island" effect where annual air temperatures can be 1.8 - 5.4°F higher, on average, than surrounding communities.[2] Trees and increased vegetation cool air temperature, which reduces energy demands and slows the formation of ground-level ozone or smog, a known contributor to childhood asthma. Increased green space in cities has been linked to other public health benefits such as lower childhood obesity rates and reduced hyperactivity.[3]

Untreated stormwater can flow across paved surfaces into streams and rivers while collecting chemicals, bacteria and other pollutants that contaminate watersheds. This is common in Passaic County's urban areas, where both the Molly Ann and Goffle Brooks do not meet NJDEP surface water quality standards. Green Infrastructure enables stormwater to infiltrate near its source, preventing sheet runoff, and allowing soil to filter runoff before it enters streams and rivers.

Better Quality of Life for Passaic County Residents

Green infrastructure will beautify Passaic County's public spaces and roadways. Increasing the number and variety of shade trees is the first step toward a more aesthetically pleasing urban environment, enhanced by other design elements including stormwater planters, rain gardens and vegetated roadways.

Studies show that vegetation and green spaces in urban areas reduces inner-city crime and violence while increasing recreational opportunities and a sense of community.[4] Across the United States, case studies demonstrate that surrounding property values increase when green infrastructure is integrated into site design and streetscape. For example, converting abandoned lots in Philadelphia, PA to green landscapes resulted in a 30% increase in surrounding housing values.[5]

Decrease Capital Costs of Public Infrastructure

Green infrastructure can decrease capital costs for the County of Passaic, bringing tax relief to residents. Valuing green infrastructure requires not only comparing the design and construction, operation, and maintenance costs of traditional infrastructure, but accounting for avoided damages, such as property loss during flood events, added value (higher property values), and benefits to the environment and public health, such as decreased medical costs for residents.

Many of the costs and benefits of green infrastructure are unquantifiable, including hazard mitigation, wildlife habitat preservation or a better quality of life for Passaic County residents. Green infrastructure therefore provides "net benefits" to the County. According to the Center for Clean Air Policy, "Green alleys or streets, rain barrels, and tree planting are estimated to be three to six times more effective in managing storm-water per $1,000 invested than conventional methods. "[6]

2 http://www.epa.gov/heatisld/about/index.htm
3 http://lhhl.illinois.edu/all.scientific.articles.htm
4 http://lhhl.illinois.edu/all.scientific.articles.htm
5 http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_philadelphia_bottomline.pdf
6 www.ccap.org/docs/resources/989/Green_Infrastructure_FINAL.pdf

Typical Design Elements

Passaic County encourages the use of the following low-impact design elements in all capital improvement projects and site development to further the goals and objectives of Green Streets. All design elements located within the right-of-way of County roads will require approval from the Passaic County Engineering Department.

Roadways

Green Streets minimize impervious surface coverage and disconnect the flow of stormwater runoff over impervious surfaces. With appropriate consideration given to traffic density, safety, emergency vehicles, and necessary street parking, street widths should be designed with the lowest minimum pavement or cartway width allowable by state and federal standards. On-street parking lanes should be made of pervious paving materials when possible, designed appropriately for the soils and infrastructure beneath the roadway. Pervious paving is not recommended for travel lanes.

Shoulders, traffic circles, rotaries, medians, and islands should be vegetated in order to receive and filter stormwater before it enters the storm sewer system or nearby bodies of water. Accordingly, roadways should be sloped or graded to direct stormwater into vegetated stormwater receiving areas.

Green Streets promote all forms of transportation that reduce congestion on roadways, including bicycling. Roadways should be designed with the highest possible level of bicycle facilities, including vehicular traffic calming, appropriate bicyclist signage and striping, and shoulders. Public facilities and amenities to promote on-road bicycling should be installed, including bicycle parking areas, bike lockers and racks, rest areas and comfort stations.

Public Transit

When feasible, the green infrastructure design elements detailed for roadways and streetscapes should be integrated into public transit facilities, including bus stops and train stations. Pervious

Rain Garden, Haledon, NJ
Photo courtesy of Amy Rowe, Rutgers Cooperative Extension of Essex & Passaic Counties

Curb Inlet ,Burnsville, MN
Photo courtesy of US Environmental Protection Agency c/o City of Burnsville and Barr Engineering

Bioswale, Bloomfield, MI
Photo courtesy of Lawrence Tech College of Engineering

paving, street trees and stormwater planters, green roofs, and energy efficient lighting are all applicable design elements for public transit facilities.

Passaic County supports investment by NJ Transit in expanding passenger rail service, priority bus service, and bus rapid transit to minimize congestion on Passaic County roads, reduce greenhouse gas emissions and the formation of ground-level ozone, and to provide multiple modes of transportation for all Passaic County residents.

Expanded public transportation necessitates integrating public transportation with bicycling, walking, and driving. Public transportation facilities require adequate seating areas, bus shelters and covered train platforms for pedestrians, bicycle lockers and bike, and parking areas for motorists. Passaic County supports the NJ Transit Bike Program and encourages NJ Transit to install bike racks on buses and expand hours that standard bicycles are permitted on trains.

On-Site Design Elements

The goals of Green Streets are advanced by on-site detention of stormwater and drainage. Section V of the County of Passaic Right of Way Entry Opening Resolution states that the diversion of surface and other runoff waters to and upon County roadways, right-of-ways, drains, gutters, bridges, and culverts is prohibited in Passaic County. Using low impact development tools on-site, similar to green streets design elements, can prevent runoff in County roadways and increase compliance with the County standard for no net increase of stormwater in County roads.

On-site design elements are practices that treat and reduce stormwater runoff from individual lots, primarily through detaining runoff from rooftops and driveways. Managing runoff from these impervious sources on-site means disconnecting them, which reduces the overall imperviousness of the watershed and speed of stormwater runoff, which is critical in Passaic County's flood prone watersheds.

Green Roof ,Chicago, IL
Photo courtesy of Natural Resources Defense Council c/o Roofscapes, Inc.

Rain Barrel, Paterson, NJ
Photo courtesy of Passaic County Planning Department

Bus Stop with Green Roof and Alternative Fuel Bus, Philadelphia, PA
Photo courtesy of Inhabitat

Streetscape Features

Green infrastructure can be integrated into nearly any streetscape plan, as the recommended design elements can be tailored to meet various aesthetics.

Plant Street Trees

Urban tree canopies intercept rainfall before it reaches the pavement and becomes stormwater; therefore street trees can reduce stormwater runoff and treat increased runoff from existing development. Street trees are also vital for air quality and public health by filtering air pollution and lessening the urban heat island effect.

Street trees are only effective components of Green Streets if they thrive; therefore the critical root zone, the area around a tree required for the tree's survival, must be protected. Within the critical root zone, adequate soil volume and mixture should be provided, not compacted and have access to both air and water.

Utilize Stormwater Planters

Stormwater planters can both reduce peak flows of stormwater during storm events and treat stormwater before it enters the storm sewer system and watersheds.

Use Pervious Paving Materials for Sidewalks

Sidewalks and bicycle lanes should be made of pervious paving materials when possible, designed appropriately for the soils and infrastructure beneath the sidewalk. Pervious paving materials including pervious asphalt, pervious concrete, interlocking pavers, grass-crete, and crushed stone provide runoff storage and infiltration into layers of stone base. Pervious paving materials are designed for precipitation only, not stormwater runoff.

Where pervious paving is not feasible, impervious sidewalks may be disconnected from the drainage system to allow some of the runoff from the impervious surfaces to re-infiltrate in adjacent pervious areas.

Integrate Vegetated Stormwater Receiving Areas

Green Streets should be designed to minimize stormwater runoff directly entering the storm sewer system. Streetscape features should be vegetated in order to receive and filter stormwater. Vegetated streetscape design elements include rain gardens, vegetated swales and median planting strips.

Install Bicycle Facilities

Green Streets are designed to accommodate on-road bicycling, therefore streetscape features should include public facilities and amenities to promote on-road bicycling. Bicycle facilities include bicycle parking areas such as bike lockers and racks, shelters, rest areas and comfort stations, as well as bicycle-on-transit accommodations.

Energy-Efficient Lighting

Energy-efficient lighting uses a balance of energy efficient technology, design, and siting to make Passaic County roads safe, functional and aesthetically pleasing for pedestrians, bicyclists and motorists. Beyond engineering requirements, street lighting should consider energy-efficient lamp technologies to provide greater light distribution with fewer fixtures, optimum pole placement and reduced number of poles. The Borough of Pompton Lakes installed LED street lights downtown, resulting in an energy savings of 50% and estimated reduction of future maintenance costs by nearly 75%.

Street Trees

Grouped plantings in a bioswale
Photo courtesy of US Environmental Protection Agency

Street trees in large tree pit
Brooklyn, NY
Photo courtesy of Gotham Gazette

Street trees in connected tree pits
Boise, ID
Photo courtesy of City of Boise

Pervious Paving Materials

Pervious concrete walkway
Washington, DC
Photo courtesy of US EPA

Grass-crete & crushed stone bikeway
Little Falls, NJ

Interlocking pavers in parking area
Photo courtesy of US EPA

Stormwater Receiving Areas

Contained stormwater planter with disconnected downspout
Photo courtesy of US EPA

Flow-through stormwater planter with street bench seattle, WA
Photo courtesy of SvR Design Company

Infiltration stormwater planter with curb cut Philadelphia, PA
Photo courtesy of Philadelphia Water Department

COMPLETE STREETS

Map 1 Complete Streets Classifications
Northern Passaic County

ORANGE COUNTY
NEW YORK
SUSSEX COUNTY
PASSAIC COUNTY
BERGEN COUNTY
MORRIS COUNTY

NORTH

0 1 2 Miles

Legend

County Roadway Classification

- Regional Street
- Highlands Regional Street
- Community Street
- Downtown Street
- Neighborhood Street
- Designated Redevelopment Area
- Potential Development Area

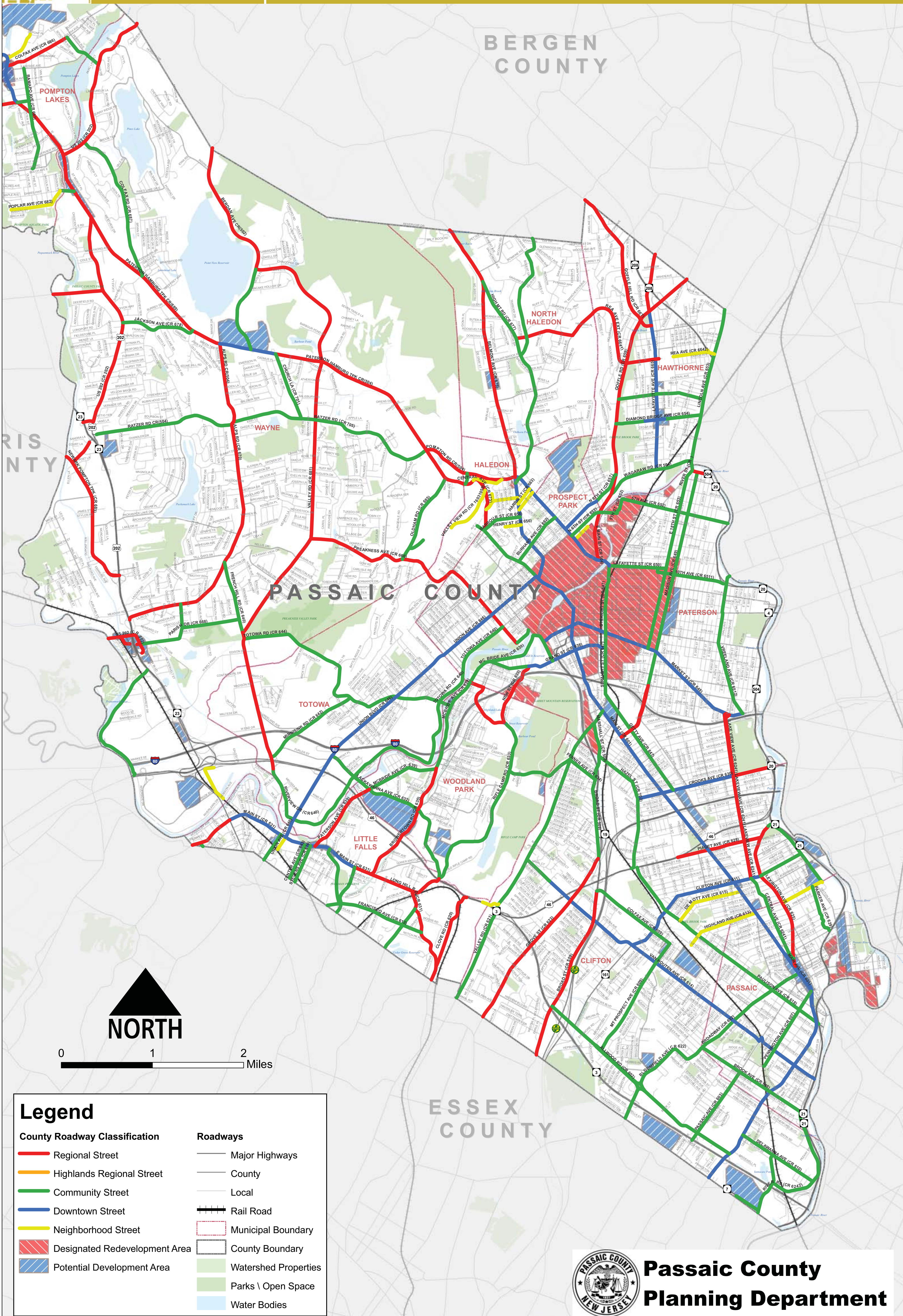
Roadways

- Major Highways
- County
- Local
- Rail Road
- Municipal Boundary
- County Boundary
- Watershed Properties
- Parks \ Open Space
- Water Bodies

Passaic County Planning Department

COMPLETE STREETS

Map 2 Complete Streets Classifications Southern Passaic County



Passaic County Planning Department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APPENDIX B
GREEN STREETS
REFERENCE MATERIALS

Section 3 – Green Streets

A. What is a Green Street?

The Green Street is a transportation corridor that incorporates low-impact design elements and promotes alternative forms of transportation to help reduce greenhouse gas emissions. These streets are ideal for the installation of structural and non-structural green infrastructure facilities for stormwater management. Reclaiming parts of the on-road and off-road environment will improve both water quality and reduce peak stormwater volumes, which can incrementally reduce flood events and their impacts throughout Passaic County.

Green Infrastructure is defined by the US Environmental Protection Agency as

> *An array of products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services. As a general principal, Green Infrastructure techniques use soils and vegetation to infiltrate, evapotranspirate, and/or recycle stormwater runoff… In addition to effectively retaining and infiltrating rainfall, these technologies can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits.*[1]

Low-impact development is a more holistic view of green infrastructure in which an entire site, roadway, or region is designed to mimic natural processes, using multiple smaller green infrastructure design elements.

B. Goals and Objectives

Green Streets will provide various environmental, economic, and public health benefits to the residents of Passaic County. The primary objectives of incorporating green infrastructure and low-impact development design elements in County capital planning are ***decreased infrastructure costs, better asset management,*** and ***improved quality of life for Passaic County residents.***

Passaic County will promote Green Streets pilot projects in various municipalities and track their performance. This data and technical assistance from the U.S. Environmental Protection Agency Office of Sustainable Communities will lead to the development of a Passaic County Green Streets Program. The goals of Green Streets include:

1. **Stormwater Management**

   Green Streets minimize impervious coverage, and utilize the natural water retention and absorption provided by native vegetation and permeable soils to reduce both stormwater runoff volumes and peak flows. Increasing the permeability of ground cover allows stormwater runoff to infiltrate the ground, reducing the volume of runoff entering storm sewer system and watersheds. Reduction in stormwater volumes can minimize the rate and severity of flood events, as well as the negative economic, societal, and environmental impacts of flooding.

   Specifically in the City of Paterson, where much of the stormwater infrastructure is a combined sewer system, decreasing the volume of stormwater runoff into the system

[1] http://www.epa.gov/npdes/greeninfrastructure

and delaying stormwater discharges can reduce the frequency of combined sewer overflow events, relieve an aging infrastructure system, and improve water quality.

2. **Maintain Drinking Water Supply**

   Green infrastructure allows stormwater to naturally infiltrate soils, improving the recharge rate for groundwater aquifers. According to the Environmental Protection Agency, groundwater provides approximately "40% of the water needed to maintain normal base flow rates in our rivers and streams."[2] Therefore, green infrastructure can replenish groundwater supplies through more rapid and effective infiltration of stormwater.

3. **Improve environment and public health**

   Green infrastructure provides additional environmental and public health benefits, including improving water and air quality as well as mitigating the impacts of urban heat islands.

   Left untreated, stormwater can sheet flow across paved surfaces into streams and rivers, all the while collecting chemicals such as engine oil or pesticides, bacteria from animal refuse and other pollutants, which end up contaminating watersheds. This process is very common in Passaic County's urban areas, where both the Molly Ann Brook and Goffle Brook do not meet NJDEP surface water quality standards. Green infrastructure enables stormwater to infiltrate near its source, preventing sheet runoff, and allowing soil to filter runoff before it enters nearby streams and rivers.

   Green infrastructure and low-impact development encourage vegetation and street trees as design elements, which filter and absorb air pollution. In addition to pollutants, increased vegetation can capture and remove carbon dioxide from the atmosphere through photosynthesis. Green infrastructure can also provide much needed wildlife habitat, recreational space and open space.

   Southern Passaic County was one of the first urban hubs in New Jersey, with Paterson at the center of industrial growth and manufacturing. Nearly two centuries of urban growth saw the disappearance of the naturally vegetated landscape as roads were paved and buildings were erected. Such dense concentrations of paved land absorb heat, and tall buildings surrounding narrow streets trap and concentrate released heat from vehicles and heating or cooling units. Annual air temperature in cities can be 1.8-5.4°F higher, on average, than their surrounding communities.[3]

   Trees and increased vegetation cool air temperature, which reduces energy demands for air conditioning, and slows the formation of ground-level ozone or smog, a known contributor to childhood asthma. In addition to reducing asthma rates attributed to ground-level ozone, increased green space in cities has been linked to other public health benefits such as lower childhood obesity rates and reduced hyperactivity.[4]

4. **Better Quality of Life for Passaic County Residents**

   While serving the active infrastructure functions of stormwater management, groundwater recharge, and filtering air and water pollutants, green infrastructure will

[2] http://www.epa.gov/npdes/greeninfrastructure
[3] http://www.epa.gov/heatisld/about/index.htm
[4] http://lhhl.illinois.edu/all.scientific.articles.htm

also beautify Passaic County's public spaces and roadways. Increasing the number and variety of shade trees is the first step toward a more aesthetically pleasing urban environment, enhanced by other design elements including stormwater planters, rain gardens and vegetated roadways.

Studies show that vegetation and green spaces in urban areas reduces inner-city crime and violence yet increases recreation opportunities and sense of community. Similar studies show increased academic performance and concentration among children in greener cities.[5]

Green infrastructure design elements have been implemented all across the United States, in rural and urban communities alike. Case studies from many urban areas demonstrate increases in surrounding property values when green infrastructure is integrated into site design and streetscapes. For example, converting abandoned lots in Philadelphia to green landscapes resulted in a 30% increase in surrounding housing values, or a $4 million gain in property values through tree plantings and $14 million through lot improvements.[6]

5. Decrease Capital Costs of Public Infrastructure

Green infrastructure can provide decreased capital costs for the County of Passaic, and tax relief to residents. Valuing green infrastructure requires not only comparing the design and construction, operation, and maintenance cost of traditional infrastructure, but accounting for avoided damages, such as property loss during flood events, added value (higher property values), and the benefits to environment and public health, such as decreased medical costs for residents. Many of the costs and benefits of green infrastructure are unquantifiable, including hazard mitigation, wildlife habitat or a better quality of life for Passaic County residents. Green infrastructure therefore provides "net benefits" to the County. According to the Center for Clean Air Policy, "Green alleys or streets, rain barrels, and tree planting are estimated to be 3-6 times more effective in managing storm-water per $1,000 invested than conventional methods.[7]"

Green infrastructure design and construction ranges from lower cost design elements such as rain gardens and rain barrels to higher cost design elements such as pervious paving and connected tree pits. Maintenance of green infrastructure varies per design element, but is often comparatively lower than traditional infrastructure when designed properly. Rather than requiring frequent patching, paving or mowing, the native grasses and vegetation utilized in green infrastructure may require seasonal weeding, and permeable paving requires occasional vacuuming or power washing. Green infrastructure should be designed as self-sustaining as possible, avoiding the need for regular replacement or reconstruction. Proof of the cost effectiveness of green infrastructure has been seen in Portland, Oregon, where a $8 million green infrastructure investment saved $250 million in traditional infrastructure costs, and in Philadelphia, Pennsylvania, which has saved approximately $170 million since 2006 through green infrastructure[8].

[5] http://lhhl.illinois.edu/all.scientific.articles.htm
[6] http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_philadelphia_bottomline.pdf
[7] http://www.ccap.org/docs/resources/989/Green_Infrastructure_FINAL.pdf
[8] http://www.ccap.org/docs/resources/989/Green_Infrastructure_FINAL.pdf

C. Design Elements

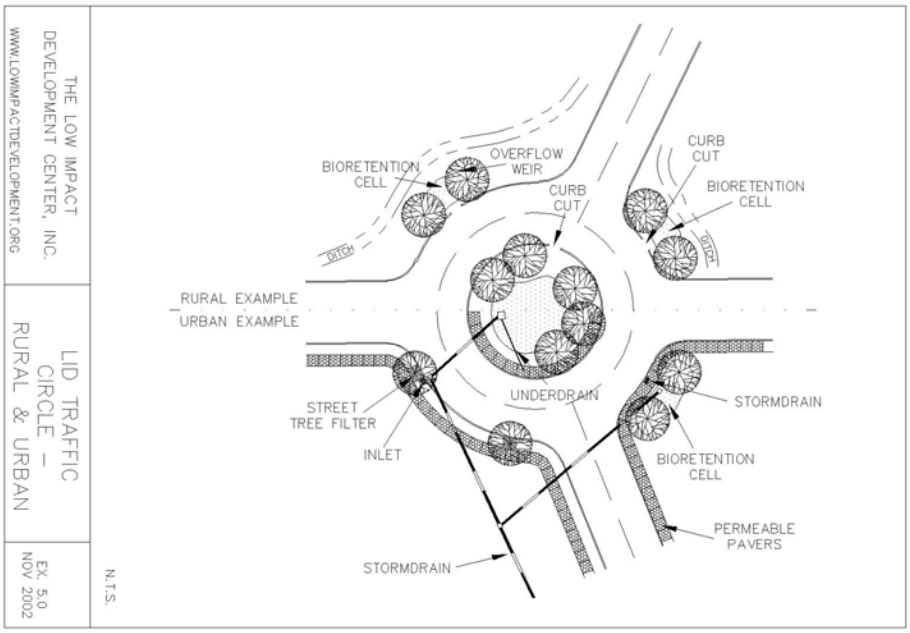
Passaic County encourages use of the following low-impact design elements in all capital improvement projects and site development to further the goals and objectives of Green Streets. All design elements located within the right-of-way of County roads will require approval from the Passaic County Engineering Department.

Roadways

Green Streets minimize impervious surface coverage and disconnect the flow of stormwater runoff over impervious surfaces. By reducing the amount of impervious surface used as roadways, green streets can minimize the volume and speed of stormwater runoff, and mitigate the heat island effect in the County's urban areas. Green Streets design elements for roadways include:

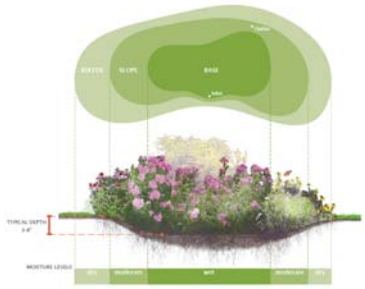
1. **Minimize travel lane widths** - With appropriate consideration given to traffic density, safety, emergency vehicles, and necessary street parking, street widths should be designed with the lowest minimum pavement or cartway width allowable by state and federal standards. Please see the *Passaic County Complete Streets Guidelines*, *Subchapter 4: Streets and Parking of the Residential Site Improvement Standards*, N.J.A.C. 5:21, and AASHTO guidelines.

2. **Vegetate stormwater receiving areas -** Green Streets should be designed so that stormwater is directed into vegetated receiving or infiltration areas, resulting in less runoff directly entering the storm sewer system. Shoulders, traffic circles, rotaries, medians, and islands should be vegetated in order to receive and filter stormwater before it enters the storm sewer system or nearby bodies of water. Accordingly, roadways should be sloped or graded to direct stormwater into vegetated stormwater receiving areas. Please see *Chapter 2: Low Impact Development Techniques, New Jersey Stormwater Best Management Practices Manual*, 2004 and *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices*, EPA, 2007.



Courtesy, *Low Impact Development Center, Inc.*

Recommended vegetated stormwater receiving areas include:

Vegetated stormwater receiving areas	
Bioretention swales Vegetated swales are densely planted, gently sloping depressions which treat runoff from roadways, parking areas or other impervious surfaces. The vegetation acts as a natural filter that allows stormwater runoff to slowly infiltrate into the ground. Often located adjacent to the edge of roadway pavement, swales are recommended in areas with well permeable soil, and may be used in conjunction with an infiltration basin. Swales should be located at least 10 feet from any building foundation, and stormwater should be conveyed directly into the swale, either by grading the impervious surface from which the swale will collect stormwater toward the swale or by using a trench or berm to direct stormwater into the swale.	 Courtesy, *Lawrence Tech College of Engineering*
Rain Gardens Also known as vegetated infiltration basins, rain gardens are planted depressions with a berm that collects and temporarily stores stormwater runoff from impervious surfaces, an inlet pipe, or disconnected downspout until it infiltrates into the ground. Rain gardens should be sized appropriately to accommodate the volume of stormwater to be collected. As with swales, rain gardens should be located at least 10 feet from any building foundation. Rain gardens should not be located on a site with >12% grade, directly on top of septic systems, or in areas prone to flooding. The purpose of a rain garden is to capture stormwater and allow it to infiltrate before it gets to the area where it pools or floods; therefore rain gardens should not be installed in extremely wet areas. For specific details on rain garden design and installation, please consult the *Rain Garden Manual of New Jersey*, Rutgers Water Resources Program.	 Courtesy, *Amy Rowe*  Courtesy, *Rain Garden Manual of New Jersey,* Rutgers Water Resources Program
Curb inlets On roadways where curbs are necessary per the *Passaic County Complete Streets Guidelines*, such as downtown, community or neighborhood streets, curb cuts should be used as inlets to direct storm water into infiltration design elements such as swales, trenches or rain gardens.	 Courtesy, *EPA*

Infiltration basins Trenches or infiltration basins are shallow impoundments designed to allow stormwater to infiltrate the soil while removing pollutants. Infiltration basins can help recharge groundwater, in effect increasing baseflow to stream systems. Infiltration basins should only be used in areas with highly permeable and uncontaminated soil, and are most often used in rural areas where continuous, flat areas are available without existing underground infrastructure.	 Courtesy, *EPA*

3. **Promote on-road bicycling** – As mentioned in previous sections of the *Complete Streets Guidelines*, Green Streets promote all forms of transportation that reduce congestion on roadways, including bicycling. Roadways should be designed with the highest possible level of bicycle facilities, including vehicular traffic-calming, appropriate bicyclist signage and striping, and shoulders, in accordance with the *NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines,* and AASHTO.

4. **Use pervious paving materials for on-street parking lanes –** On-street parking lanes should be made of pervious paving materials when possible, designed appropriately for the soils and infrastructure beneath the roadway. While pervious paving is not recommended for travel lanes or entire roadways, some pervious paving materials are adequate to withstand parking. Consideration should be given to types of vehicles that park in the specific on-street parking area under design, road classification, and surrounding land use. Further information on pervious paving materials is provided in the following section, *Streetscape Features*. Please see the *US EPA National Menu of Stormwater Best Management Practices* for detailed guidance.

Streetscape Features

1. **Integrate vegetated stormwater receiving areas** – As previously described in the *Roadways* section, Green Streets should be designed to minimize stormwater runoff directly entering the storm sewer system. Streetscape features should be vegetated in order to receive and filter stormwater. Vegetated streetscape design elements include rain gardens, vegetated swales and median planting strips. Please see *Roadways* recommendation 2. *Vegetate stormwater receiving areas* for further guidance.

2. **Plant street trees** – Urban tree canopies intercept rainfall before it reaches the pavement and becomes stormwater, therefore street trees can reduce stormwater runoff and treat increased runoff from existing development. According to the Natural Resources Defense Council, trees with mature canopies can absorb the first half-inch of rainfall. Street trees are also vital for air quality and public health by filtering air pollution and lessening the urban heat island effect. For more guidance on planting street trees, please consult the *Passaic County Forestry Management Plan* and municipal shade tree ordinances.

   Street trees are only effective components of Green Streets if they thrive, therefore the critical root zone, the area around a tree required for the tree's survival, must be

protected. The critical root zone is determined by tree size, species and surrounding soils. Often street trees fail when they are planted in highly disturbed soils with poor drainage, aeration, structure, and little organic matter. Within the critical root zone, adequate soil volume and mixture should be provided that are not compacted and have access to both air and water. Recommended street tree planting methods include:

Street Trees	
Grouped plantings Grouped plantings are single trenches, tree pits, or planting beds planted with multiple street trees or trees and other forms of native vegetation. Grouped plantings provide increased shading, higher soil volume and less soil compaction, and reduced evapotranspiration.	 Courtesy, *EPA*
Structural soils and cells Also known as "cells," structural soils are rigid frames and platforms installed under sidewalks or paved surfaces and filled with lightly compacted soil that suspend and support the pavement while allowing tree roots to grow. Structural soils provide better access for street trees to air and water, and also accommodate surrounding utilities.	 Courtesy, *Baum Publications Ltd.*
Deep tree pits Tree pits should be as large and deep as possible given surrounding conditions and local ordinances to accommodate future tree growth in the critical root zone, ideally five (5) feet by 10 feet.	 Courtesy, *Gotham Gazette*
Connected tree pits Connected or continuous tree pits are areas with a continuous soil panel between trees. Often concrete footings or other structural elements, similar to structural soils frames, are used to help suspend the sidewalk paving over the continuous soils.	 Courtesy, *City of Boise*

3. **Use pervious paving materials for sidewalks -** Locations for sidewalks and bicycle lanes should follow the *Passaic County Complete Streets Guidelines* based on road classification. Sidewalks and bicycle lanes should be made of pervious paving materials

when possible, designed appropriately for the soils and infrastructure beneath the sidewalk. Pervious paving materials including pervious asphalt, pervious concrete, interlocking pavers, grass-crete, or crushed stone provide runoff storage and infiltration into layers of stone base. Pervious paving materials are designed for precipitation only, not stormwater runoff.

Where pervious paving is not feasible, impervious sidewalks may be disconnected from the drainage system to allow some of the runoff from the impervious surfaces to re-infiltrate in adjacent pervious areas. Please see the *US EPA National Menu of Stormwater Best Management Practices* for detailed guidance. Recommended pervious paving materials include:

Pervious Paving Materials	
Pervious asphalt Pervious asphalt is similar to conventional asphalt but with a larger coarse stone aggregate, very little fine aggregate, and more air spaces or voids. The additional voids allow water to drain through the asphalt into a thick base of crushed aggregate or gravel prior to infiltrating the ground.	 Courtesy, *Low Impact Development Center, Inc.*
Pervious concrete Pervious concrete is similar to conventional concrete but with less sand and more air spaces or voids. The additional voids allow water to drain through the concrete into one or more layers of crushed stone aggregate and then a thick base prior to infiltrating the ground. Pervious concrete and asphalt are ideal for both sidewalks and bicycle lanes.	 Courtesy, *EPA*
Crushed stone A preferred treatment for bicycle trails and paths, gravel or stone dust is very small crushed stone aggregate that provides a stable enough surface similar to pavement but is permeable, allowing water to infiltrate the soil.	 Passaic County Planning Dept.
Interlocking pavers Permeable interlocking pavers are paving stones with openings at locking joints filled with small aggregate such as sand or gravel. Water drains between the pavers into one or more layers of sand prior to infiltrating the ground. Interlocking pavers can be made of pre-cast concrete, brick or stone, and are able to withstand high volumes of traffic.	 Courtesy, *EPA*

Grass-crete Also known as turf block, grass-crete is similar to permeable interlocking pavers but with larger locking joints normally filled with soil and planted with turf grass or another groundcover. As noted in its name, grass-crete cells are made of concrete and sometimes plastic. Water drains between the grass-crete through the vegetation into one or more layers of crushed aggregate prior to infiltrating the ground. Grass-crete functions best in low volumes of traffic such as patios, walkways, and terraces. Interlocking pavers and grass-crete are ideal for sidewalks, parking areas, and other streetscape facilities.	 Passaic County Planning Dept.

4. **Install bicycle facilities –** Green Streets are designed to accommodate on-road bicycling, therefore streetscape features should include public facilities and amenities to promote on-road bicycling. Bicycle facilities include bicycle parking areas such as bike lockers and bike racks, shelters, rest areas and comfort stations, as well as bicycle-on-transit accommodations. Bicycle facilities should be designed in accordance with the *NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines.*

5. **Energy efficient lighting**

   Energy efficient lighting uses a balance of energy efficient technology, design, and siting to make Passaic County roads safe, functional and aesthetically pleasing for pedestrians, bicyclists and motorists. Beyond engineering requirements, street lighting should consider energy efficient lamp technologies to provide greater light distribution with fewer fixtures, optimum pole placement and reduced number of poles[9]. The Borough of Pompton Lakes installed LED street lights, with a 16.3 year life span contrary to the 3.5 year life span of traditional metal halide lights, resulting in an energy savings of 50% and estimated reduction of future maintenance costs by nearly 75%.

6. **Utilize stormwater planters –** Stormwater planters can both reduce peak flows of stormwater during storm events and treat stormwater before it enters the storm sewer system and watersheds. Recommended stormwater planters include:

Stormwater Planters	
Contained planters A contained planter, or traditional planter, is a container filled with soil and plants that is placed above ground on an impervious surface. Precipitation gradually filters through the planter's soil, rather than into a stormwater system. Some contained planters have perforations or 'weep holes' at the bottom to allow any excess water to flow out of the planter. Contained planters are meant to collect precipitation, not stormwater runoff.	 Courtesy, *EPA*

[9] http://www.rpi.edu/dept/lrc/nystreet/

Flow-through planters A flow-through planter is also a container filled with soil and plants, but can be placed above ground on an impervious surface or in the ground. Precipitation gradually filters through the planter's soil, but instead of being contained in the planter or flowing through 'weep holes,' excess water is collected in a perforated pipe at the bottom of the planter that connects to a stormwater system. Flow-through planters are recommended in areas with less permeable soil that does not drain well.	 Courtesy, *SvR Design Company*
Infiltration planters An infiltration planter is a structure filled with soil and plants, but it is unlike a container because it has either no bottom or an open bottom. Precipitation gradually filters through the planter's soil, and excess water flows into the ground. Infiltration planters usually contain a layer of gravel or stone, and often have a layer of sand in addition to soil as a planting medium. Infiltration planters are only recommended in areas with very permeable soil that drains well. All three types of planters can be made of various materials, from stone to wood or concrete, and can be aesthetically designed to fit a variety of settings.	 Courtesy, *Philadelphia Water Department*

Public Transit

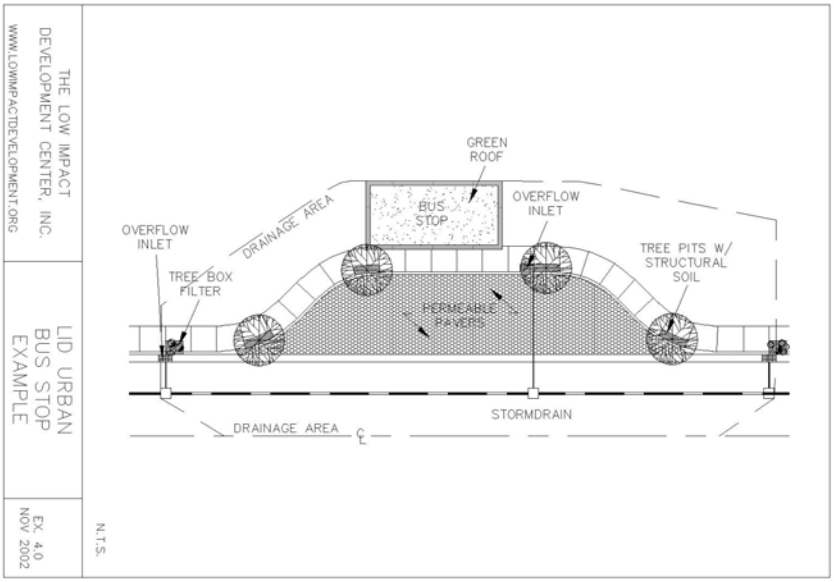
1. **Promote public transportation**

   As mentioned in previous sections of the *Passaic County Transportation Element*, the County supports investment by NJ Transit in expanding passenger rail service, priority bus service and bus rapid transit to minimize congestion on Passaic County roads, reduce greenhouse gas emissions and the formation of ground-level ozone, and provide multiple modes of transportation for all Passaic County residents.

2. **Integrate all modes of transportation**

   Expanded public transportation necessitates integrating public transportation with bicycling, walking and driving. Public transportation facilities require adequate seating areas, bus shelters and covered train platforms for pedestrians, bicycle lockers and bike racks for bicyclists, and parking areas for motorists. Passaic County supports the NJ Transit Bike Program and encourages NJ Transit to install bike racks on buses, and expand hours that standard bicycles are permitted on trains.

3. **Integrate green infrastructure into public transit facilities -** When feasible, the green infrastructure design elements detailed for roadways and streetscapes should be integrated into public transit facilities, including bus stops and train stations. Pervious paving, street trees and stormwater planters, green roofs, and energy efficient lighting are all applicable design elements for public transit facilities.



Courtesy, *Low Impact Development Center, Inc.*

On-Site

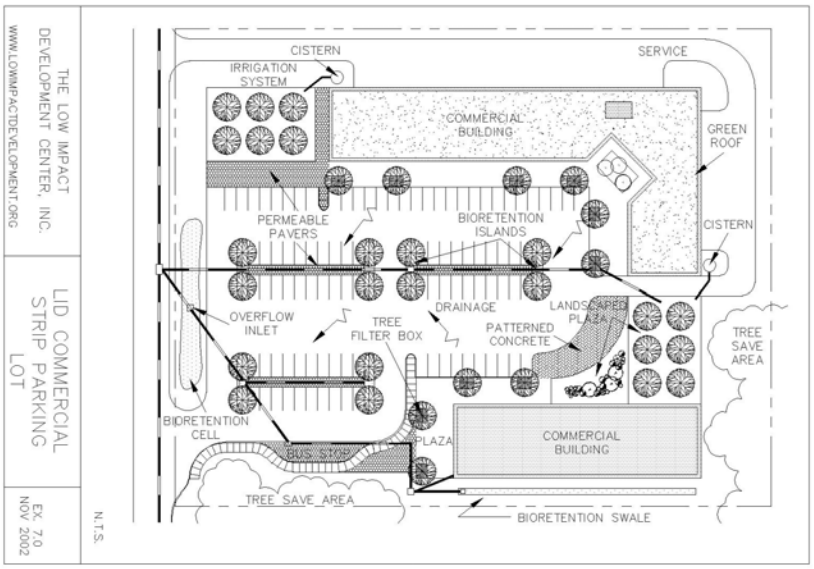
The goals of Green Streets are advanced by on-site detention of stormwater and drainage. Section V of the *County of Passaic Right-of-Way Entry Opening Resolution* states that the diversion of surface and other runoff waters to and upon County roadways, right-of-ways, drains, gutters, bridges, and culverts is prohibited in Passaic County. Using low-impact development tools on-site, similar to Green Streets design elements, can prevent runoff in County roadways and increase compliance with the County standard for no net increase of stormwater in County roads.

On-site design elements are practices that treat and reduce stormwater runoff from individual lots, primarily through detaining runoff from rooftops and driveways. Recommended on-site design elements include:

1. **Reduce parking** – On-site parking requirements are determined through municipal zoning ordinances. Passaic County encourages municipalities to set maximums for the number of parking lots created, reduce the minimum required amount of parking spaces and utilize shared parking among multiple sites to reduce the amount of impervious coverage dedicated to parking.

   Commercial property owners are encouraged to utilize the minimum required amount of parking spaces, minimize dimensions of parking lot spaces, use pervious paving materials in parking lots, and vegetate stormwater receiving areas in or adjacent to parking lots. Mixed-use development wherein parking is provided on the ground floor for other uses above is preferable to surface parking.

   Residential property owners are encouraged to reduce driveway length or utilize shared driveways with neighbors. Reducing impervious coverage through a combination of various low-impact development parking design elements can significantly reduce stormwater runoff and flooding.



Courtesy, *Low Impact Development Center, Inc.*

2. **Retain stormwater on-site using green infrastructure** – Managing runoff from impervious sources on-site means disconnecting them, which reduces the overall imperviousness of the watershed and speed of stormwater runoff, critical in Passaic County's flood prone watersheds. Various design elements discussed in the Roadways or Streetscape Features sections could be utilized on-site to infiltrate rooftop runoff, divert runoff into a pervious area, or store runoff for later use, including pervious paving materials, trees and planters, and vegetated stormwater receiving areas. Additional recommended green infrastructure design elements for stormwater management include:

On-Site Green Stormwater Infrastructure	
Green roofs Green roofs are vegetated roofs which absorb initial precipitation and release it later through evapotranspiration. Green roofs prevent precipitation from flowing directly into the storm sewer system, and can reduce both peak flow volumes and discharge of pollutants into waterways, which are especially beneficial in Passaic County's urban areas with combined sewer systems. In comparison to conventional asphalt or metal roofing, green roofs can increase energy efficiency and reduce the urban heat island effect. Please consult the *US EPA National Menu of Stormwater Best Management Practices* or industry organization, *Green Roofs for Healthy Cities,* for detailed guidance.	 Courtesy, *Natural Resources Defense Council*

Rain barrels Rain barrels or cisterns are large drums, usually 55-60 gallons in capacity, which collect rain water from a roof for nonpotable uses. Water drains from the roof surface to the gutter and then through the downspout, which is directed into a rain barrel. Water collected in rain barrels can prevent water from discharging directly from a roof onto an impervious surface while providing an alternative to using drinking water for gardening, washing cars or pets, and other nonpotable uses. Multiple rain barrels can be connected together to provide extra water storage, and overflow should be directed to a pervious surface at least ten (10) feet from any building foundation, where water can infiltrate the ground. Rain barrels should be elevated at least two (2) feet above the ground on cinder blocks or bricks to allow water to flow from the barrel, and should have a screen or netting cover to prevent mosquito larvae development. For more information on rain barrels, please consult the Rutgers Water Resources Program Fact Sheet *Rain Barrels Part II: Installation and Use*.	 Passaic County Planning Dept.
Drywells A drywell refers to redirecting the storm drain to a linear underground trench, similar to the infiltration trench discussed in the *Roadways* section, with a perforated pipe buried in stone aggregate or gravel. Water flows from a roof through the storm drain into the perforated pipe, which distributes the water throughout the trench. The trench can be directed to a pervious area, or other vegetated stormwater receiving area, such as a bioretention swale or infiltration basin. For further information on drywells, please consult the *US EPA National Menu of Stormwater Best Management Practices.*	 Courtesy, *Portland Built*

3. **Preserve open space in site design** – Known by the EPA as conservation design, sites should be designed to preserve open space to minimize the generation of runoff and treat increased runoff from existing development. Conservation design preserves important environmental features or natural areas of the site, such as riparian and forested areas, and builds upon parts of the site with the least porous soil. Development should strive for the least site disturbance possible, avoid clearing and grading the site, and maintain natural vegetation. Cluster development, reduced setbacks, and conservation easements are design elements that preserve open space in site design.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APPENDIX C
SCENARIO PLANNING - MODELING INPUTS AND RESULTS

Passaic County Modeling Scenarios

Appendix C

Scenario Planning – Detailed Modeling Inputs and Results

Base Future Alternative

The Passaic County Base Future (2035) scenario builds upon the NJTPA Plan 2035 scenario. This network does not contain the Access to the Region's Core (ARC) project. It does contain a system wide five (5) percent increase in transit service to simulate system efficiencies and increased services in the future.

The demographics have been changed in Passaic County. The basis of the demographics is the NJTPA Plan 2035 Scenario. The Passaic County population and employment totals are maintained. The municipal totals are also maintained. Within municipalities, development and redevelopment areas/zones were identified. Growth in municipalities (between 2009 and 2035) was reallocated to these zones based on each area's land contribution (percentage) to the overall area of growth in that municipality. The base case does not contain any enhancements to transit, highway or parking beyond the NJTPA Plan 2035 scenario improvements.

Transit Oriented Development Alternative

The Passaic County Transit Oriented Development (TOD) alternative builds upon the Base Future scenario, intermediate testing and input from NJ Transit. This alternative is meant to simulate TOD principles of increasing service around the TOD development and redevelopment areas created in the Base Future alternative demographics. There are no changes to the demographics in this alternative.

Rail service running through Passaic County was increased by 10% for the inbound peak on the Main Line. On the Montclair Boonton Line service was increased by 10% on inbound peak and outbound off-peak. Service was not increased for the outbound peak service because of single tracking restrictions along portions of the rail line. Park and Ride walk access times were reduced by 20% to simulate better/easier walk times associated with TOD development near train stations.

Bus service running through Passaic County near TOD areas was increase by 10% for both peak and off-peak operations. Auto access to park and ride locations in Passaic County were reduced by 1/3 to ½ of the existing times to also simulate the easier access for TOD areas as a result of locating service nearer to the transit oriented population/employment.

Highway network changes were made to simulate Intelligent Transportation System (ITS) improvements that are in Passaic County plans and other major corridors as identified by Passaic County staff. The methodology behind these improvements is as follows:

For state, authority and interstate roadways:

1. Improved midblock roadway capacity by **5%** for [1]severely congested segments taking into account efficiencies gained from Intelligent Transportation Systems (ITS) such as traffic information systems, improved incident detection and management systems, dynamic variable

[1] "severely congested" or "failing" refers to roadway segments modeled in the NJRTME that have a volume to capacity (VC) ratio > 1.2

Passaic County Modeling Scenarios

message signs and interchange improvements. Most if not all of the state and interstate segments passing through Passaic County are listed on the New Jersey Congested Management System as high priority commuter corridors

For Passaic County and local facilities:

1. Improved midblock roadway capacity by **20%** for [1]failing segments, taking into account efficiencies from traffic management systems, integrated traffic signal systems, traffic cameras, incident detection and management systems (i.e., using Bluetooth detection technology).
2. For those segments that are only moderately congested we improved midblock roadway capacity by **10%** showing a lesser effect as most of the available infrastructure budgets would be spent on improving the worst roadway segments.

Research Behind Improvement Characteristics

Some of the thinking behind the improvement values come from the following which is e*xcerpted from New Jersey Department of Transportation: ITS Investment Strategy 10-Year Program, FY07-16 (Statewide Traffic Operations ITS Engineering March, 2007)*

"According to the Federal Highway Administration (FHWA), metropolitan ITS systems on average have a cost benefit ratio of greater than 8 to 1. Freeway management systems can reduce accidents by 15% and increase capacity by 17% to 25% while Incident Management programs can reduce incident related congestion by up to 50%. By optimizing traffic flow, controlled traffic signal system (CTSS) can also provide capacity improvements of 15% or more with a significant reduction in fuel usage and fumes generated for an additional environmental benefit."

Model Assumptions

	Passaic County Base Future	TOD Alternative
Network	Used NJTPA Plan 2035 Network	Same as Passaic County Base Future
Trip Table	Passaic County demographics: MCD growth placed into redevelopment zones --->>>	Same as Passaic County Base Future
NJTPA Bus Improvements	**NJTPA Based** 5% increase in service simulates improved service system-wide	Same as Passaic County Base Future
Transit - Bus Improvements	NA	1. Increase in **bus service** by 10% for peak and off-peak for bus lines near redevelopment zones 2. **Park and Rides**: decreased access time (~1/3 or 1/2) for Ringwood, Clifton - Allwood Road, Willowbrook Mall, and Paterson 3. Increased percentage zonal **walk access to transit** for redevelopment zones
Transit - Rail Improvements	NA	1. Increase **train service** by 10% on inbound peak on NJ Transit Montclair-Boonton Line and Main Line 2. **Park and Rides**: decreased walk access time by 20% on stations within Passaic County (peak and off-peak) where redevelopment zones have access 3. Increased percentage zonal **walk access to transit** for redevelopment zones
Parking	No Parking changes/charges	On Street parking charges increased in redevelopment zones - aim was to encourage more transit walk trips
Highway Network Adjustments	Small zonal access adjustments --->>>	Same as Passaic County Base Future

Future Congested Roadways after Transit Improvements (identified from TOD Alternative)

NAME	Route Number	From	To
Allwood Road	CO. 602	Passaic Avenue	Mount Prospect Avenue /Clifton
Alps Road		Paterson Hamburg Turnpike	Wilson Avenue
Belmont Avenue		Haledon Avenue	Overlook Avenue
Berdan Avenue		Valley Road	Indian Road
Bloomfield Avenue		Knollwood Road	NJ 3
Clove Road		Long Hill Road	US 46
East 20th Street		I-80	Lafayette
G S P	GARDEN STATE PARKWAY	Int. 154	Int. 155
Getty Avenue		East 20th Street	Straight Street
Glenwild Avenue		Approaching Main Street	Approaching Main Street
Haledon Avenue	CO. 504	North Bridge Street	Belmont Avenue
Hamburg Turnpike		Pompton Ave (Co 504)	Oldham Road
I-80	I-80	NJ 23	Garden State Parkway
I-80	I-80	23rd/Beckwith Avenue (Int. 58A)	Bergen County Border (Int. 59)
Main Avenue	CO. 601 (PASSAIC)	NJ 21	Piaget Avenue
Main Street	CO. 509	East 20th Street	Marshall Street
Main Street (Bloomingdale)		Paterson Hamburg Turnpike	Morris County Border
Main Street and Memorial Drive Combination	CO. 509 SB	Market Street	West Broadway
Market Street		East 20th Street	Spruce Street
Marshall Hill Road		Union Valley Road	Greenwood Lake Turnpike
McBride Avenue		Hillery Street	Glover/West 31st Street
Newark Pompton Turnpike	C.O. 683	US 202/Wayne	Morris County Border
NJ 23		Echo Lake Road	Clifton Road
NJ 23 - Pompton Avenue	N. J. 23	I-80	US 202 Interchange
NJ 23 - Pompton Avenue	N. J. 23 / US 202	Newark Pompton Turnpike	US 202 Interchange
NJ 3	N. J. 3	NJ 23	Bergen County Border
North Straight Street		North Bridge Street	Haledon Avenue
Oak Ridge Road		NJ 23	Morris County Border
Passaic Avenue		Brook Avenue	NJ 3

Future Congested Roadways after Transit Improvements (identified from TOD Alternative)

NAME	Route Number	From	To
Paterson Hamburg Turnpike		Valley Road	Jackson Avenue
Paterson Hamburg Turnpike		Main Street (Bloomingdale)	Morris County Border
Pompton Road	CO. 504	Belmont Avenue	Paterson Hamburg Turnpike
Ratzer Road		Approaching Alps Road	Approaching Alps Road
Route 20	N. J. 20	US 46	I-80
Route 20	U. S. 46	8th Avenue	NJ 4
Route 21	N.J. 21	Madison Street	Outwater Lane
Sloatsburg/Mill Pond Road		Margaret King Avenue	New York State Line
SR 208	N. J. 208	Bergen County Border	Bergen County Border
SR 46	U. S. 46	NJ 23	GSP
SR 46	U. S. 46	GSP	Paulison Avenue
Totowa Road/Totowa Ave		Union Blvd	Elberon Avenue
Union Blvd	CO. 646	I-80	Elberon Avenue
Van Houten Avenue		Garden State Parkway	Mt. Prospect Avenue
Various Roadways		In the Great Falls District Paterson	In the Great Falls District Paterson
West Broadway	CO. 673	Union Boulevard	Main Street

Overall Performance Measures by Scenario

Performance Measure	Unit	2035 Passaic County Base	2035 TOD Alternative	% Change from Base
Passaic County- Statistics				
Highway				
Average Speed by Trip Purpose	mph	30.49	31.29	2.64%
Home Based Work Direct (HBWD)	mph	20.71	21.19	2.31%
Home Based Work Strategic (HBWS)	mph	19.96	20.82	4.31%
Home Based Shopping (HBSH)	mph	17.29	19.89	15.08%
Home Based Other (HBO)	mph	16.16	20.31	25.70%
Work Based Other (WBO)	mph	27.99	26.90	-3.89%
Non-Home Non-Work (NHNW)	mph	21.29	20.07	-5.73%
Average Trip Length				
Home Based Work Direct (HBWD)	Miles	9.55	12.24	28.09%
Home Based Work Strategic (HBWS)	miles	9.06	11.61	28.17%
Home Based Shop (HBSH)	miles	4.21	5.19	23.28%
Home Based Other (HBO)	miles	3.69	5.18	40.49%
Work Based Other (WBO)	miles	11.08	9.85	-11.15%
Non-Home Non-Work (NHNW)	miles	6.16	5.37	-12.96%
VMT - Vehicle Miles of Travel	MVMT	9.926	9.842	-0.84%
Freeways + Expressways	%	55.53%	55.45%	-0.15%
Freeways	%	40.41%	40.34%	-0.19%
Expressways	%	15.12%	15.11%	-0.04%
Principal Arterials	%	10.80%	10.91%	0.99%
Major Arterials	%	15.75%	15.79%	0.26%
Minor Arterials /Collectors /Locals	%	17.91%	17.85%	-0.36%
VMT per Capita	VMT/Person	16.299	16.162	-0.84%
Percentage of VMT Above Congested Conditions (VC >1.2)	%	9.5%	8.9%	-6.16%
Percentage of VMT At Congested Conditions (0.8 < VC < 1.2)	%	26.5%	26.3%	-0.98%
Percentage of VMT Under Congested Conditions (0.8 < VC)	%	64.0%	64.8%	1.32%
VHT - Vehicle Hours of Travel	MVHT	0.326	0.315	-3.39%
Freeways + Expressways	%	40.61%	40.89%	0.69%
Freeways	%	27.94%	27.91%	-0.10%
Expressways	%	12.67%	12.98%	2.41%
Principal Arterials	%	9.98%	10.36%	3.82%
Major Arterials	%	19.43%	19.88%	2.31%
Minor Arterials /Collectors /Locals	%	29.98%	28.87%	-3.70%
VHT per Capita	VHT/Person	0.535	0.516	-3.39%
Percentage of VHT Above Congested Conditions (VC >1.2)	%	24.2%	22.3%	-7.81%
Percentage of VHT At Congested Conditions (0.8 < VC < 1.2)	%	31.6%	31.8%	0.43%
Percentage of VHT Under Congested Conditions (0.8 < VC)	%	44.1%	45.9%	3.98%
Non-Motorized Trips		202,564	202,564	0.00%
Home Based Work Direct (HBWD)	Trips	17,930	17,930	0.00%
Home Based Work Strategic (HBWS)	Trips	5,706	5,706	0.00%
Home Based Shopping (HBSH)	Trips	20,647	20,647	0.00%
Home Based Other (HBO)	Trips	105,683	105,683	0.00%
Work Based Other (WBO)	Trips	17,990	17,990	0.00%
Non-Home Non-Work (NHNW)	Trips	33,471	33,471	0.00%
Home Based University (HBU)	Trips	1,138	1,138	0.00%
Truck - Vehicle Miles of Travel (NJRTME)	MVMT	0.362	0.362	-0.20%
Truck - Vehicle Miles of Travel (FAF3)	MVMT	0.757	0.757	0.00%
Percentage of VMT at Congested Conditions (FAF3)	%	0.369	0.369	0.00%

Transit

Transit Person Trips			26,864	28,216	5.03%
Person Trips by Mode and Purpose (Includes Trucks)			1,166,803	1,164,418	-0.204%
Home Based Work (HBW) - includes Home Based University			18,719	19,472	4.023%
SOV	Trips		245,192	242,433	-1.13%
HOV2	Trips		26,583	26,251	-1.25%
HOV3+	Trips		4,067	4,015	-1.28%
HOV4	Trips		3,174	3,136	-1.20%
Walk to Rail	Trips		570	906	58.95%
Walk to Path	Trips		478	433	-9.41%
Walk to Bus	Trips		14,982	15,052	0.47%
Walk to Ferry	Trips		0	0	0.00%
Walk to LRT	Trips		1	41	4000.00%
Walk to LH Ferry	Trips		0	0	0.00%
Total Walk to Transit	Trips		16,032	16,432	2.50%
Drive to Rail	Trips		1,195	1,416	18.49%
Drive to Path	Trips		194	213	9.79%
Drive to Bus	Trips		1,297	1,410	8.71%
Drive to Ferry	Trips		0	0	0.00%
Drive to LRT	Trips		0	0	0.00%
Drive to LH Ferry	Trips		0	0	0.00%
Total Drive to Transit	Trips		2,687	3,040	13.14%
Home Based Shop (HBSH)			683	733	7.321%
SOV	Trips		59,137	59,120	-0.03%
HOV2	Trips		39,372	39,359	-0.03%
HOV3+	Trips		7,980	7,977	-0.04%
HOV4	Trips		7,963	7,960	-0.04%
Walk to Rail	Trips		7	13	85.71%
Walk to Path	Trips		6	4	-33.33%
Walk to Bus	Trips		643	671	4.35%
Walk to Ferry	Trips		0	0	0.00%
Walk to LRT	Trips		0	14	0.00%
Walk to LH Ferry	Trips		0	0	0.00%
Total Walk to Transit	Trips		656	703	7.16%
Drive to Rail	Trips		6	8	33.33%
Drive to Path	Trips		2	2	0.00%
Drive to Bus	Trips		18	19	5.56%
Drive to Ferry	Trips		0	0	0.00%
Drive to LRT	Trips		0	0	0.00%
Drive to LH Ferry	Trips		0	0	0.00%
Total Drive to Transit	Trips		27	30	11.11%
Home Based Other (HBO)			4,194	4,581	9.227%
SOV	Trips		203,589	203,416	-0.08%
HOV2	Trips		141,390	141,281	-0.08%
HOV3+	Trips		53,812	53,772	-0.07%
HOV4	Trips		50,771	50,734	-0.07%
Walk to Rail	Trips		159	336	111.32%
Walk to Path	Trips		13	9	-30.77%
Walk to Bus	Trips		3,614	3,758	3.98%
Walk to Ferry	Trips		0	0	0.00%
Walk to LRT	Trips		0	5	0.00%
Walk to LH Ferry	Trips		0	0	0.00%
Total Walk to Transit	Trips		3,786	4,108	8.51%
Drive to Rail	Trips		281	343	22.06%

Walk to Ferry	Trips	0	0	0.00%
Walk to LRT	Trips	0	14	0.00%
Walk to LH Ferry	Trips	0	0	0.00%
Total Walk to Transit	Trips	656	703	7.16%
Drive to Rail	Trips	6	8	33.33%
Drive to Path	Trips	2	2	0.00%
Drive to Bus	Trips	18	19	5.56%
Drive to Ferry	Trips	0	0	0.00%
Drive to LRT	Trips	0	0	0.00%
Drive to LH Ferry	Trips	0	0	0.00%
Total Drive to Transit	Trips	27	30	11.11%
Home Based Other (HBO)		4,194	4,581	9.227%
SOV	Trips	203,589	203,416	-0.08%
HOV2	Trips	141,390	141,281	-0.08%
HOV3+	Trips	53,812	53,772	-0.07%
HOV4	Trips	50,771	50,734	-0.07%
Walk to Rail	Trips	159	336	111.32%
Walk to Path	Trips	13	9	-30.77%
Walk to Bus	Trips	3,614	3,758	3.98%
Walk to Ferry	Trips	0	0	0.00%
Walk to LRT	Trips	0	5	0.00%
Walk to LH Ferry	Trips	0	0	0.00%
Total Walk to Transit	Trips	3,786	4,108	8.51%
Drive to Rail	Trips	281	343	22.06%
Drive to Path	Trips	17	15	-11.76%
Drive to Bus	Trips	110	114	3.64%
Drive to Ferry	Trips	0	0	0.00%
Drive to LRT	Trips	0	0	0.00%
Drive to LH Ferry	Trips	0	0	0.00%
Total Drive to Transit	Trips	408	473	15.93%
Non-Home Based (NHB)		3,268	3,430	4.957%
SOV	Trips	157,633	157,551	-0.05%
HOV2	Trips	80,016	79,971	-0.06%
HOV3+	Trips	40,113	40,090	-0.06%
HOV4	Trips	19,151	19,140	-0.06%
Walk to Rail	Trips	32	95	196.88%
Walk to Path	Trips	9	6	-33.33%
Walk to Bus	Trips	3,067	3,149	2.67%
Walk to Ferry	Trips	0	0	0.00%
Walk to LRT	Trips	0	0	0.00%
Walk to LH Ferry	Trips	0	0	0.00%
Total Walk to Transit	Trips	3,109	3,250	4.54%
Drive to Rail	Trips	29	40	37.93%
Drive to Path	Trips	7	6	-14.29%
Drive to Bus	Trips	123	134	8.94%
Drive to Ferry	Trips	0	0	0.00%
Drive to LRT	Trips	0	0	0.00%
Drive to LH Ferry	Trips	0	0	0.00%
Total Drive to Transit	Trips	159	180	13.21%

Socioeconomic

Population	608,967	608,967	0.00%
Employment ("Jobs")	222,373	222,373	0.00%
Households	213,120	213,120	0.00%


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